F180®

INSTRUCTION MANUAL

F180®

INTRODUCTION

The Serpent F180 was developed with a dream in mind of creating the world's best gas powered, scale Formula car. After three years of development this all new revolutionary platform is complete, bringing together stunning looks, great handling, F1-style technology all combined in an easy-to-use, high-performance racecar.

The F180 has been designed to fit the shape constraints of a modern Formula car and therefore features many innovations that include the use of inboard suspension (previously pioneered by Serpent) which uses pushrods and rockers to act upon pre-built inboard RCC shock absorbers at both the front and rear of the car. Sporting a radical new front braking system, when combined with the conventional rear disk brake system the total braking power and performance of this 2WD car allow for smooth, strong, controllable stops. To further obtain the scale looks of a Formula racecar, the F180 features a laydown engine mounting system that prevents the engine from sticking out of the body shell and ruining the aesthetics, whilst the use of realistic-looking and fully-functional front and rear wings and grooved rubber tires completes the overall Formula look that screams "performance."

INSTRUCTIONS
Serpent's long tradition of excellence extends to their instruction manuals, and this instruction manual is no exception. The easy-to-follow layout is richly illustrated with 3D-rendered full-color images to make your building experience quick and easy. Following the instructions will result in a well-built, high-performance racecar that will soon be able to unleash its full potential at the racetrack.

This instruction manual has been divided into sections that will logically lead you through the assembly process of your Serpent F180. Follow the assembly steps in the order presented to ensure that no problems occur during assembly. Each step indicates all the fasteners and small parts used. Bag numbers identify the kit bag(s) that contains the appropriate parts.

SETUP
In certain assembly steps you need to make basic adjustments, which will give you a good initial setup for your Serpent F180. Fine-tuning the initial setup is an essential part of building a high-performance racecar like your Serpent F180. This Serpent F180 manual features a detailed Setup section which is an invaluable resource for making adjustments to your Serpent F180 and understanding the concepts behind those adjustments.

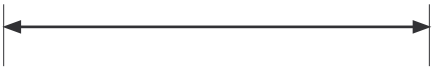
EXPLODED VIEWS AND PARTS LIST
The exploded views and parts lists for the Serpent F180 are contained in a separate Serpent F180 Reference Guide. The exploded views show all the parts of a particular assembly step along with the Serpent part number. The parts lists indicate the part number and name of each part for easy reference when ordering.

SAFETY
Included with your Serpent F180 kit is a document entitled "Read This First" that covers safety precautions for the assembly and use of this product. We strongly recommend that you thoroughly read and understand that document, and follow all the precautions.

CONTENTS

USING THE MANUAL

Each step contains a variety of numbers, lines, and symbols. The numbers represent the order in which the parts should be assembled. The lines and symbols are described below.

LINE / SYMBOL	DESCRIPTION
	Step number; the order in which you should assemble the indicated parts
	Length after assembly
	Assembly path of one item into another
	Group of items (within lines) should be assembled first
	Direction the item should be moved
	Glue one item to another
	Press/Insert one item into another
	Connect one item to another
	Gap between two items
	Setup Section A: F180 Basic Setup
	Setup Section A: F180 Advanced Setup
	Apply graphite grease (GR), threadlock (TL), CA glue (CA) or Serpent's One-way Lube (OW). (Items not included.)

SERPENT.COM

The printed instruction manual included with your Serpent F180 kit is very complete, though due to continuous product development, more up-to-date information may be provided at our Serpent.com website.

All information about the Serpent F180 is accessible from the Serpent F180 product page can be found on Serpent.com and can be accessed by simply typing **serpent.com/300000** into your web browsers address bar.

From the Serpent F180 product page you will find the very latest information about your Serpent F180: reports by team drivers and other experts, tips and tricks, setups, image gallery and downloadable files including the latest version of the instruction manual will be made available as downloadable PDF files.

1.0 PREPARATION

STEP 1.1 BAG A

SHOCK ABSORBERS
Fill ALL 4 factory pre assembled shock absorbers with shock oil using the following steps

1

Unscrew the bottom half of the pre-assembled shock absorbers.

