DeAGOSTINI MODEL SPACE™

Red Bull Racing
FORMULA ONE TEAM

RB7

RADIO CONTROLLED • BUILD IT YOURSELF • NITRO ENGINE

Pack 7

Stages 25-28

DeAGOSTINI MODEL SPACE™

Red Bull Racing FORMULA ONE TEAM

RB7

Contents

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DeAGOSTINI MODEL SPACE™

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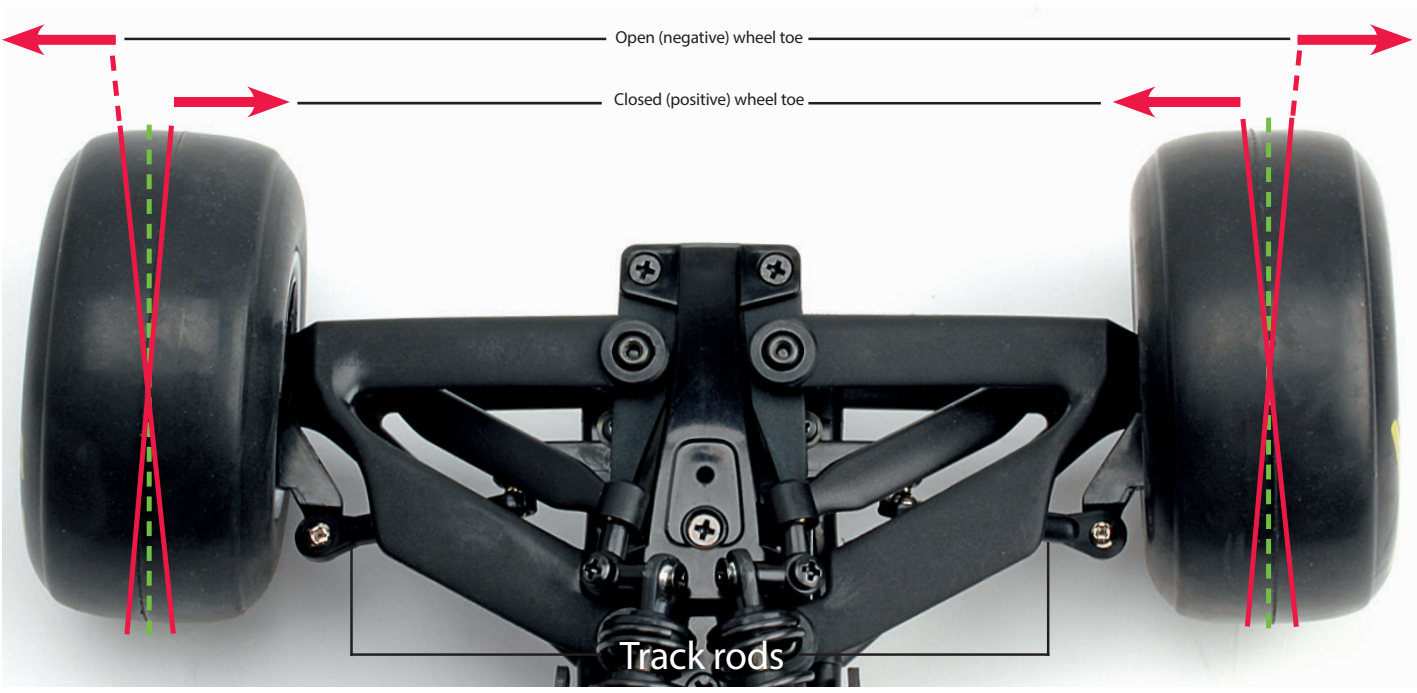
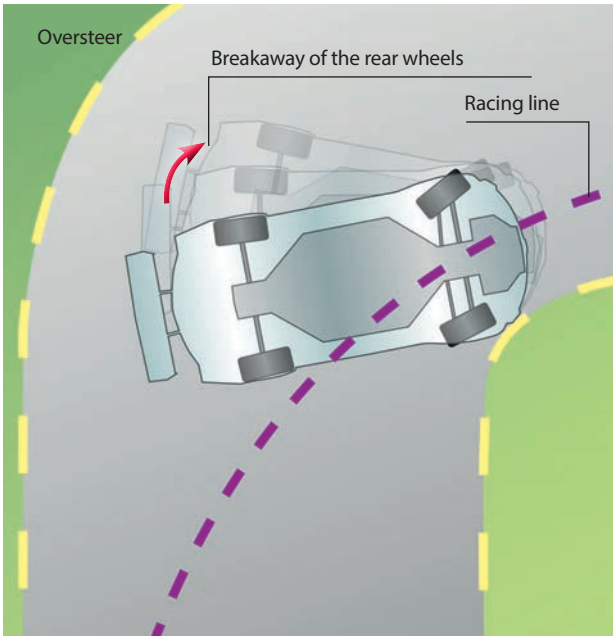
STEERING GEOMETRY

