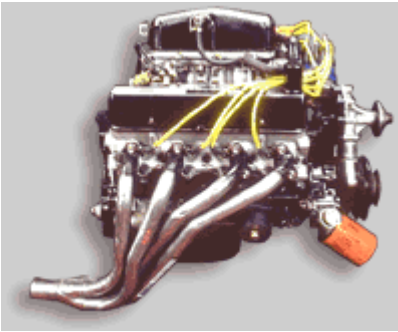
General Information V8 engines, What to expect.



With the Rover V8, We suggest you don't take anything for Granted.

We do not recommend these pages for feint-hearts.

Whilst we realize others may try to copy us & our V8 Engines' high specifications

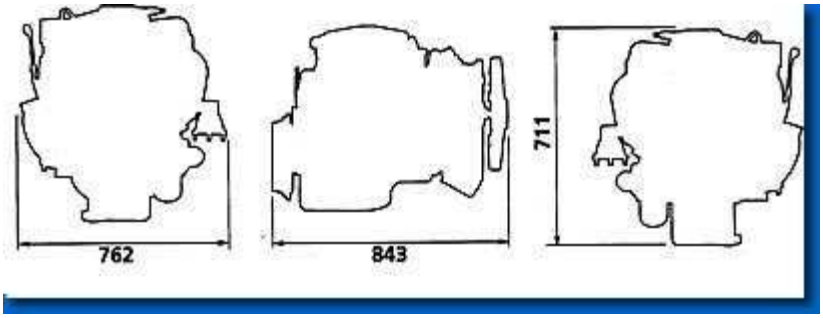
Be assured that 20 years of V8s, and all they have to offer & have been fitted to, can never be duplicated overnight or short term, by the many 'free loader' and 'discounted suppliers'.

We strive to offer (wherever possible) without compromise, first class 'Phone, mail and web based assistance' at all times, and, we think, a second to none service backed up with many, many years of diverse day-to-day Rover V8 experience to call on.

For Land Rovers, Range Rovers, Discoveries, TVRs, TR8s, MGBs, Morgans, SD1s Marcos, Cobras, West fields, Daxs, other kit and custom cars, trikes, planes & more!

General V8 Engine information

Dimensions of the Rover V8 engine fully dressed, and weighing in at 230KG all up.



With the Rover V8, it is never, 'how many miles they have done' but how they did them. This is a typical low mileage engine, it is not uncommen to see such contamination on a ten-year-old or older engine that has covered typically less than 50K miles and has had only factory specified interval oil changes, but please don't let this put you off,
on the other hand, a V8 that does a thousand miles a week would last perhaps 200K miles and still be in great shape.

Almost all used Rover V8 engines that have covered in excess of 70,000 miles will be suffering, or beginning to suffer, from worn camshaft, lifters and a stretched timing chain. This is normal with the V8 because these engines are amongst the most forgiving.

The result is a gradual decrease of engine efficiency and economy that goes quite unnoticed to start with, this is due to the fact that although you have eight cylinders, the major loss of efficiency, in only in one or two of them (typical of a worn camshaft), may not be apparent until they have perhaps failed completely, as the remaining good cylinders will mask the power loss effectively until severe enough to make replacement unavoidable. However, if left this long, many other engine components will have suffered due to this, and can lead to an engine's condition being far too bad for an inexpensive overhaul.

Why unnoticed? With the hydraulic tappets taking up the clearance as things wear away, by the time you get to hear them, they are already very worn. The initial problem will be a gradual loss of power over a few thousand miles. Also, you will notice the need for changes in carburetor and ignition settings to cope with the excessive emissions produced, seemingly from the engine as a whole but more likely the individual cylinders that are suffering the most camshaft wear (causing loss of full or correct valve lift).

This change in emissions (High CO and HC) is why most mechanics would be incorrect when they advise that your carburetion or ignition is in need of attention, when in fact the problem is more likely to be camshaft wear, along with erratic ignition and cam timing due to the timing chain stretch.

Engine capacities, 'To cut the confusion and mystery'

All RPi engine options have (as std.) additional specification improvements upon O/E spec. with further upgrade options readily available.

The following information regarding O/E engine specs and capacity is for those who have asked, as well as for those who did not ask but feel they need to know.

3.5.=89.5mm bore Std 3.5 crank
3.9.=94mm bore Std 3.5 stroke crank
4.2.=94mm (3.9 bore) plus and 4.2 longer stroke crank
4.0 is the same capacity as 3.9 but uses later big journal crank and is cross bolted
4.6. + 94mm bore (As per - 3.9 & 4.0) but uses later big journal (long stroke) crank and is also cross bolted as is the 4.0.

Stage 1, Stage 3, as above and 4.8, 4.9, 5.2 big capacity big strength upgrades are 'Specials' and are available only and exclusively from us.

How can I tell the condition of my engine, by looking inside? TOP

We all need to start somewhere, and this is for sure the best and most reliable place to start!

Take a good look inside even if only through the oil filler hole.
Oh, and you will need a torch, a Penlight is best.

A good look inside the rocker covers through the oil hole will help you to determine the internal condition (and the minimum parts you will need for a successful job).
if your are unsure, it will fall into one of the following categories.

Silver Alloy surfaces? Sounds like a new engine
Brown tarnished? Very low mileage, dark brown? Perhaps higher mileage, but well cared for.
Black? Getting poor, a full rebuild/replacement should be considered.
Black Coated & becoming dense? Very poor condition, A rebuild is normally required
Black and very sludgy? Dead on its feet.

You can be sure this method is a reliable way to determine what you have, and to help you decide what you should do.

Engine identification the visual way

Gems - Sagem injection

Thor - Motronic

Although there have been a few variants in the V8 engine's injection systems over the years, none were so dramatic as the changes made in or around 1999. I am talking about Motronic injection. You can see in this picture a conventional style injection system with the square type plenum chamber.

This one is Gems (Sagem) injection, and looks the most familiar as it is pretty much the same at hardware level as its injected predecessors; 'Hot wire' and 'Flapper' style injection systems.