2

FILLING
Fill the shock body with the supplied shock absorber oil.

BLEEDING
Let the oil settle and allow the air to escape.

STEP 1.2

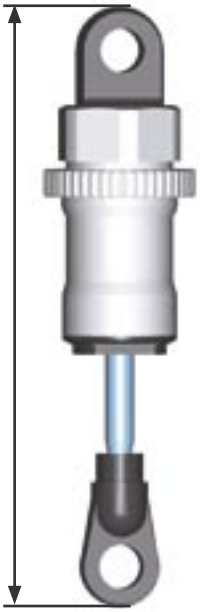
1 Massage some shock oil into the shock sponge before re-assembling the shock absorber.

2 With the shock body filled with oil, slowly screw the bottom half of the pre-assembled shock back onto the shock body.

IMPORTANT! Do not cross thread!

Oil will overflow through the built-in bleed channel in the threads. Tighten carefully until the bottom half seats against the shock body.

Shock Length
68mm
for ALL shocks



Use the lower ball joint to adjust shock length.

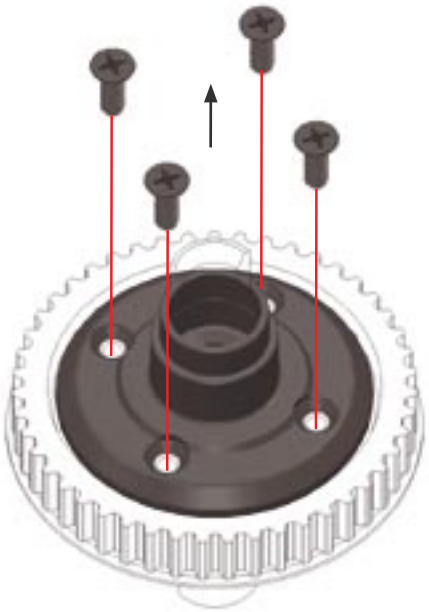
Each left & right pair of front/rear shocks MUST be the same length!

See setup Sections A2 and B2 for more information about shocks

STEP 1.3

BAG B

GEAR DIFFERENTIALS
Fill the pre-assembled rear gear diff with diff oil using the following steps.



STEP 1.4

STEP 1.5

REAR DIFF: Use **10,000** diff oil

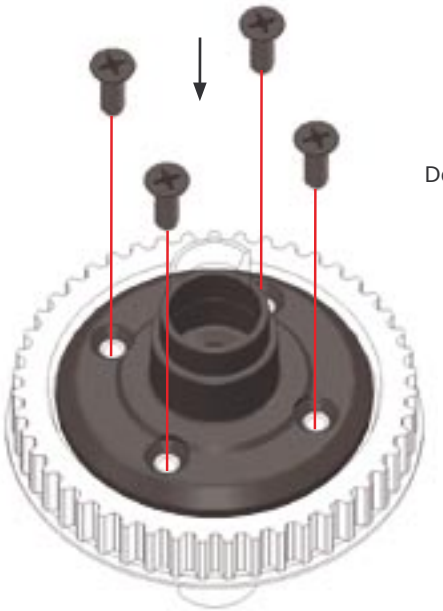
Fill the space around the gears with the indicated Serpent Diff Oil **until level with the top of the casing**. Rotate the output shaft to allow the diff-oil to fill all gaps in and around the gears.