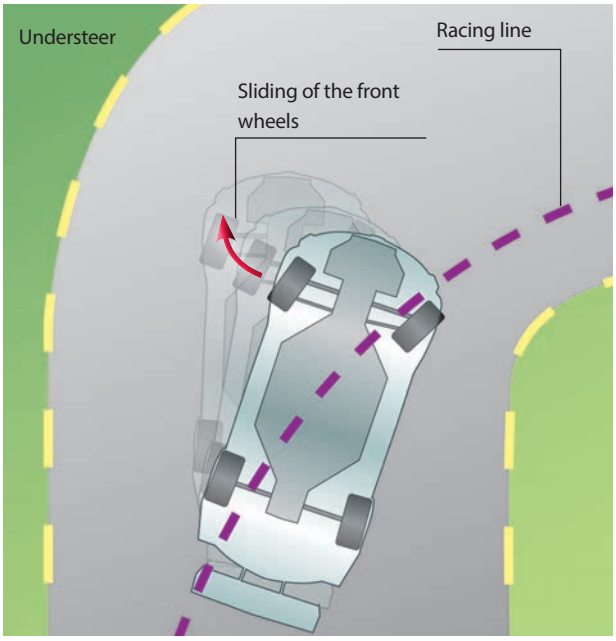
IN FAST CORNERS, YOUR RB7 RACER WILL PUSH ITSELF TO THE LIMIT, BUT IF THE CHASSIS AND STEERING SYSTEM HAVE NOT BEEN ADJUSTED WITH ABSOLUTE PRECISION, THE CAR WILL START FISHTAILING.

The term 'positive toe' or 'toe-in' indicates that the wheels of an axle are not parallel to the longitudinal axis but that the fronts of them are angled slightly towards the centre of the car. As a result of the position of the suspension arms, the rear wheels are permanently fixed in a kind of 'snowplough' arrangement. The benefit of positive toe on the rear axle is that it ensures directional stability. The situation with the front axle is different, in that the toe angle can be altered by adjusting the track rods, which are made up of the threaded rods and ball ends supplied with this pack.

The photo below shows a pair of wheels set with a positive, or closed toe. The red dotted lines show the angle were the wheels to be set with a negative, or open toe. Which of these is used depends on the circumstances of use – for example racing on a track with tight corners – and can be adjusted for each race and individual driver style.







Depending on whether the vehicle slides at the rear or the front, as indicated by the red arrows, the situation is described as either oversteer or understeer.

A QUESTION OF BALANCE

As your RB7's front axle and steering apparatus are beginning to take shape, the time has come to have another look at the front axle as a whole. In the case of the front wheels, the role of toe is less about ensuring directional stability and more about achieving the best cornering ability.

By opening or closing the toe of the front wheels, you can achieve more or less aggressive cornering behaviour. By examining the behaviour of the car when driving through a corner (see diagrams above), it becomes apparent that whether the steering system should be positively or negatively aligned depends on the driving style of the person controlling the car.

When slowing down, the weight shifts onto the front axle. As the vehicle approaches the apex of the corner, it tilts ever more strongly towards the outside of the corner. When accelerating out of the corner, the load shifts back to the rear of the vehicle.

It is therefore important to find the right balance between the front and rear axles. Depending on how late the driver brakes, how wide or how sharp he takes the corner and how quickly he accelerates again, a more or less direct steering alignment may be better. The only problem is, how do you discover what your own driving style is?

WHICH WHEELS SLIDE?

If the rear of the car slides outwards when cornering, the vehicle will turn more strongly in the new direction than intended. This phenomenon is called oversteer (see left diagram above). Although the front wheels maintain contact with the track, the rear wheels break their adhesion with the road surface. Centrifugal force then pulls the rear towards the outside of the curve and the vehicle fishtails round the front axle, which now also threatens to lose its adhesion.

This would be very undesirable in racing, because regaining control of the car is only possible by counter-

steering immediately and reducing the speed. Therefore, even the smallest amount of oversteer ends with a skid that slows down the vehicle considerably.

In the opposite case (top right illustration on page 110), the front wheels are the first to lose contact with the road. Because the car doesn't enter the curve as tightly as intended, this is described as understeer. The vehicle broadly maintains the chosen path, but slides further in the direction in which it was moving previously. For the driver, this is a slightly easier manoeuvre than that of oversteering (a rear-wheel skid). In the case of slight understeer, the vehicle leaves the racing line but the car can usually continue in the right direction. Your aim should be to fine-tune the chassis in such a way that it neither oversteers nor understeers. To achieve this, you need practical experience on the circuit, and the following rules will give you a few useful points of reference.