As you can see from this picture of the Thor (Motronic) injected engine, the intake system is now looking completely different, incorporating 8 tubular style intake runners rather than the square plenum type shown above.
This intake was supposed to offer far greater torque, which indeed it does.

However, this increased torque (and much more besides) could have been gained much more simply by applying essential upgrades such as chipping & hardware upgrades, rather than this complete redesign.

Q Identifying worn cams and tappets ▲TOP

A It is easy to tell if a cam is worn out without removing the engine or the need for close inspection.
When the tappets become worn (normally 60,000 -80,000 miles) the tappet base becomes concave (dished), so that when the camshaft rotates through 360 deg., the tappet will only ride on the edges of the camshaft, and only make contact in the centre when it goes over the (worn to shape) cam lobe. This has the effect of causing the camshaft to be brown in appearance and shiny on the edges. The cam in a Rover V8 is hydraulic in design, which means when it is manufactured the lobe is cut at a slight angle so that it rotates the tappets, essential for them to fill with oil. Even when the lobes still look intact, if the cam is starting to discolour, it is well on the way out. It is important to change the cam before it starts to wear away quickly because the metal particles produced will rapidly cause further wear in the crank by becoming embedded in the white metal bearings and softer aluminum rockers and causing further metal particles to be produced. Replacing the camshaft and tappets before they get bad will greatly extend engine performance and long life.

Longer engine life, increased engine efficiency, smooth idle and good power, cannot be expected from cams that look like this (and it is not an uncommon sight).

Although you can see this cam is showing all the discolorations mentioned, the Camshaft lobes showing are all becoming **rounded on the shoulders,** it's clearly been bad for quite some time, and will have caused considerable harm to the engine already, not to mention the engine's *performance and efficiency*.

A range of Camshaft Kits
are available on our Special offer pages.

It's clear to see that the tappet on the left is already showing signs or becoming worn, the centre is dished (concave). The trouble is that the cam and tappets will get a lot worse than this before you can actually hear them, and the gradual, long-term wear means you will not notice the power and economy losses either. So check the condition of your engine by the method we describe above, and judge for yourself if it's worth closer inspection.

Replacing worn tappets and cams TOP

Some so called experts may say it is ok to fit new tappets without fitting a new camshaft when all seems good. **Not so.**
At only 5,000 miles, this TVR engine had new tappets fitted (without a new cam) by an appointed TVR. agent. They also had the cheek to suggest the tappets must have been all faulty when we told them they had all become worn or were beginning to wear (what, all 16?).

Never fit new tappets without a new cam, honestly, it's the only way.

These three tappets have only done 5,000 miles on the TVR engine they were fitted to. They tell a story from left to right, it's not looking good.

Comparing Cams: Top, at 35,000 miles and no sign of wear, the Morgan cam is still looking good.
Below, this cam did not take to its new tappets, so it was bad then, and worse now.

The left hand tappet shows it is completely worn out and after only 5,000 miles it was the worst one on the engine. As expected, it corresponded to the camshaft lobe that was most worn (probably the one that was the cause of the tappet noise in the first instance).

The middle tappet is also quite dished and this was going to be the next one to become a major issue soon.

The right hand tappet shows the signs of wear (rounded indentation expanding from the centre) all other tappets on this engine at only 5,000 miles were showing signs of bad wear, and the three depicted above represent the extremes and average condition of what we found and what you could expect.

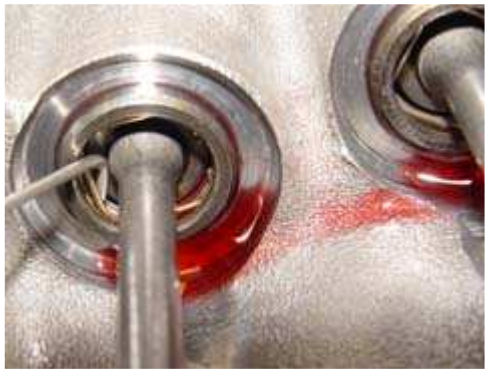
By coincidence, at the same time as working on this engine we started work on a Morgan +8 which was going through a stage 3 upgrade. Its engine had done only 35,000 miles and all the tappets were still in perfect order, indeed in better shape (all 16) than the best of the tappets depicted above.

Setting Tappet pre-load step by step TOP

Whilst most Rover or other publications do not touch on this subject, it is extremely important (if assembling your own top end) to carry out this operation. If you fail to do so, all may not lost and maybe you'll not have problems, but the symptoms for those not so lucky will be lost compression on one or more cylinders, and noisy tappets.

Checking tappet pre-load can be quite difficult and, as there are no special tools as yet available for it, you will need to select varying sizes of welding rod, or fabricate your own.

The allowed tolerance is 20-50 thou. which is the distance measured between the top of the tappet's piston and the retaining circlip. Each one needs checking individually with the cam ideally 108 deg. off its lobe.



Nicely oiled with cam shaft lube (the red stuff)

To create your own tool, all you need is a welding rod and a suitable device to measure it with. This rod is 60 thou, your best bet is to create 2 rods, one at 20-30 thou. and the other at 50-60 thou. This will tell you if your tappets are out of the allowed tolerance, more rods will be needed to judge what size shims to fit.

Once you have ascertained the measure of the tappets, pre-load adjustment is achieved by fitting special pre-load shims under the pedestals. But beware, the rocker ratio is 1.6 that of the clearance that needs correcting, so a 16 thou. shim will make approx 25 thou. difference.

You MUST find an average shim size, and fix it to EVERY rocker. So, for example, if you find that you have 4 tappets at 70 thou. and 4 at 80 thou. you would put 32 thou. shims on all the pre-load of the tappets, making the 70 thou. tappets 25 thou. and the 80 thou. 35, thus all the tappets are within, or closest possible to, the allowed tolerance.

To attach the shims, you need to slacken all 8 of the 14mm bolts.

Then, one bolt at a time, nearly remove them so you can slide the shim underneath, then slightly tighten the bolt so nothing slips or slides. Do this for all 8 rockers.