See setup Section B11 for more information about the rear gear differential

STEP 1.6

IMPORTANT!
Make sure to set O-ring in place

STEP 1.7



Do not overtighten screws

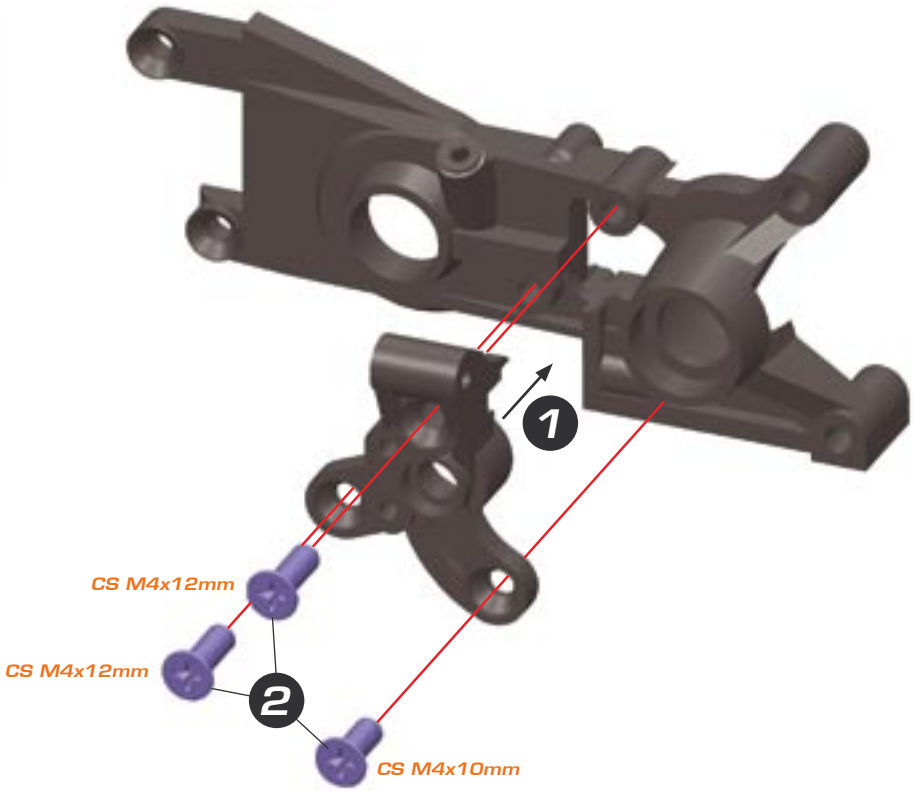
2.0 REAR ASSEMBLY