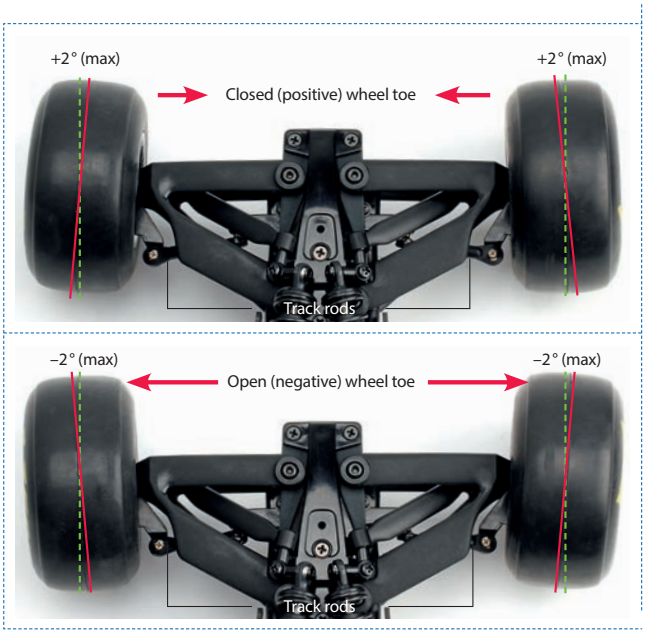
When you lengthen the track rods, the wheel toe closes. This is described as positive wheel toe (upper illustration). When you shorten the track rods the opposite happens: the wheel toe opens until it becomes negative toe (lower illustration). The wheel toe angle must be exactly the same on both sides and must never exceed 2°.

Unlike the rear axle, where the wheel toe is determined by the position of the suspension arm, the toe of the front axle can be altered as required by adjusting the lengths of the track rods. Each complete turn of the ball end on the threaded rod corresponds to a change in the track rod's length of 0.5mm.

THE BASIC SET-UP

As mentioned above, rear-wheel sliding is the greater of the two evils. A helpful approach is to stabilise the rear axle as much as possible. Here, stronger positive toe is a tried and tested solution, but it must be within limits, because too much will be at the expense of maximum speed. However, because the rear suspension of your RB7 racer has already been optimally set up at the factory, you do not need to make any changes.

So you only need to concentrate on the front axle. The toe can be fine-tuned with infinite variation by adjusting the two track rods (see illustration below). To do this, you detach the rods from the suspension at one or both ends and screw the ball sockets on the threaded rod clockwise to shorten them or anticlockwise to lengthen them.



Before you set to work fine-tuning the toe, you must make absolutely sure that the steering slider to which the inner ends of the two track rods are attached is positioned exactly in the middle (see white arrows in the illustration). If this is not the case, correct its position by very carefully moving the lever of the steering crank servo or the front wheels themselves (against the resistance of the servo motor) a tiny little bit.

Starting from the 'neutral position' (the exposed part of the threaded rod is about 4.9mm), lengthening the track rods will produce a positive toe angle at the wheels, while shortening them will produce a negative toe angle at the wheels.

FINE-TUNING

Before you start experimenting with the various settings, check two things. First, the two track rods must be exactly the same length (neutral length) before you start to make any changes. Second, the steering slider to which the track rods are attached must be in the central position (see photo above right).

To close the toe, you screw the socket further along the rod. One complete turn produces a change of about 1° in the positive toe angle, and up to a maximum of 2° improves the directional stability of your RB7. At the same time, its steering response becomes more indirect and more sluggish; however, this makes it easier for the beginner with a more restrained driving style to handle the car. But if you want to drive fast, a closed toe angle is not really recommended. The increased grip when slowing down into a corner may cause the car to oversteer more easily, then at the apex of the corner, the more positive the toe, the less grip there will be, and the vehicle will understeer.

By contrast, opening the toe (again, two complete turns, or 2°, at the most) will cause the steering to react more quickly and more directly. Directional stability does become less easy to control, but the vehicle corners more smoothly and willingly. As the vehicle enters the curve, the front axle has slightly less grip, which requires more sensitivity from the driver to prevent any understeer when slowing down. This is why the roadholding grip of the front axle improves at the apex of the corner, making higher cornering speeds possible. But take it step by step so as to achieve the best set-up for a given circuit.

To adjust the toe, disconnect the inside ends of the track rods from the steering slider, and change their overall length by rotating the ball socket (upper illustration). Then push the free end back onto the ball-headed screw of the steering slider. Needle-nose pliers can be useful here.

Stage 25

THE RIGHT FRONT PUSHROD

THIS TIME, YOU WILL FIT THE RIGHT FRONT PUSHROD THAT CONNECTS THE LOWER SUSPENSION WISHBONE TO THE SHOCK ABSORBER MOUNTED ON TOP OF THE CAR.

Tools & Materials

Phillips screwdriver (size 2)
Angled needle-nose pliers (smooth)

1. Right front pushrod
2. Right front pushrod crank
3. Right front pushrod crank collar
4. 3 x 12mm screw
5. Countersunk 3 x 10mm screw
6. Pillow ball
7. 5.8mm ball-headed screw

01 Place the collar, as shown above, then place the crank over it with the flat side of the central boss facing downwards (red arrow).

