Contents

CONTENTS

Chapter 2
TR2-4 handling, suspension & steering

The steering and the front and rear suspension are completely interlinked in so far as the roadholding and handling characteristics of the car are concerned. As a result, I felt one single chapter on the ladder chassis cars conveyed the appropriate message, while the TR4A's handling improvements, particularly with its IRS, warrants a chapter (3) to itself! Don't overlook the fact that wheels and tyres also dramatically affect the handling characteristics of any car, so you'll also need to read the following in conjunction with Chapter 4. Some of these improvements are practical with body and chassis together, many are not, though, and require the body to come off.

Even within the ladder chassis cars there are variations in design that require us to look at these cars under the following sub-headings:

- An integrated suspension package.
- Front suspension.
- Rear suspension.
- Rear axle and hubs.
- Sidescreen steering.
- TR4 steering.

Before concluding this preamble I must mention that I feel it's very important that you buy all your suspension improvement parts from one specialist. Do not, for whatever reason, buy the front suspension improvements from one vendor and the rear from a different one. It may well be in order, if not ideal, to get your steering improvement parts separately, and from a different specialist than the suspension 'kit', but do use one vendor for all the front and rear suspension parts. You may well buy and fit them in several batches, but the important thing is to end up with an harmonic, integrated (if I may borrow a word from Neil Revington), package. I would also recommend you drive a car with the complete package in situ before you make up your mind. It can be a friend's car, a vendor's demonstrator or a previous customer's car. But get a feel for what you are buying.

THE INTEGRATED SUSPENSION PACKAGE

Good roadholding, for any car, depends on the front and rear suspension, and the steering setup. All the contributors to this book know that, but to the best of my knowledge, at the time of writing, only one actively sets out to market its products as an integrated suspension package, and that's Revington. Its 'package' uses parts that are designed to bolt-on and, therefore, require no vehicle modifications. The kit comprises:

- Harmonically balanced front and rear springs, with an improved locationing kit for the TR2 to TR4 rear springs. It's designed to give a road car ride height of about 6.4in (160mm). This not only looks fine, but provides adequate clearance. See photograph 2-1-1 for a little more detail.
- Anti-roll bars front and rear, along with the relevant mounting brackets and polyurethane bushes. Pictures 2-1-2 and 2-1-3 give you a respective view of each.
- A full car set of front and rear polyurethane suspension bushes, picture 2-1-4.
- Avo adjustable telescopic shock absorbers (front), with exchange uprated rear lever arm dampers. The latter can be seen in picture 2-1-5.
- Adjustable upper fulcrum (picture 2-1-6), specially made to allow the upper wishbones some adjustment. This reduces the virtual swing axle dimension from 7 to 3 metres.
- The steering is improved by an exchange steering arm to improve the Ackermann angle and make the car 'turn-in' better. The components are identified in picture 2-1-7.

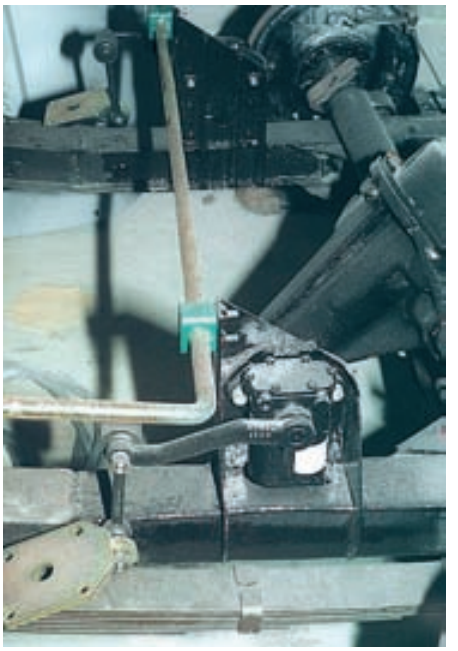
Integrated suspension kits are

2-1-1. Front (and rear) springs are available individually in a wide range of ratings, and you can see the difference in thickness and length of these examples. You really should buy the front and rear springs from the same supplier, and preferably simultaneously, so that they are harmonised for your car and its intended use and running height. You don't have to fit the front and rear springs simultaneously, although there are obvious advantages in doing so!