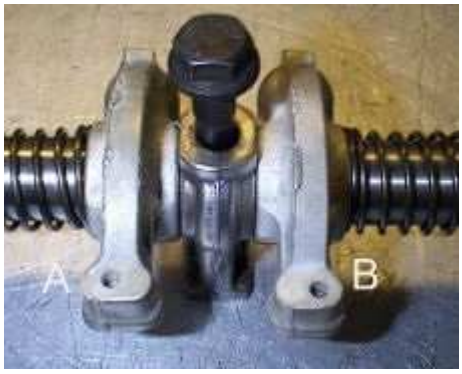
Then to tighten the bolts, start with one bolt and tighten by a couple of turns of the spanner, then go onto the next one. Keep going round till all the bolts are tight. The eventual torque setting for the bolts is **35 Lb/ft.**

Q Identifing worn Rockers TOP

A If you must re-use original rocker shafts or rockers, it is worth considering the following ...

Why do the steel rocker shafts wear away and not the all-alloy rocker shafts that run on them? As an engine's internal parts start to wear out (cam, tappets and timing gear first), metal particles (swarf) are created and set loose to run around with the oil in your engine. Although your filter will trap most of the larger particles, oil filters (especially cheap or old ones) will not stop this swarf from reaching the vital soft metal components (cam bearings, main bearings, big end bearings and alloy rockers) where it soon permanently embeds itself into the soft surface of the alloy and white-metal bearings, turning them into a very effective abrasive surface (the end is nigh). Consider this also, why do steel cranks ever need re-grinding? Because the white metal surfaces of the big ends and main bearings, with this abrasive quality, soon gouge into the hardened steel surface.

One very common mistake we regularly encounter is for an engineer to replace the rocker shafts only, this is normally because the rocker shafts are showing signs of wear and the alloy rockers do not seem to be worn, but beware, this will not be a cure because the re-used alloy rockers, and the abrasive their surface contains, will at once start to wear out the newly fitted rocker shafts in a very short time.



These bearings are your worst nightmare. Any sign of copper means you need to do something quick.

Often closer inspection will show hair line cracks, don't ignore them, as this is what you can expect.

If the rocker shafts are worn, it is a sure sign that the surface of the softer aluminium rockers is contaminated with particles from existing engine wear. Replacing the shafts without the rockers is worse than doing nothing.
Why? Because new shafts will be eaten away by old rockers and create even more damaging metal particles to cause yet more engine damage.
Not the best thing to have after an expensive
and time-consuming engine rebuild.

If they are worn, replace them all.

Assembling rocker shafts TOP

One of our customers very kindly sent in the following on assembling rocker shafts.
We have added to it where necessary and it is now here for you to follow when building up your rocker shafts.
Click here to see what he's put together

Camshaft changes (serpentine type) TOP

The later type Serpentine V8 engines have the camshaft further retained by a fixing plate (secured with two bolts). There are still a few upgrade cams on the market that do not have the added machining to re-use the fixing plate, **ours included, but we're working on it!** This, however, is not actually required, as nothing else has changed with the V8 engine and its 35-year-old design to make this fixing plate necessary, indeed the rotating chain would hold the cam true, as would the thrust casting that is still present on all later type timing covers.

Oil pressure won't prime TOP

Assuming you have packed the pump with Vaseline or grease, you have a fully charged battery, and, better still, the plugs are removed.

Maybe:

- The distributor drive gear pin has come out, or the drive is spinning on the camshaft
- The pressure oil relief valve is stuck open in the pump body
- The pump drive gears are not broken
- The strainer pipe is not fully tightened due to incorrect bolt or the gasket is split
- The stainer has a crack or fracture above the oil level line, or is perhaps blocked.

Pre-96?, then this is your Head Gasket Problems

From top:

1. New head Gasket, (can't fault it)

2. Head gasket after 50,000(ish) miles, notice the upper edge is showing a high degree of discoloration whilst looking good on the lower edge, and no blows but obvious leakage from all cylinders.

3. As 2, but the leakage is so severe the gasket is breaking up. and allowing compression to leak into the oil and water jackets.

Because the V8 engine is so forgiving, most engines will get to stage three before any indication of this problem is apparent.

For

One solution (but it lowers compression ratio) the composite type head gasket.

serious engines, use the head stud kit.

What's the problem? You can see the discoloration.

All pre-96 V8s with the 14-bolt heads (yes, that's all of them) have this problem to some degree. It's maybe not causing a big problem (or so you think), but it's steadily killing off the detergents in your oil.

Older engines seem to suffer more, possibly because they usually get less frequent oil changes, when they actually need far more. The secret of the correct oil change interval is not when 3,000 or 6,000 clocks up, but when the oil is visibly contaminated and no longer able to do its job efficiently. Most people don't realize that the quality and detergent level of an oil are actually far more important then its viscosity. A reputable oil, changed often, is far better for your engine than much more expensive synthetic oil changes done less frequently.

All post '96 Rover V8 engines no longer have the outer 4 head bolts on each bank, this is what the engine has always needed, but it took Rover 25 years to realize it. The following solutions/actions are available to you.

Do Nothing. Well Rover got away with it for 25 years. It's a far-off, long term problem on new engines and an immediate problem on all pre '96 used, medium to high mileage engines, of all assumed conditions.

Use conventional tin (shim steel) gaskets to retain compression ratio. This is actually better than it may seem, you can (we would) refit the outer 4 offending bolts as Rover, but torque them to only 20-25ft/lb so they fill the hole but have no detrimental effect, this is generally the best option if your head and block faces are new or near perfect order.

Fit composite gaskets. This is the surest way of getting the best head gasket seal, but unlike the above option, will lower the compression ratio by a factor of about 0.6-1 (important to some but not to most).

How much lower? As an example, a 9.35-1 compression engine would realize a compression of about. 8.65-1 using composite gaskets (composite gaskets are thicker than conventional gaskets by a compression factor of about 0.6-1).