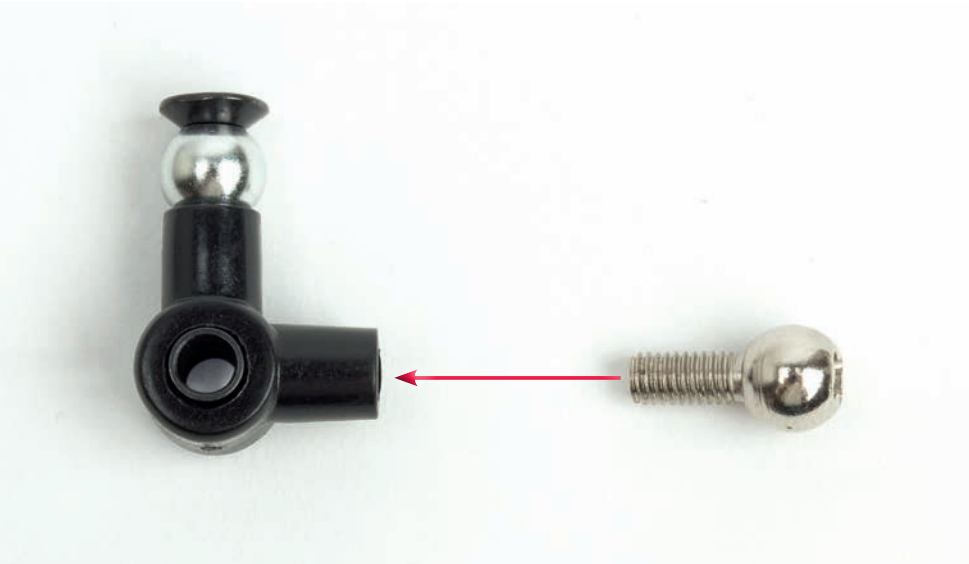
02 Press the collar firmly into the hole in the crank.

03 The gap between the collar and the crank should be no larger than shown above (red arrow).

04 Fit the countersunk 3 x 10mm screw through the pillow ball (red arrow).

05 This is how the ball and screw should appear.

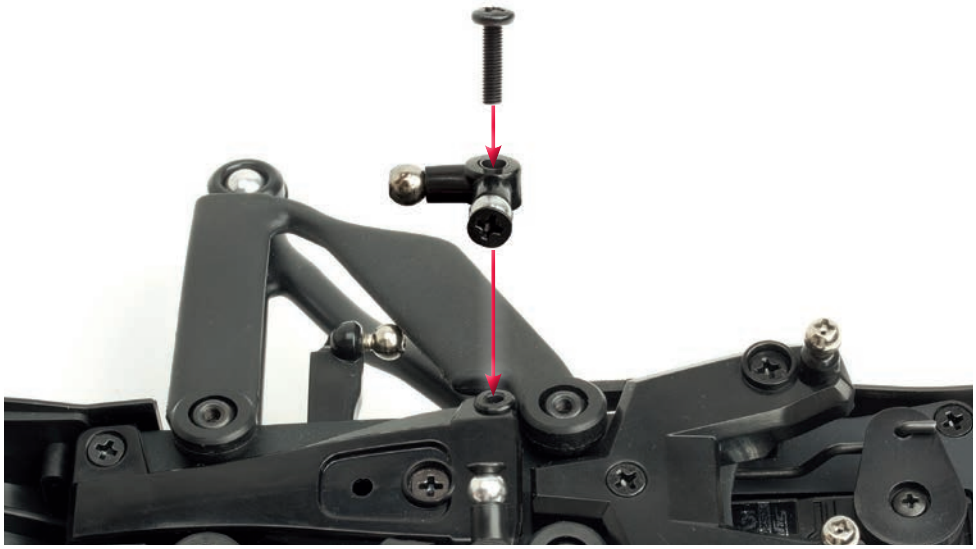
06 Position the assembly from Step 05 as shown and screw the countersunk screw into the upper hole of the crank (red arrow).



07 Insert the 5.8mm ball-headed screw into the remaining hole in the crank (red arrow).

08 Using a Phillips screwdriver, tighten the ball-headed screw into the crank.

09 Your assembly should now look like the one shown above.

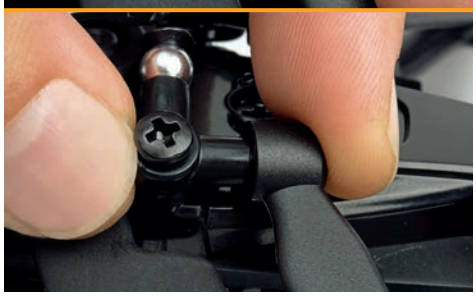


10 Fit the 3 x 12mm screw through the hole in the collar as shown, and then into the hole on the front chassis (red arrows).

11 Tighten the screw into the hole until it stops, then loosen the screw by about half a turn.

12 Feed the right front pushrod between the two right front suspension wishbones, noting which way round it goes. Place the hole at the end over the ball fitted to the lower wishbone.

13 Use smooth-jawed pliers to press the pushrod onto the ball on the lower arm.



14 Fit the other end of the pushrod onto the ball on the crank fitted in Step 11. Press the parts together until the ball locks into the hole.

15 At the end of this stage, both pushrods have now been mounted to the front chassis. The front suspension is one step closer to being fully operational. Store the assembly carefully until it is needed again.

Stage 26

THE RIGHT FRONT SHOCK ABSORBER

ASSEMBLE YOUR RB7'S SECOND SHOCK ABSORBER AND IMPROVE THE PERFORMANCE OF THE FIRST BY FITTING AN ADDITIONAL WASHER, SUPPLIED WITH THIS PACK. THEN FIT THE TWO SHOCKS TO THE CHASSIS.