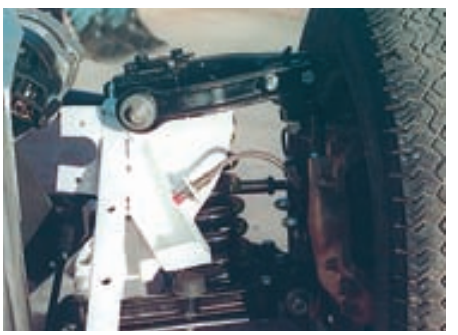
2-1-2. This shot shows the front anti-roll/sway bar mountings with 'solid' polyurethane bushes, but is also an excellent shot of Racetorations' front air spoiler with its brake cooling ducts. Did you spot the oil cooler?

2-1-3. Our experts' opinions vary as to the overall benefit of a rear anti-roll/sway bar on a live axle car, but this is how one can be fitted after the rear shock absorber brackets have been further extended and strengthened.

2-1-4. Polyurethane bushes come in a variety of shore (hardnesses), and the harder the material the more road noise they'll transmit, the more difficult they'll be to fit, but the less they'll distort under braking and cornering stresses. Note the integral steel bushes.



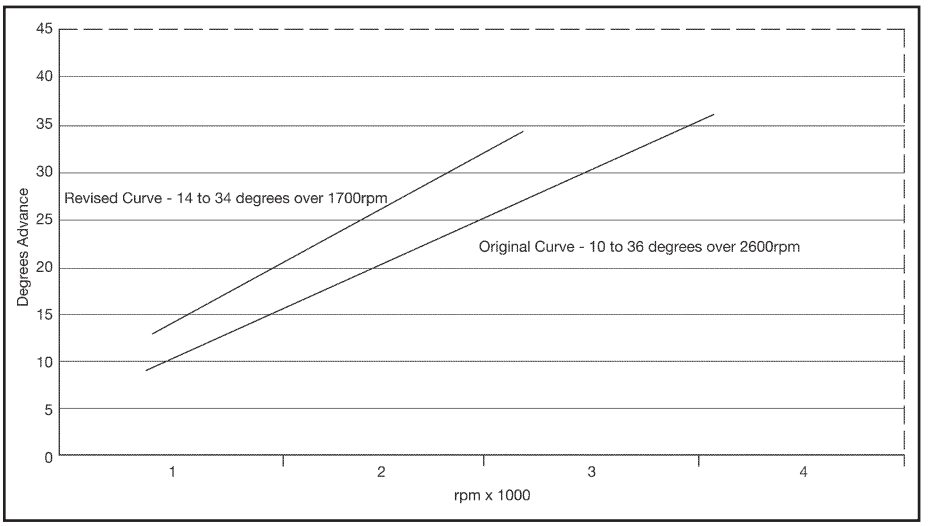
2-1-5. Although not the primary purpose of this picture, it does show the extended damper mounting bracket and rear anti-roll bar mounting. The larger rear dampers are also clearly visible.



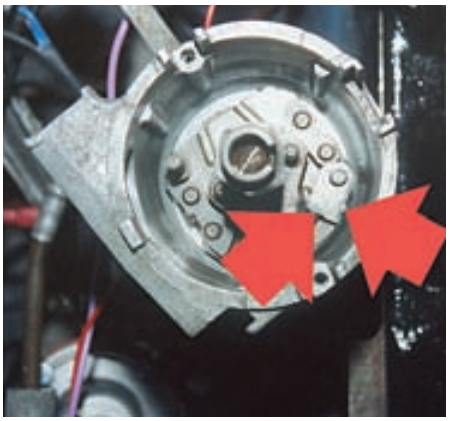
2-1-6. This is an adjustable top wishbone, available in isolation or as part of Revington's integrated suspension package. As mentioned in the main text, this improves the swing axle dimension to close to ideal for road/rally cars, and spot-on for sprint/competition cars.

available for sidescreen cars with steering box improvements, with steering rack improvements, and for TR4 cars. In fact, sidescreen TRs have the choice of retaining the original steering box or switching to rack and pinion steering. For those retaining the original steering box, the centre track rod bushes are improved in the manner detailed later in the chapter.

There are cost savings to be made if you specify rack and pinion steering at the same time as your complete suspension package. A rough overall price for the sidescreen road kit is £1500-1650, while the TR4 and TR4A kits are actually simpler, and, therefore, significantly cheaper. Revington recognises the significant cost of the full kit and has thoughtfully broken all the suspension kits into three constituent parts to enable phased purchase and adoption. Should you wish to follow this route, it's important that you fit each phase in chronological order for maximum effect and safety.



D7-1. Typical examples of original and revised advanced curves.



7-1-6. Hopefully you will be able to see two weld spots (arrowed), that basically lock the mechanical advance mechanism to allow the electronic advance curve to have full control of this car.

the position and slope of the ignition curve. Why would you want to change the curve? Fuel and engine tune would be the main reasons behind any such revision.