STEP 2.1

BAG C, 1

CS
M4x10mm

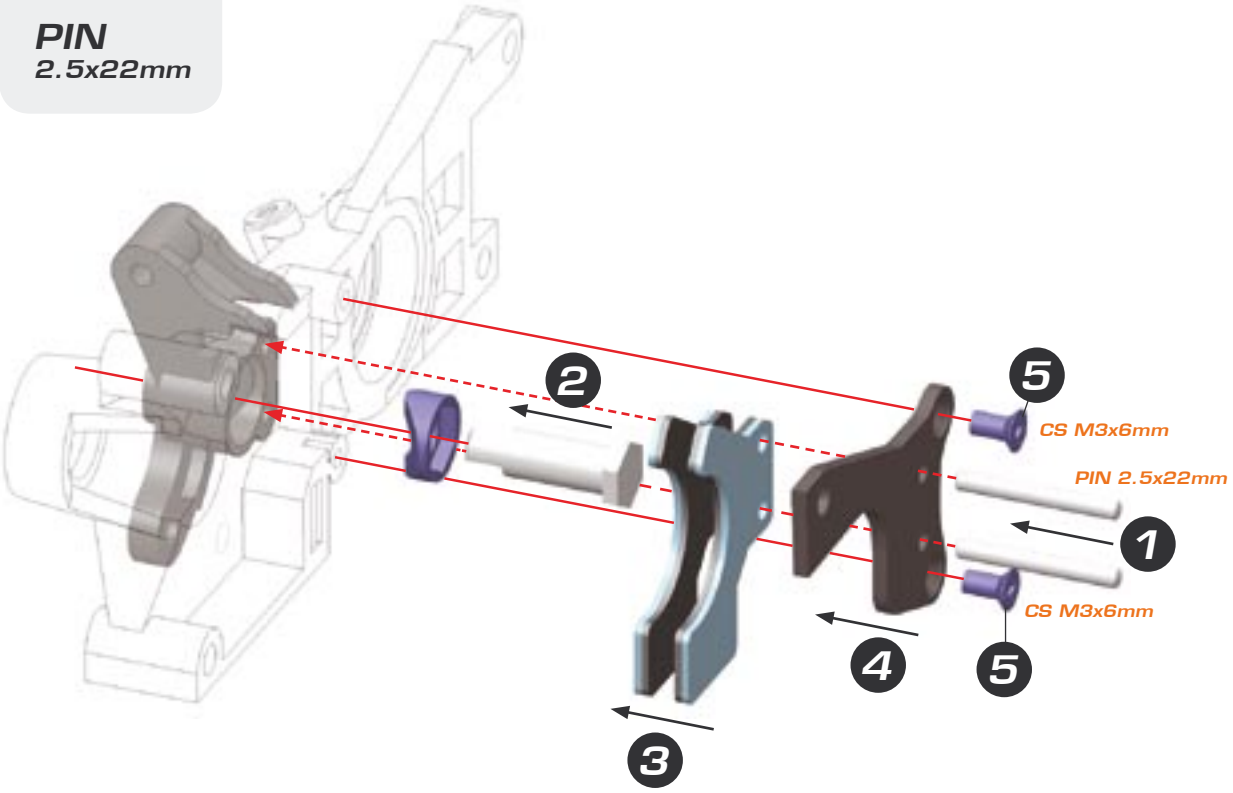
CS
M4x12mm



STEP 2.2

CS
M3x6mm

PIN
2.5x22mm

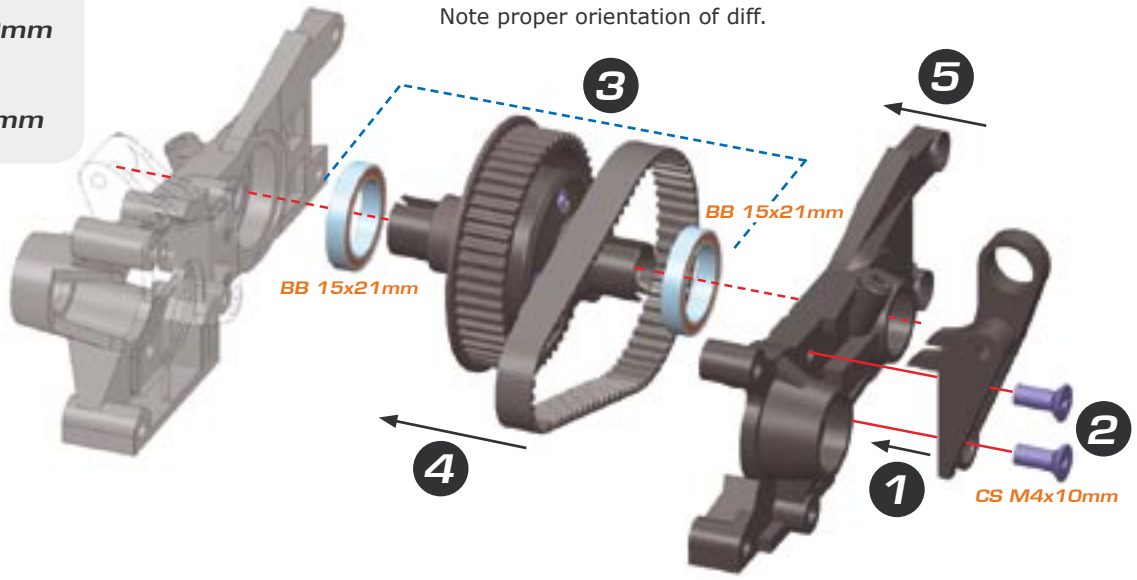


STEP 2.3

CS
M4x10mm

BB
15x21mm

Note proper orientation of diff.