Tools & Materials

Phillips screwdriver (size 2)

1. Shock spring
2. Shock case
3. Shock shaft
4. E-rings (E2.5) x 2
5. 5mm washers x 2
6. Spring holder (lower)
7. Shock top
8. Spring holder (upper)
9. Diaphragm
10. Piston
11. Ball end

01 Take the shaft and position one of the two E-rings in the groove (arrowed) at the end of the piston rod.

02 Squeeze the E-ring into place at the end of the shaft with pliers.

03 Push the piston onto the shaft (see red arrow), until it rests up against the E-ring.

04 The piston must be completely flush with the E-ring. Place the second E-ring into the second groove (dotted red line).

05 As in Step 02, squeeze the second E-ring in place with pliers.

06 Place one of the two 5mm washers on the end of the shaft (see red arrow).

07 Retrieve the left front shock absorber that you assembled in Stage 4. For technical reasons, it is necessary to add a 5mm washer to this assembly.

08 Holding the shock as shown, pull back the spring and unscrew the ball end a little.

09 While holding the spring, remove the lower spring holder. Then slowly release the spring back into position.

10 Now remove the spring from the assembly.

11 Remove the upper spring holder from the assembly.

12 Unscrew the lid from the bottle of shock oil and remove the nozzle, as shown. It's a good idea to put a towel or paper down to catch any oil drips.

13 Unscrew the cap from the case, keeping the case vertical so that no oil escapes. Then, remove the diaphragm.

14 Carefully pour the shock oil back into the bottle.

15 Pull the shaft a little way out of the case and hold it with a cloth and pliers. Unscrew the ball end.

16 Push the shaft all the way back into the case (top) and pull it from the other side with pliers, to remove it from the case.

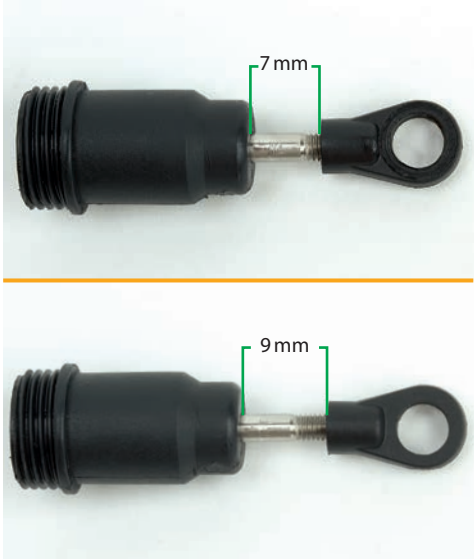
17 Take the second 5mm washer and place it over the end of the shaft. Now, both the shocks are technically the same, and Steps 18 to 34 will show you how to assemble them, starting with the one that you just dismantled.

18 Take the shock case and insert the shaft into it.

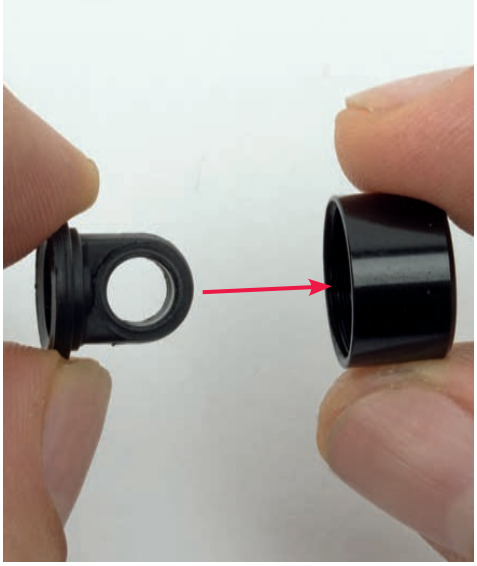
19 Pull the shaft through to the other end.

20 Holding the shaft with pliers and a cloth (to avoid damaging it), take the ball socket and screw it onto the end.

21 Make sure that the shaft is out of the case as far as it can be. Take a ruler and measure the distance between the ball end and the case, and unscrew or tighten the ball end until it is 8mm away from the case.



22 When the distance is 8mm, the ground clearance is set to neutral. If you want a lower ground clearance of the front axle, adjust the distance to 7mm. To increase the ground clearance, you can adjust the distance to up to 9mm.



23 Push the shock top into the hole in the cap.

24 Take the shock absorber oil and fill the case to about halfway. Move the shaft slowly up and down, so that the oil spreads throughout the assembly and replaces the air below the piston. Ensure that the shaft is always covered by oil.

25 Moving the piston up and down forces air upward, and bubbles form in the oil. Leave the assembly on one side in a vertical position for two to four hours, until no more air bubbles are seen in the oil. You can use the spring to hold the assembly upright.

26 When the air bubbles are gone, move the shaft up and down again. If this creates more bubbles, put the assembly aside again until they are gone. Repeat this process until no more bubbles form.

27 When there are no more air bubbles, carefully fill the case to the brim with shock absorber oil. Make sure that no oil overflows onto the outside of the body.