The fuel you'll be using today is quite different from that available when the car was first built, the tuning manuals were written, and Triumph designed its timing static and all-in points. Furthermore you have probably also modified your engine, carburation and exhaust system – all of which makes the original timing settings redundant! A well-modified engine should burn fuel more efficiently than a standard engine and, consequently, need an earlier advance curve, but the camshaft, compression ratio, carburation and intended use (i.e. Sunday drive to the pub, occasional track day or straight competitive car) all affect the choice of curve.

Most standard ignition advance arrangements aren't aggressive enough for today's fuel, particularly with modified engines, and usually miss the opportunity to optimise the power and torque of the engine. Clearly you can damage your engine by being too aggressive with the advance curve, but that doesn't mean you have to be overly conservative.

In order to appreciate the changes that can be brought about let's explore a revised ignition curve. The reference books will state that your engine should fire 4 or 6 or 9 degrees btdc. This is the starting or static point, and is shown in D7-1 as the bottom/left end of the line. You can easily adjust that point, gradually advancing the timing one degree at a time for as long as the idle revolutions per minute are increasing and the engine is running sweetly. Using a stroboscopic timing light, you'll probably find that you've set the static advance several degrees in advance of that recommended by most of the manuals! When you go past the optimum static/idle point the engine will start to sound harsh and the rpm will reduce slightly.

The all-in end of the ignition advance curve is defined as the point when maximum mechanical advance (i.e. that provided by the expanding weights) is fully applied. Car manufacturers in the 1960s and '70s rarely set the distributor to achieve all-in advance before about 3400/3500rpm (the top/right point of the initial curve in D7-1). Today, most cars' all-in advance is achieved by the time the engine reaches 3000rpm. For some engines, the all-in point could be reached at even lower rpm.

Advancing the all-in point is achieved by fitting a pair of weaker springs to control your distributor's centrifugal weights. Weaker springs allow the distributor's weights to swing out earlier – which moves the top of the shaft earlier and introduces the advance curve earlier.

You could find your engine starts to pink/detonate as the rpm builds up beyond the all-in rpm, which would suggest that the total advance is too great – i.e. you're advancing the ignition by, say, 26 degrees at the all-in point when, for example, 20 degrees would be sufficient. How would you know the all-in point of any distributor? It will be stamped on the weights – 10 degrees or, perhaps, 13 degrees, for example (note that the distributor's advance is half that 'seen' by the crankshaft, so the weights in these examples provide 20 and 26 degrees all-in, respectively).

If a distributor is over-advancing, and this is most prevalent in high compression engines (10:1 and up, for example), you'll still wish to advance it earlier using softer springs, but to also restrict the amount of total mechanical advance. This is achieved by building up the pillars, as shown in picture 7-1-6. The pillars act as a stop to prevent the balance weights swinging out further than their allotted advance. Most tuners looking to restrict the degrees of advance will put a blob of **hard** mig weld on each weight to restrict their swing.

Over advanced all-in ignition also can be the consequence of the increases you have brought about, coupled with that from the vacuum diaphragm attached to the side of most distributors. Many competition cars dispense with the vacuum advance because it plays little or no part in enhancing performance. It's operated by vacuum and so is virtually inoperable during acceleration because there's very little manifold vacuum available to move the diaphragm. However, on cruise, when manifold vacuum levels do increase, the diaphragm can advance the timing by a further 10 or 15 degrees

depending upon the diaphragm fitted to the distributor. This generates little by way of performance benefits but perhaps an extra 2 to 4mpg fuel economy. So, it's possible that any performance distributor you purchase will have the fixings for the vacuum diaphragm blanked off, and owners of the petrol injected six-cylinder engines will already have a distributor without a diaphragm.

Although unlikely, your performance expert may feel that your distributor is not providing sufficient total advance. In this event he will machine a sliver off the face of each balance weight to allow it to move that bit further, thus increasing the total advance. The summary of these changes in the ignition curve of a distributor can be viewed at D7-1, which shows the changes that a professionally-prepared performance distributor will provide:

- Changing the static advance from, say, 10 to 14 degrees btdc, which moves the curve upward by 4 degrees.
- Fitting weaker springs to allow a faster rate of advance, demonstrated by a sharper inclination to the line.
- Adding weld to limit the movement of the advance weights, thus curtailing the revised curve by 2 degrees.

You'll appreciate now why I said that altering a distributor's advance curve is a job for experts with rolling roads. You do have the option of purchasing a professionally-modified distributor.