Composite gaskets would be the preferred option if you are using post '96 cylinder heads as they have a combustion chamber size reduced from 36cc (pre '96) to 28cc. This reduction in combustion chamber size compensates for the use of the composite gaskets, and compression is retained. Composite gaskets should also be considered when ultimate reliability is far more important then the slightly reduced reliability of shim steel gaskets, and when the Nth degree of power is not the overriding factor.

Rover timing chain sets Pre-98? This could be 'yours'

Stock Timing Gear

This rather weedy looking thing is the stock Rover timing chain set, unchanged for the past 30 years. One major problem it suffers from is stretching, and a stretched timing chain will cause significant problems with advance and retard under acceleration and deceleration to both cam and ignition timing. Most are badly stretched, but higher mileage engines will have a major problem in this area.

And this is what they so often get like.

In this picture you can't see the stretch, but you sure can see how tolerant the V8 is, this engine had been (like most) running for many thousand miles in this condition before it finally died.

This is what so often happens when you leave things until they go bang, it costs so much more to correct it this late, and the results may be less than that of rebuilding a cleaner engine.

If you are amazed that things can get this bad, go back to our head gasket section and you will realize just how much contamination can occur when the detergents in the oil can no longer do their job.

J&P Duplex Timing Gear

The J&P Duplex timing chain set not only solves the problem of premature chain stretching, it also offers alternative cam timing options and a Roller chain, as well as being available at a very economical price. It is also offered in all our camshaft kits.

See our special offer pages.

Yet more & similar info on our FAQ V8 General Info faq section.

Improved oil feed to distributor drive gear with JP timing chain

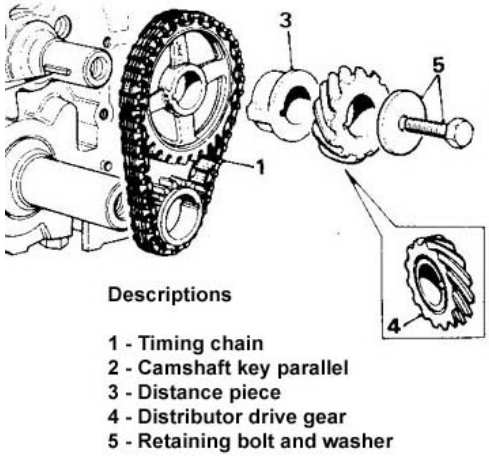
You may notice that the new JP timing chain set employs a deeper machined journal for the woodruf key location, of the pulley (shown here without the chain). Thus it has come to our atttention that this may cause concern and we would like to offer the following advice.

With image one and two shown below, you will notice that the internal size of the 2 pulleys, original and J&P, are almost exactly the same. Therefore the original key will protrude into the machined slot by the same amount, and thus for this scenario is not a problem.

It has also been suggested that any movement or deflection of the woodruff key may cause a problem, however this is not possable due to the following points.
1. The woodruff key cannot press into the camshaft key way slot any further as it already sits at the bottom of the machining, nor can it rise out of its slot and lose contact with the camshaft itself as there is more than sufficient height in the woodruff key way to maintain more than enough contact.
2. The woodruff key cannot move forward as it would also need to rise (due to being a crescent shape in a crescent shaped machined groove) and the front spacer and gear will not allow this due the original slot size. Added to the fact that the engine's oil pressure will hold the key way down.
3. The woodruff key cannot move back as the rear of the woodruff key is flat and hard up against the camshaft locating boss which is also a larger diameter than shown at the front.

Althought the front appearance of the keyway slot is bigger with the JP timing wheel the advantage of this allows for a far greater oil feed through the woodruff key slot to enable increased lubrication to the distributor drive gear. As you can see in picture 2 below, the oil has a much larger area to flow into, even when the angle of the woodruff key restricts it on the normal key way set up.

Above, shown here you can see the true location between woodruff key and camshaft. As you will notice in picture A, when located, the woodruff key will actually have far greater contact with the timing wheel location, as the woodruff key will actully sit at this angle when installed, thus making the woodruff key appear to have only small contact. But as you can imagine, the contact area is significantly increased along the length of the woodruff key.



Cam shaft thrust plate. Is it necessary?

Cam locating device on more modern Rover V8 engines
This is no more than a plate that bolts to the block and prevents the cam from sliding forwards (due to rotation of the chain).

Is it needed?
Basically the early engines pre-'94(ish) relied on correct camshaft location because they had the taut timing chain running around it.

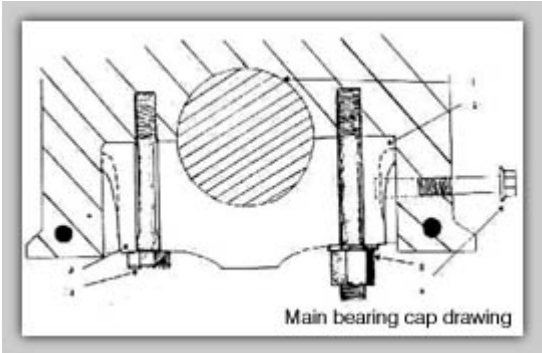
This relies on centrifugal alignment (like a giroscope), however the early engines did have better cam-nose to timing-cover clearance (this is between the end of the cam and the inner surface of the timing cover) indeed, the timing cover has a pad on it which acts like a stop.

Rover Main bearings area and 'Stud Kit'

Main bearing stud kit

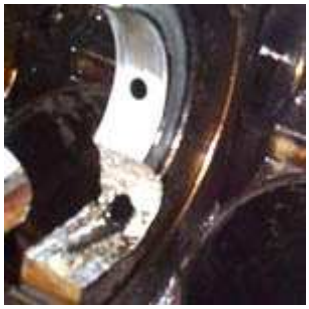
The main bearing stud kit is an essential part of any serious engine rebuild. If you don't go this far, then be sure not to re-use your existing mains bolts, as failure is common and leads to total engine destruction. If only a few pounds for the Stud Kit is considered over the top, then at least use new bolts

Main bearing stud kit installed on an '87 block, torqued down to 90 ft./lb (std bolts 55 ft./lb.) ensures the best possible engine strength.