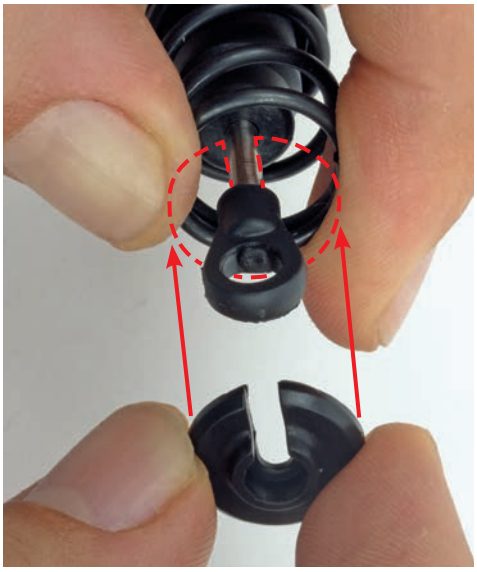
28 Hold the diaphragm so that the domed side is facing downwards. Place it on top of the case, as shown, to avoid air pockets.

29 The edge of the diaphragm must be flush with the top of the case. If some oil gets onto the body, you will need to wipe it off carefully using a cloth. Keep the assembly as upright as possible, so that no oil can leak out.

30 Now take the shock absorber cap and top assembly and screw it onto the thread at the top of the shock absorber case. Turn it in the direction of the arrow until tight.

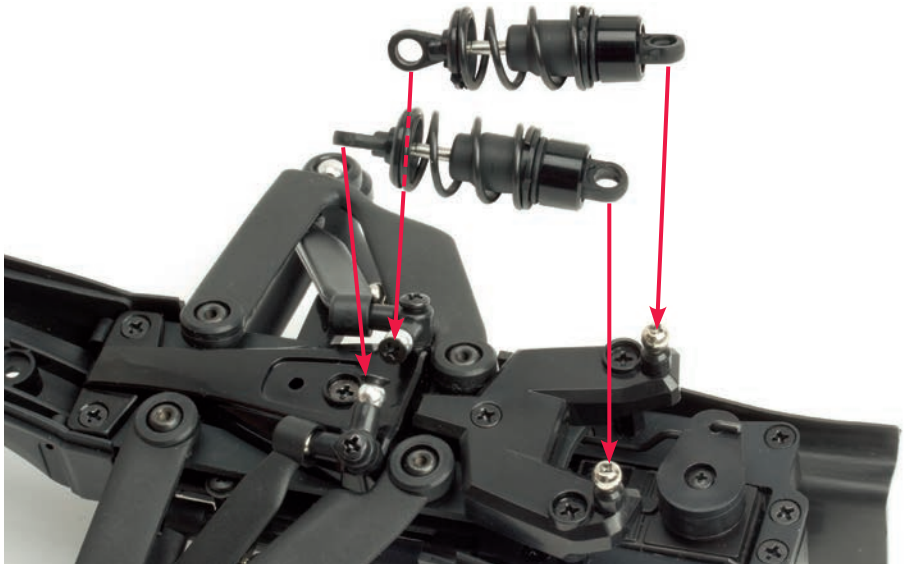
31 Hold the case assembly, as shown. Place the upper spring holder so that the wider ring is facing down, and push it down the case as far as it will go.

32 Place the spring over the end of the case with the shaft, as shown.



33 Hold the case assembly in one hand and pull back the spring, as shown. Place the lower spring holder in the gap on the shaft between the spring and the ball end. Gently release the spring so that it comes to rest against the spring holder.

34 Check that your shock looks like the one shown. Then assemble the second shock in the same way, repeating Steps 18 to 34.



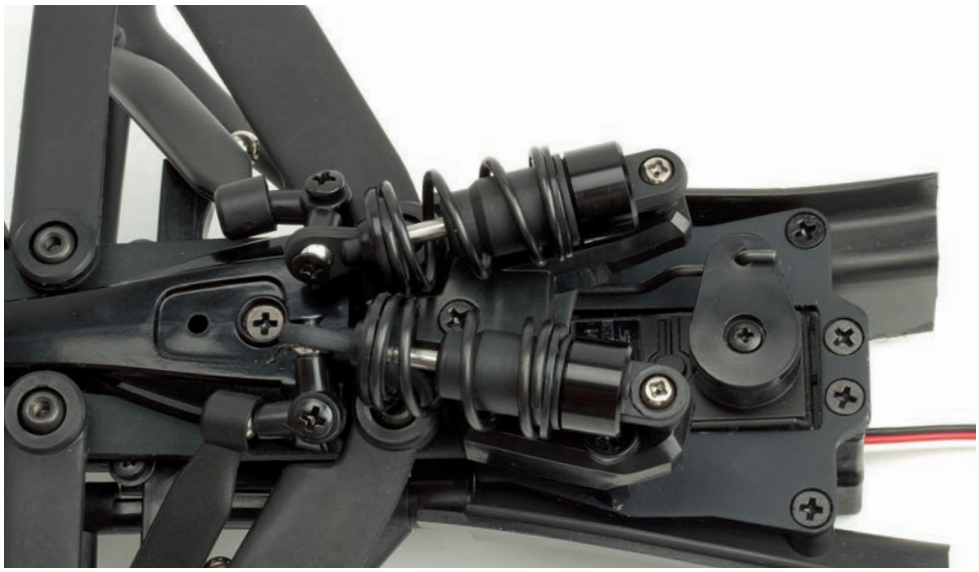
35 Now that you have two fully assembled shocks, adjust them so they are the same length. The red arrows show the points where the ends of the shock absorbers are mounted to the front chassis.