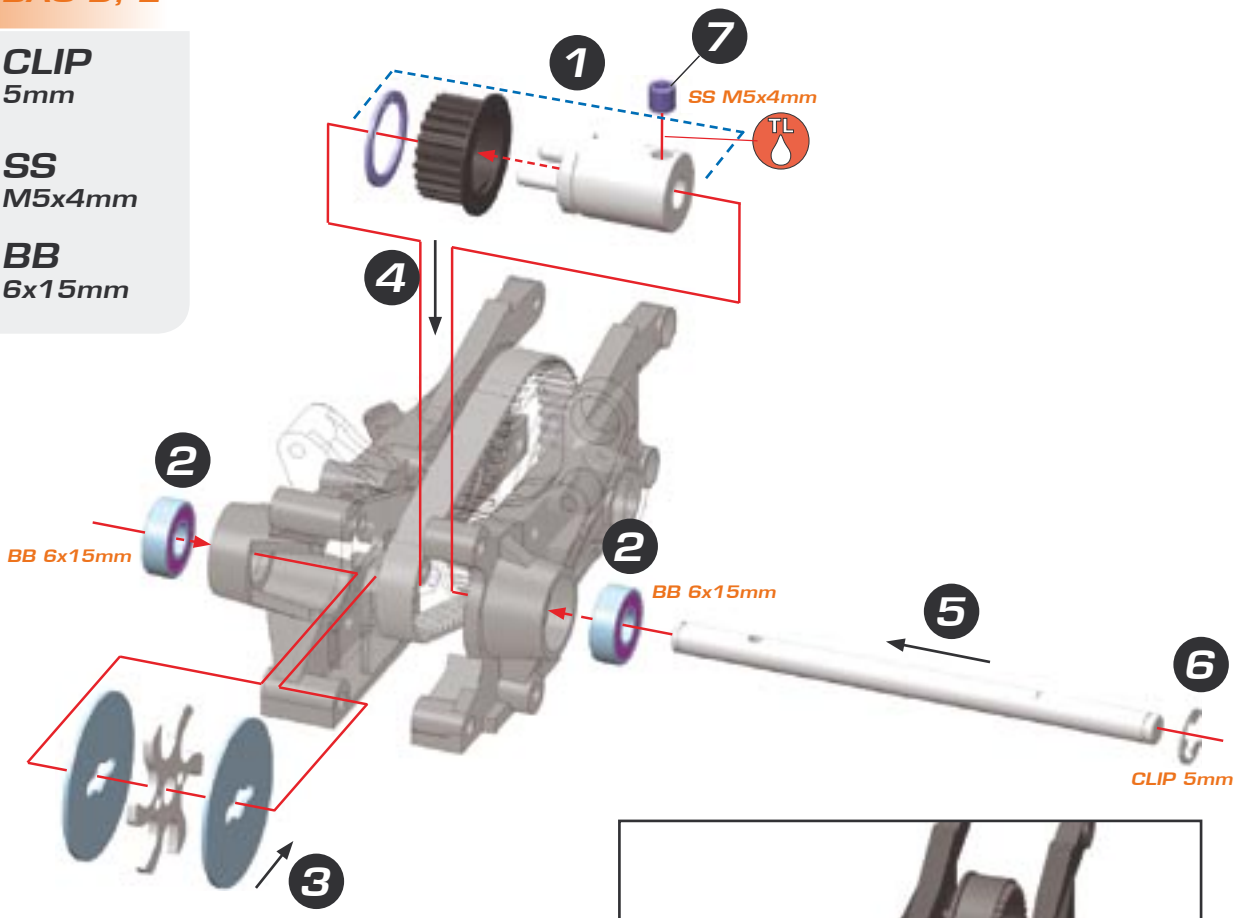
STEP 2.4

BAG D, 2

CLIP
5mm

SS
M5x4mm

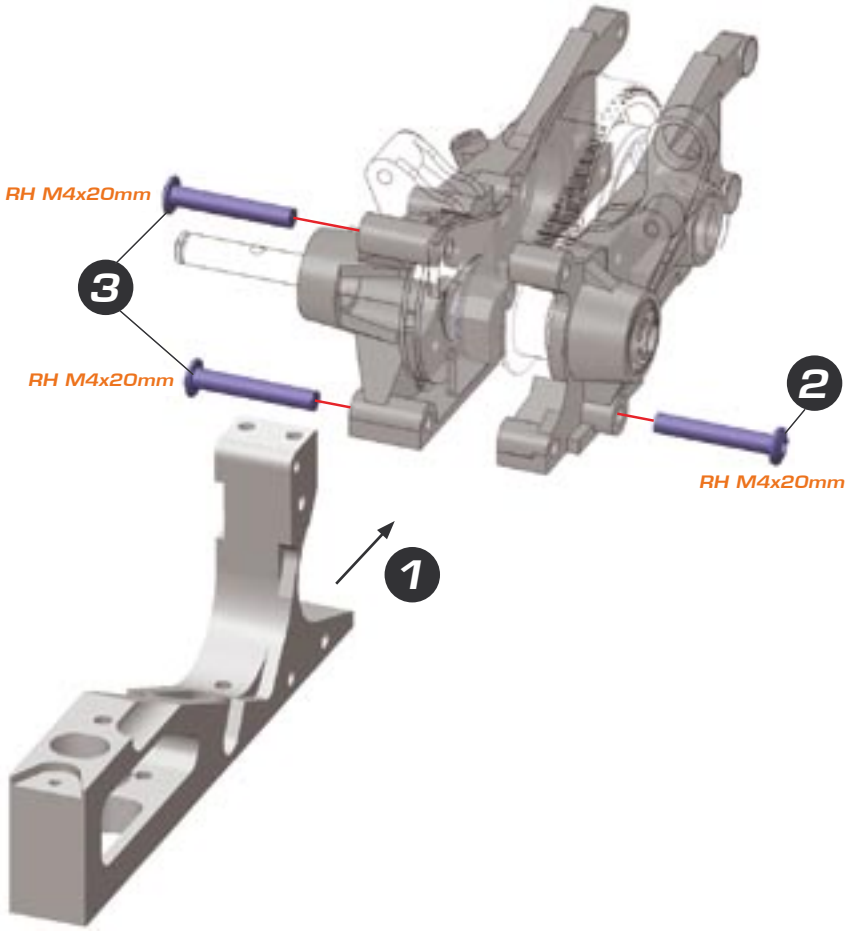
BB