Ok. So you can't see Click here or on the picture for the larger image.

These bearing are your worst nightmare. Any sign of copper means you need to do something quick.



Often, closer inspection will show hair line cracks. Don't ignore them, as this is what you an expect.

All later (post '96) Rover engines have fully enclosed main bearing caps, (you will see from the picture on the left that the main bearing cap has no contact with the engine block).

All later (post '96) Rover engines have fully enclosed main bearing caps, (you will see from the

picture on the left that the main bearing cap has no contact with the engine block) See the (right) diagram also.
All post '96 engines have fully enclosed engine main bearing caps and the 4.6 has them cross-bolted as well, it goes to show the weakness we have always known about in the Rover design has at last been recognized & rectified, So, if you have a pre '96 block then the stud kit will be a good choice.

Q Engine covers etc. ▲TOP

A **Please make sure your engineer has prepared the external parts that are being re-used** (if any) to the highest standard of cleaning (even in the places you can't see).
Acid dipping is recommended on any aluminium components, if not, a strong paint stripper (*Nitromors* or similar) and some hard work will do.
Avoid using silicon type gasket sealer, the faces should be good enough to seal without it when using correct gaskets. In any case, if you must use silicon type gasket sealer, use it sparingly to avoid the possibility of any finding its way inside the engine. It is a very common sight to find the sealer blocking the oil ways and causing further damage within the engine. **Use non-hardening gasket sealers when at all possible**.

Q Exhaust and intake ▲TOP

A Check all manifolds and carbs. (or injection plenum) for contamination (especially if the old engine suffered from broken piston or valves etc.) that can get drawn back into your new engine. This includes both inlet and exhaust manifolds and any associated parts (assuming you are re-using anything not supplied new by us).

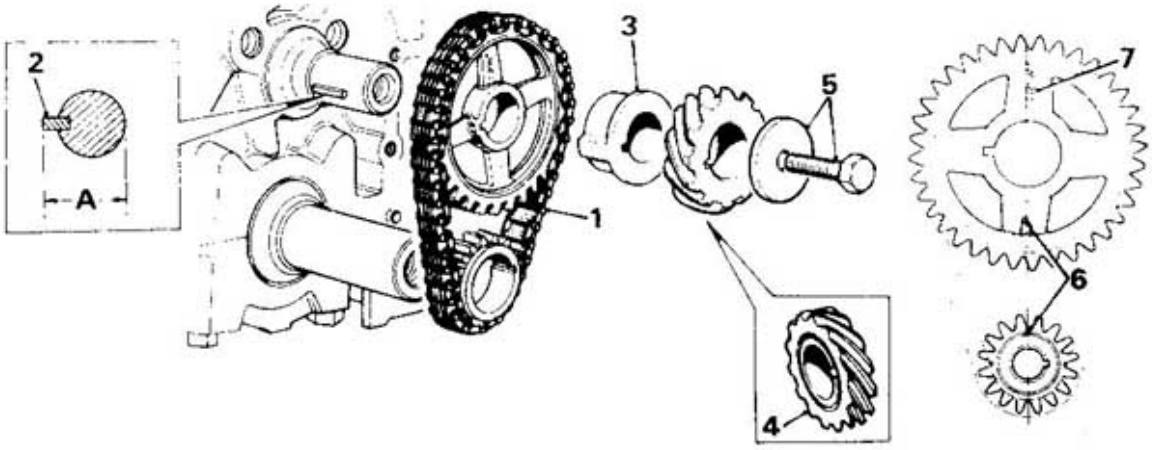
Q Exhaust gasket alignment ▲TOP

A Although it may seem obvious, which way round you fit the exhaust gaskets, it is very possible to get it wrong, We strongly suggest you check [& double check] the correct alignment as the following 2 pictures will show, getting it wrong has serious power loss implications.

It's clear to see **just how wrong things can be**. The problem is not 'the wrong way round', but 'inside out & the wrong way round'!

Surprisingly enough, exhaust blow was not a problem but power was 40% down (minimum), especially as rpm. increased.

Q Timing chain removal and refitting ▲TOP



Descriptions

1 - Timing chain
2 - Camshaft key parallel
3 - Distance piece
4 - Distributor drive gear
5 - Retaining bolt and washer
6 - Timing marks
7 - 'FRONT' marking

Q Fuel lines ▲TOP

A Make sure all fuel and oil lines (inc. oil cooler if fitted) are replaced, or fully cleaned, always use new air and fuel filters (of reputable quality), and it is very important to re-check the fuel filter for contamination after only a few hours of running, always check inside the tank for fuel contamination & replace if required.

Q Fitting Kit ▲TOP

A

The old blanking plug has a hole in it for the crank angle sensor that the GEM's engine management system uses.

This has to be removed for our blanking plug to be fitted. Removal of this is very easy, a small tap with a hammer will knock the old plug out.

The blanking plug that we supply fits in place of the original and just needs some silicon to ensure it stays in place.

The dowel in the end of the crank shaft has to be removed to enable the flywheel to fit correctly. You should ensure that the crank seal is completely covered, and also the bottom end of the engine, so that no swarf can contaminate it.

Using a hacksaw (or air hacksaw as seen here) the dowel has to be cut off as flush to the end of the crank as possible.

A centre punch is then required just to knock what remains of the dowel into the hole so that it does not protrude from the face as seen in the next picture.

As seen here the dowel has been cut off and then punched back into the end of the crank so that there is no chance that it can interfere with the flywheel.

The crank is slightly longer, which means that when you do up the front pulley bolt, it would not actually come into contact with the pulley and therefor the pulley will be loose.

As you can see here we have made a spacer that fits over the crank end. Now, when the pulley bolt is tightened, everything is pulled together as it should be.