36 Remove the two screws holding the two 5.8mm balls in the cranks.

37 Place a ball into the ball end at each of the shocks.

38 Re-fit the screws, removed in Step 36, through the balls and back into the crank, securing the two shocks to the two cranks.

39 Squeeze the two sockets at the other ends of the shocks onto the pillow balls at the back end of the shock mount.



40 At the end of this stage you have completed and mounted the two front shocks to your front chassis. Check the photo above to see that the two shocks are correctly positioned.

Stage 27

THE RIGHT FRONT KNUCKLE ARM

IN THIS STAGE, YOU FIT THE RIGHT FRONT AXLE INTO THE KNUCKLE ARM, AND THEN ATTACH THIS ASSEMBLY TO THE FRONT RIGHT SUSPENSION WISHBONES.

Tools & Materials

Phillips screwdriver (size 2)
Angled needle-nose pliers (smooth)
1.5mm Allen key (supplied in Issue 23)

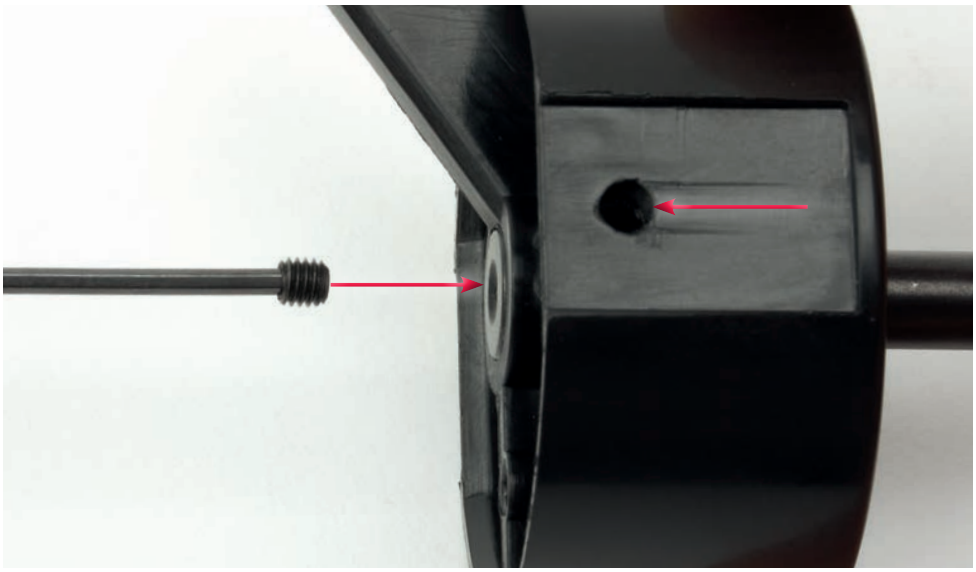
1. E-ring E2.5
2. 5.8mm ball-headed screw
3. 6mm locknut
4. Kingpin
5. 3 x 3mm set screw
6. Right front axle
7. Right front knuckle arm

01 Position the right front knuckle arm as shown, and place the 5.8mm ball-headed screw into the hole in the projection on the left of the arm, as indicated by the red arrow.

02 Screw the ball-headed screw all the way into the hole with a size 2 Phillips screwdriver.

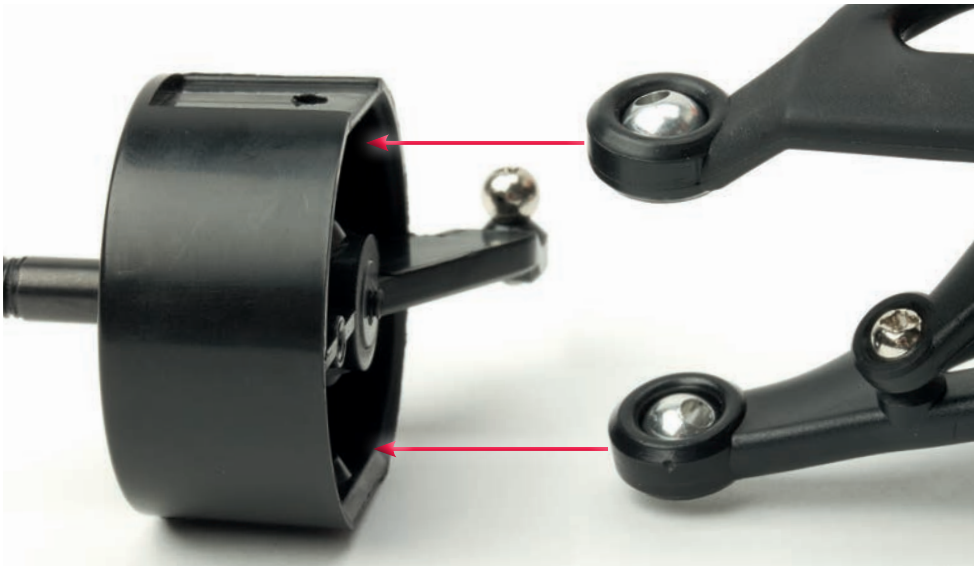
03 Hold the right front axle as shown, and insert it into the hole in the centre of the knuckle arm (red arrow).