6x15mm



STEP 2.5

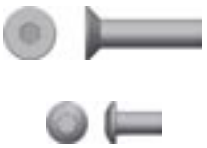
BAG 3

RH
M4x20mm



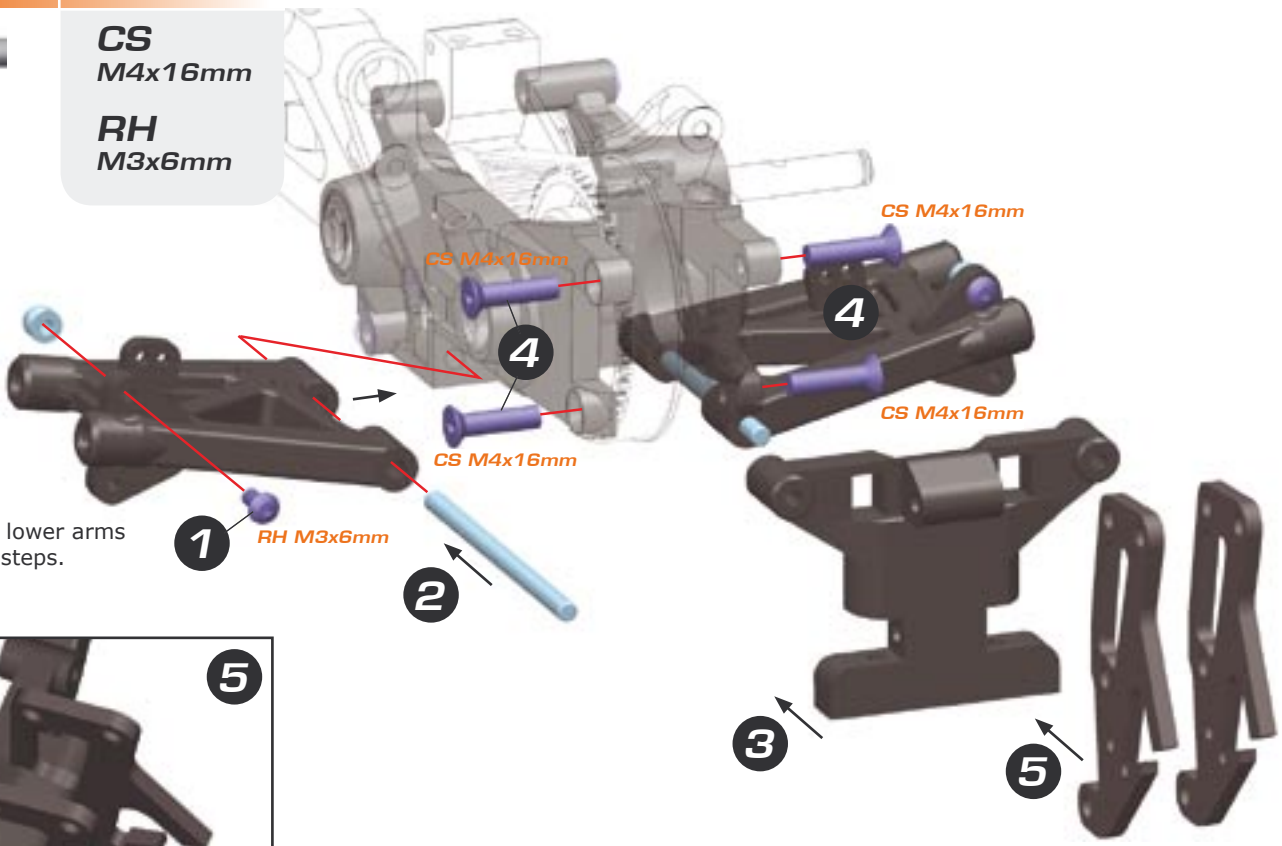
STEP 2.6