EFi. fuel pressure regulators TOP

We have had instances, where the **EFi fuel pressure regulator** has been fitted the wrong way round. This caused a new engine to run only 7000 miles before its demise due to excessive (uncontrolled) fuel pressure. It ran so rich that all cylinders were badly coked up and eventually caused a valve guide to drop into the cylinder, causing severe damage to the piston etc. (I hate to think what the fuel economy was like).

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Automatic gearbox flex plates TOP

In cases of broken crank shafts, the old flex plates may contact the rear of the engine block. This will cause stress of the metal and a failure of the flex plate after some miles behind the new engine. Be sure to inspect the flex plate and the back of the OLD block for signs of contact.

Aluminium bits in the ring gear are a sign of contact and, if found, replace the flex plate no matter what. In cases of a broken crank shaft with an automatic, ALWAYS replace the flex plate if possible, or have the original flex plate tested for cracks that can not be seen with the naked eye.

Flex plate failure shows up as a rattle at idle under no load that goes away when power is applied. Replacing the flex plate means gearbox removal, so check it carefully.

Automatic gearbox fitting & consideration of what went wrong, 'before' TOP

Important !!!

When fitting a new transmission (or indeed any major component similar) to your car, please be sure all associated items that may be able to transfer contamination, including contaminated fluid/oils or other such issues, are thoroughly flushed, cleaned or renewed. This applies to your transmission, so be sure that the oil cooler and associated parts/pipe-work/unions are impeccably clean internally, and make sure the transfer box is cleaned out prior to fitting to your

new Auto-box. Also, after you have fitted it, change (renew) the fluid completely after only 200 - 300 or so miles This will further flush the system, And if it comes out contaminated, do it again after another 500 miles.

Consider what caused the old one to fail

Sometimes automatic transmissions are damaged (have failed) because water gets into the transmission oil cooler pipes where they pass through the radiator in the radiator header, have this checked or get them renewed.

Q Cooling ▲TOP

A Make sure your radiator is in perfect condition, with no cooling fins rotted and no signs of leaks (these will show up as blue/green/white) snail trails down the side, or blue colouration from the radiator core itself. Always replace faulty radiators, and flush out the heater matrix radiator. Also, beware blocked radiators, these are often ones that leak, but that no longer leak generally because they have been filled up with cheap fix fluids that block everything and are not wanted in your engine.

Q Cooling system air locks ▲TOP

A It is also very important to make sure the engine has no **air locks, if the system has no leaks then it should be easy to bleed out any air** that would normally be trapped in the top hose, or highest points of the inlet manifold (SUs. and Strombergs have a bleed pipe in the 'V' at the top, these normally need clearing).
The Edelbrock and Offenhauser manifolds often trap air behind the thermostat, this can be overcome by drilling a small hole in the top area of the thermostat but is not normally required.

Q Cooling systems can cause total oil pressure loss ▲TOP

A **Overheating problems on a V8 engine** can cause the oil pressure relief valve to stick open and destroy the engine due to nil oil pressure. Additionally there are the obvious reasons not to run an engine excessively hot, especially for any prolonged time.

Q Overheating ▲TOP

A The best indication of overheating on a road test would be the **lack of heat coming from the vehicle's interior heater fan,** and eventually noisy tappets and **'pinking'**, (time to stop) this is in addition to the temp gauge, but you can never fully rely on these.

Q Priming Oil Pumps (engine) ▲TOP

A **Use only Classic high detergent style Oils such as 'Castrol Magnatec' or 'GTX', do not use fully synthetic or oil additives.**
If your engine is supplied with the Oil Pump base plate fitted, you can be assured that a priming agent (Vaseline) has been packed into the oil pump gears to ensure trouble free priming, if it has not been fitted then you will need to do this yourself to get oil to turn the engine over if the

distributor is not fitted (the distributor drives the oil pump), but if you forget and the distributor is fitted you will need to re-prime the oil pump before starting.

The best way to do this is not to worry about starting the engine but to remove the plugs and the coil lead and have a highly charged battery available. The engine (with the distributor fitted) will crank over at a speed that should allow the oil priming to be achieved in seconds (oil Light out and a visual check), and, unless you remove the oil pump again, no further priming should ever be required.

Q Priming tappets ▲TOP

A **It is normal for the hydraulic tappets to take some time to prime up** and can often take two to three minutes for them all to go quiet. To ensure your oil is primed, it is always advisable to not only check that the oil light has gone out, but if you have a pressure gauge, this is a good secondary source of information. If in doubt, look inside (or remove a rocker cover) and check that oil is freely flowing from the rockers, although only a small amount is to be expected.

Q Getting quieter ▲TOP

A **Another good indication** is that although you can still hear some, tappets, they will start to quieten down right from the first moment, so if tappet intensity quickly reduces, you can be sure that the oil has primed and safely run the engine until the last ticking stops. (normally 1 - 2 mins.).

Q Using primed tappets ▲TOP

A From time to time it may be possible to receive an engine (or tappets) that is/are already partially or fully primed. This means that the engine may go quiet within seconds, so this is not a worry. However, in some cases it may mean that they will need to release some oil before they can allow the valves to fully shut, so the engine may appear to run on only 4.7 cylinders, again do not worry, as running the engine at just above tick over will allow them to bleed down safely. Acompression check at this stage is not viable as it will give a false reading on any cylinders that have not yet bled down.

.

Q Some people won't listen ▲TOP

A We have known a customer to insist he had oil (primed) at the top of his engine, because (he said later) he could see it 'through the filler hole' (he did not tell us this at the time though), only to find to his horror that it was the oil that he had filled the engine up with, because removal of the rocker covers proved the rest of the engine was completely dry of any oil. **The engine was subsequently destroyed before it had started its life.**

Q Careful with all that paint ▲TOP

A Please refrain from painting the inside as well as the outside. This was a fully rebuilt engine supplied to an overseas customer, needless to say, it did not last long.