04 Before pushing the axle fully in, align the hole at its upper end (see Step 03) with the holes of the knuckle arm (see red line).



05 Push the axle all the way into the hole of the knuckle arm, until its end is flush with the edge of the knuckle. Then, holding the knuckle arm as shown, look through the hole on the outside (right arrow) to check that the holes are aligned correctly, as in Step 04. If not, turn the axle until they align correctly. Then, using the 1.5mm Allen key, insert the 3 x 3mm set screw into the hole at the end of the axle (left arrow), but don't screw it all the way in.

06 Position the front chassis assembly so that you can see both pillow balls of the left wishbones, as shown, and align the balls vertically.



07 Place the knuckle arm as shown in the photo, and position the ends of the wishbones above and below the axle. Make sure that the holes of the pillow balls remain aligned as vertically as possible.

08 Look at the assembly from above through the hole marked with a red circle. If you can see through it, the balls are aligned correctly. If not, remove the wishbones and repeat Steps 06 and 07.

09 Insert the kingpin into the hole at the top of the knuckle arm (red arrow). Push it into the hole until the groove highlighted in Step 10 is visible.

10 Turn the assembly over, and locate the groove at the bottom of the kingpin (red arrow). Use pliers to clip the E-ring into this groove.

11 Take the 1.5mm Allen key and tighten the 3 x 3mm set screw to secure it in place, as shown in Step 12.

12 The photo above shows how far the 3 x 3mm screw should be screwed into the hole.

13 Screw the 6mm locknut onto the threaded end of the axle, as shown above.

14 At the end of this stage, both front knuckles have been fitted to the front chassis of your RB7 racer. In the next stage, you will begin mounting the front wheels.

Stage 28

THE RIGHT FRONT WHEEL BEARINGS

IN THIS STAGE, YOU WILL BE FITTING THE TWO BEARINGS TO THE RIGHT FRONT WHEEL AND THEN MOUNTING BOTH FRONT WHEELS ONTO THE FRONT CHASSIS ASSEMBLY.

Tools & Materials

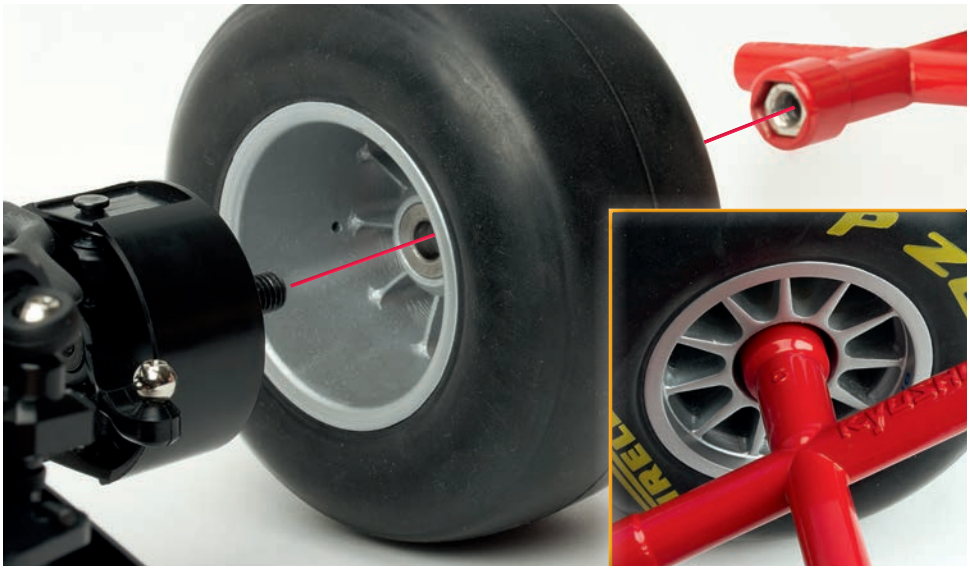
Cross wrench
Bearing insertion tool

1 Right front wheel bearings x 2

01 Take the cross wrench and insert the bearing insertion tool from Stage 18 into the arm labelled '10'.

02 Place one of the wheel bearings on the end of the adapter. Then push the bearing into the hole in the centre of the right front wheel (red arrow).

03 Turn the wheel around, and insert the second bearing into the other side of the centre of the wheel (red arrow).



04 Remove the nut from the shaft of the right steering knuckle and place it into the '10' arm of the cross wrench. Then place the right front wheel onto the shaft (red line) and screw the nut back onto the end of the shaft. When the nut stops turning, unscrew it one-eighth of a turn so that the wheel is free to turn.

05 Repeat step 04 on the left side of the front chassis assembly. At the end of this stage you have completed the assembly of the front wheels.