BAG E



CS
M4x16mm

RH
M3x6mm

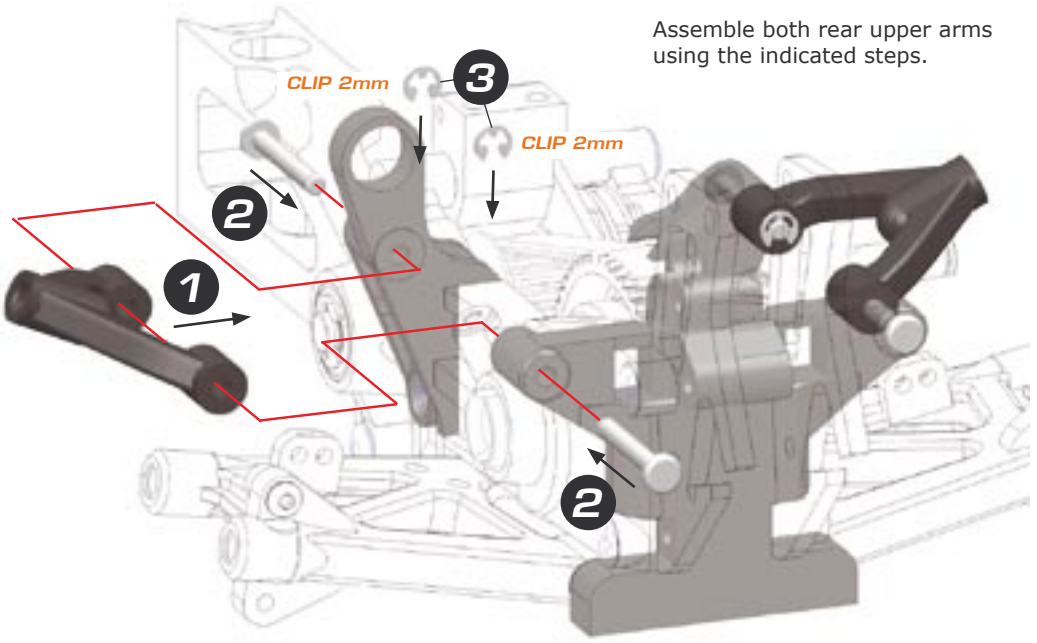


Assemble both rear lower arms using the indicated steps.