It's hard to believe anyone could paint an engine with all the bits inside it

The strainer is showing the red paint blockage, this engine failed completely within 20 miles

Close up of the strainer shows the red paint blockage

Q Look Behind ▲TOP

A On the back of the engine, if possible, **always check there is a crank oil seal, all core plugs and the appropriate spigot bush /toe bearing** (manual only) in the end of the crank shaft, as removing the engine to fit them after it has been fitted (about the time when you discover its been forgotten) is rather annoying if not expensive.
If we have fitted the flywheel, you can safely assume the above has been checked, but if you are fitting the flywheel, then it is in both our interests to re-check.

Q 3.5 Torque settings ▲TOP

A **General torque settings for a Rover V8. engine.**

Description	Torque setting
Air intake adaptor to Carbs.	17 lb/ft
Alternator mounting bracket to cylinder head	3/8 U.N.C bolt :: 25 lb/ft 5/16 U.N.C bolt 17 lb/ft
Alternator to mounting bracket	17 lb/ft
Alternator to adjusting link	17 lb/ft
Chain wheel to camshaft	45 lb/ft + lock tight
Connecting rod bolt	35 lb/ft + lock tight
Clutch attachment to flywheel	20 lb/ft
Cylinder head bolts No. 1 - 10	70 lb/ft
Cylinder head bolts No. 11 - 14	20 lb/ft + lock tight
Distributor clamp bolt	14 lb/ft
Exhaust manifold to cylinder head	16 lb/ft
Fan attachment	9 lb/ft
Flexible drive plate to starter ring	25 lb/ft
Flexible drive plate to crankshaft	60 lb/ft + lock tight
Flywheel to crankshaft	60 lb/ft + lock tight

4.0 & 4.6 Torque settings TOP

Below are the torque settings for 4.0 litre and 4.6 litre Rover V8 engines.

Description	Torque setting
Mains Bearings 1 - 8	13.5 NM first time round then 72NM
Mains Bearings 9 -10	13.5 NM first time round then 92 NM
Big Ends	20 NM and then 90o more.
Side Bolts	13.5 NM first time round the 45 NM
Head Bolts (10 bolt head)	25 NM then 90o then 90o again.

Engine overheating problems TOP

Normally, overheating would be caused by one of the following. This however can only be true if there are absolutely no internal signs of gasket failure, block cracked (mainly older 3.9s & 4.2s and this fault cannot be seen (see below)), or external water leaks. We would always recommend head & block pressure testing, or at least a chemical block.
1. **Not all temperature gauges are reliable.** Try attaching an external gauge to check readings are correct. Also make sure you are using adequate engine cooling fans, we recommend Pacet cooling fan systems.
2. **Check the condition of the radiator (if not new).** Some have been filled with sealer in their life, and circulation can be a problem. Also, if the fragile cooling fins are corroded or missing, the radiator will struggle to keep the engine cool. Many altered vehicles may have restricted air flow to the radiator, this may sound trivial but is worth considering.
3. **The most common problem is caused by air locks.** You need to be sure to remove all air in the system. One of the most common traps is in the heater radiator inside the car; this can be cleared sometimes by flushing it. To do this remove the two pipes that pass through the bulkhead, get a high-pressure garden hose [if you use a commercial high-pressure washer you must not force all the pressure through the radiator so hold the spay a few cm. away]. What happens is that for many years the water has passed through this radiator always in the same direction, this means that deposits build up inside, flushing in both directions will normally reduce the amount of blockage.
4. **And most important, if you cant cure or find it, don't drive it.** Overheated engines will cause the oil pressure relief valve to stick open and cause irreversible damage.

Engine Overheating Problems 3.9 and 4.2 only (pre 96)? & 4.0, 4.6 post 96? TOP

Overheating starts with water loss. The early 3.9 and 4.2 (pre '95-'96) engines were basically an over-bored 3.5 casting with 4mm extra on the diameter of the liners. This caused a reduced thickness of aluminium between the water jacket and the cylinder bore. The subsequent water loss problem normally starts off as just a water light that appears once a month or so, then once a week, until it becomes a permanent feature. The normal unsuspecting owner will have by this time paid for heads to be skimmed and gaskets to be changed, and they will have spent a lot of money already. So, although the engine functions fine, it is a permanent worry leading

towards a total engine failure.

Many might be excused for thinking that the overheating is caused by running the engine in a hot climate, or with a radiator problem, or even insufficient cooling fans or oil cooler, but we can assure you this is not normally the case.

3.9 & 4.2 The true & main reason these engines run very hot is due to the fuel/air ratio, or fuel mixture, that is controlled by the engine EFi computer (ECU Chip) from the factory. This was designed to run very lean through the mid range to make altitude driving or mid range emissions (tested in some countries) less of a problem, the upshot of this however is that when these engines are used on low quality or low octane fuels, or when the engines are upgraded with items even as minor as a free-flow air filter or exhaust headers & Cam/Head upgrades, although all of these are only mild upgrades, they will make a weak engine run even weaker and the problem will get closer!

The solution is simple (if it's not cracked already), fitting our Optimax or Tornado Eprom (ECU Chip) will give your engine the near perfect fuel/air ratio it deserves, thus giving lower engine internal temperatures and giving, without other modifications to all, 15% efficiency boost [power and economy} & also allow the upgrades you have already done to be beneficial at last, instead of being detrimental. **3.9 & 4.2 ECU info 'Click'**

4.0 & 4.6 (new shape) suffer a similar but normally less dramatic problem although these engines are much stronger. The same air/fuel ratio problem will arise with low octane fuels, you will not normally suffer cracked blocks, but you will cause the liner to shift from its seat or cause sticky valve guides (partial seizure), and the solution is much the same as the 3.9 & 4.2 above, an ECU re-chip will sort it out and more **Gems ECU info 'Click'**

All cracked engines (blocks) are not normally repairable due to the fact that it will crack behind other liners, even if you could effectively repair the one at fault.

If you are undecided about where the problem actually is, then the next job would be to remove the heads, and if you see nothing suspect the worst (the surest way to tell if your engine is suffering from this problem is the fact that you can find nothing obviously wrong). You could have the heads & block pressure tested if you are still not convinced).