Performance distributors

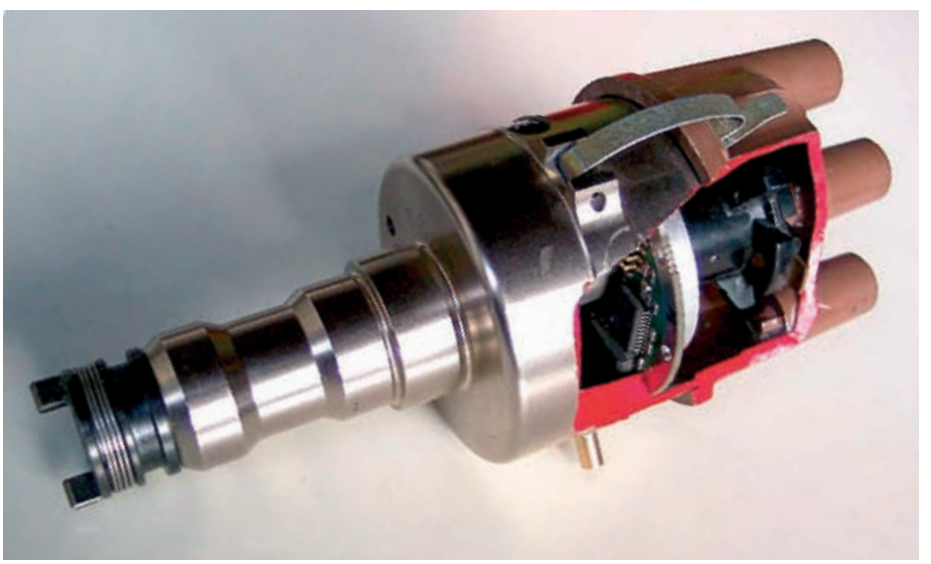
Most Triumph retailers will offer performance-enhancing distributors. A new or refurbished distributor will have had new bushes fitted to the body, thus eliminating any 'play' in the central shaft, giving you the option of employing a magnetic trigger. Indeed, many come with a magnetic trigger pre-fitted. The refurbished/upgraded option (sometimes referred to as 'factory rebuilt'), usually necessitates your old dizzy in part exchange. Completely new distributors are available thanks to the capabilities of modern CNC machines that turn the constituent parts from aluminium billets. Both solutions require you take account of your car's earth/ground polarity when ordering.

The refurbished/upgraded option is the cheaper solution, and is perfectly adequate provided you purchase from a recognised TR specialist and enquire about the details of the ignition curve. Most come set for a 10-degree distributor (20-degree engine) advance curve, but you should always ask what changes have been incorporated and what benefits you can expect in terms of performance, bhp, torque or fuel efficiency. Some distributors will not be suited to your intended use due to the advance curve's static and all-in positions, and you need to establish those details. You also need to establish that a breakerless ignition trigger is pre-fitted, its make, type and whether it's included in the price. New distributors are modelled on the Lucas model 25D4 and cost about 20/25% more than a reconditioned unit. As with a refurbished unit, you would need to ensure that the ignition curve (usually also 20-degree engine advance) suits your needs, and that it takes account of modern fuel and tuning.

New and reconditioned distributors use Lucas pattern 25D caps and rotor arms that, as you will see in the next section on high tension components, some enthusiasts have experienced unreliability with. Another common feature is the early 20th century 'straight-line' ignition technology. Although the static and all-in points are adjustable, setting them up is a long-winded and, without a rolling-road, very hit and miss process. I like idea of changing the ignition curve at the turn of a switch, and having the flexibility of the 123-Ignition distributor seen at photo 7-1-7. With 16 curves to choose from, this seems like a step towards computer-controlled ignition, but these new distributors do have a disadvantage for TR owners – there's no mechanical drive for the original tachometer. You can get around this problem by fitting an electronic drive within your original tacho, so this doesn't detract from the advantages of 123-Ignition's product.

The 123\GB-4-R-V model ('GB' for UK-made cars) can be seen at picture 7-1-8 and replaces most 4-cylinder Lucas-distributors where the shaft is turning in a counter/anti-clockwise rotation. They are an important step

7-1-7. 123-Ignition's rotary switch-controlled ignition selection is, to my knowledge, unique, and brings modern digital control and tuning options to our classics.



7-1-8. No special or ancillary amplifiers, coils or triggers are required with a 123-Ignition new distributor. Note the Bosch cap – a step forward in reliability terms, perhaps?