It's no coincidence that the Piston on the right (no 7) seems to have been **'steam. cleaned'**

This is a sure sign of the cylinder block being cracked somewhere behind it. In many cases such as this one you will also find that the cylinder liner has moved down the bore slightly. The problem with this engine had been wrongly diagnosed by the main agent (at a cost of £600.00) as a 4 thou. warp in the centre of the head.

Want to see more?

This is clearly incorrect. But please be sure, this is not a problem caused by the 4.6 engine itself, or indeed any of the smaller V8s, but is caused by the very weak fuel maps they are subjected to with modern (un-

chipped) std. fuel injection ECU.s, and the resultant very high cylinder temperatures they run!

Why should I be careful buying a 'used 3.9 or 4.2'? TOP

Buying used 3.9, 4.0, 4.2 or 4.6 engines. Please be very very sure if you purchase a 'used engine' that you get a written warranty from a reputable supplier. However, also realize that although they might refund your money, they cannot replace your wasted time and fitting expenses (one reason why RPi. will not sell used engines).
You can find more (and some the same) on our V8 general information page

Adjusting end float, mains bearings. TOP

All oversize bearings have oversized thrusts, therefore the crank end float must be adjusted on no 3 (centre) end cap. To do this - take 2 pieces of 1000/1200 emery paper and a flat surface, i.e. glass. Rub down thrusts equally on both sides until a clearance of 6-14 thou is achieved.

Setting up and checking for problems. TOP

First remove advance vacuum pipe from intake and check for positive vacuum when throttle is applied.
Check (if fitted) that the vacuum delay module is not blocked.
Check positive vacuum will pull distributor advance whilst also checking vacuum module is not holed (when sucking the pipe, the base plate of the distributor should rotate anti-clockwise about 15 deg.).
Check condition of rotor arm for signs of damage or arcing, also check cap and clean contacts (better still fit new).
Check rotor for free play, there should be none, either rotationally or side to side.
Check rotor will turn clockwise through about 20 deg. and smartly retract back to its home position under good spring tension.
Distributor output is known to be weak, so upgrading with our Spark amp is recommended (see below).
Replace plug leads preferably with Magnecor. Use good quality Plugs such as NGK BP6ES, and avoid fancy plugs, as they don't normally last long.

A check list of common simple issues

.Being sure of TDC with regard to crank-indicated timing mark is a must.
Plug gap needs to be 0.8mm - 0.9mm.
Don't use resistor plugs and suppressed leads together.
Std. spec. high street leads may not be able to handle the extra spark KVs.
Check fuel delivery pressure.
Check carb. float bowl height.
Check no blocked or restrictive fuel filter in line.
Do you have the fuel return hose (to the tank) connected ? If so, it needs restricting.
Try an alternative coil even if yours is new.

. **For other Injection related problems & chipping issues see relative injection pages.**

Never underestimate the quality of std, O/E, or High street spec. ignition leads.

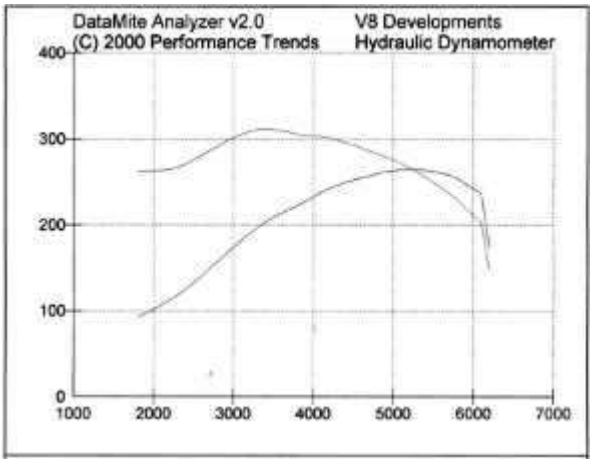
A typical e-mail quote 'Thank you for helping me sort out my misfire problem with the amplifier. You may recall when we spoke that I said that the misfire was when on LPG when the engine was cold. You recommended fitting Magnacore leads as well, but as I had new Lucas leads fitted I said that I would try them out with the amplifier first. The result is the engine is sweet as a nut when cold and a definite improvement in power and fuel consumption.

I am very pleased with it and will be recommending other gas users I speak to. Yours sincerely
Peter Munday

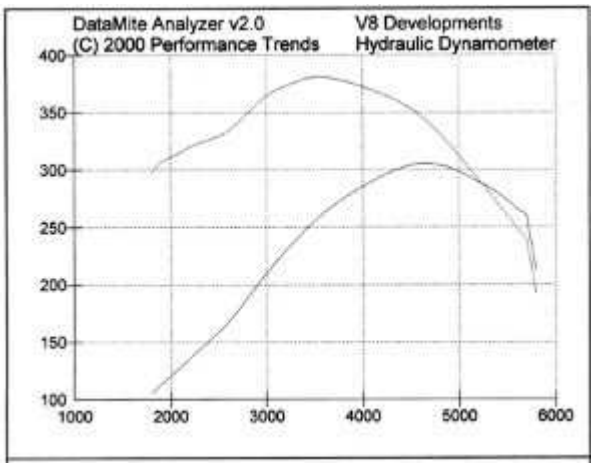
Below are the graphs for 5.0 and 5.3 litre V8 engines that we have recently had dynode. More info soon

Click the graphs for a more detailed (higher res) version

5.0 litre



5.3 litre



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For our part, we do our best to check all information provided and printed is correct to the best of our knowledge, and as V8 specialists for 15 years, we don't get it wrong often.

Q If in doubt? ▲TOP

A **If in any doubt you can Phone us on +44 (0)1603 891209, Mail us or Fax us on +44 (0)1603 890330, but don't leave it until its too late**.

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links to other FAQ pages

[V8 Engine Fitting Information] [Rover 3.5, 3.9, 4.2 to 4.6 Conversion] [LPG Conversion details] [Fuel Injection Section]
[Weber 500 & SU Carbs] [Mallory Ignition Systems] [General Engine Problems] [General Information]

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