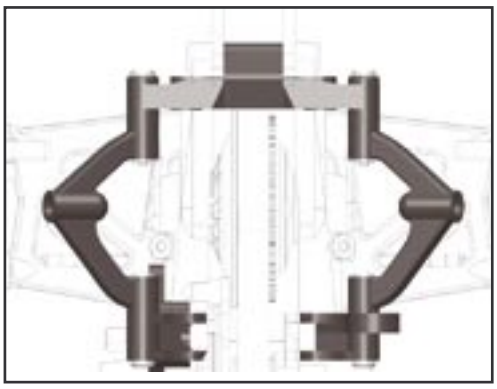
STEP 2.7

CLIP
2mm

Assemble both rear upper arms using the indicated steps.



Note the orientation of the upper arms



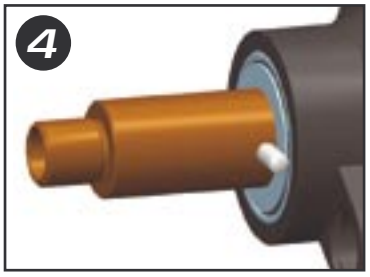
STEP 2.8

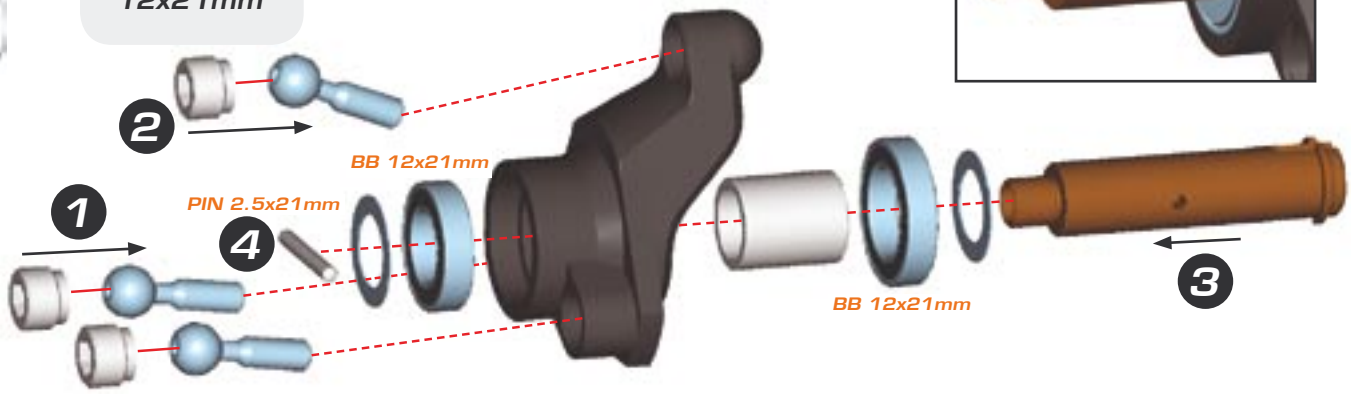
BAG F

PIN
2.5x22mm

BB
12x21mm

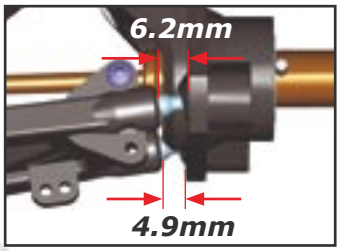
Assemble both rear uprights using the indicated steps.
L + R uprights are mirrored.

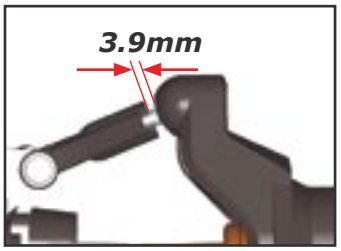


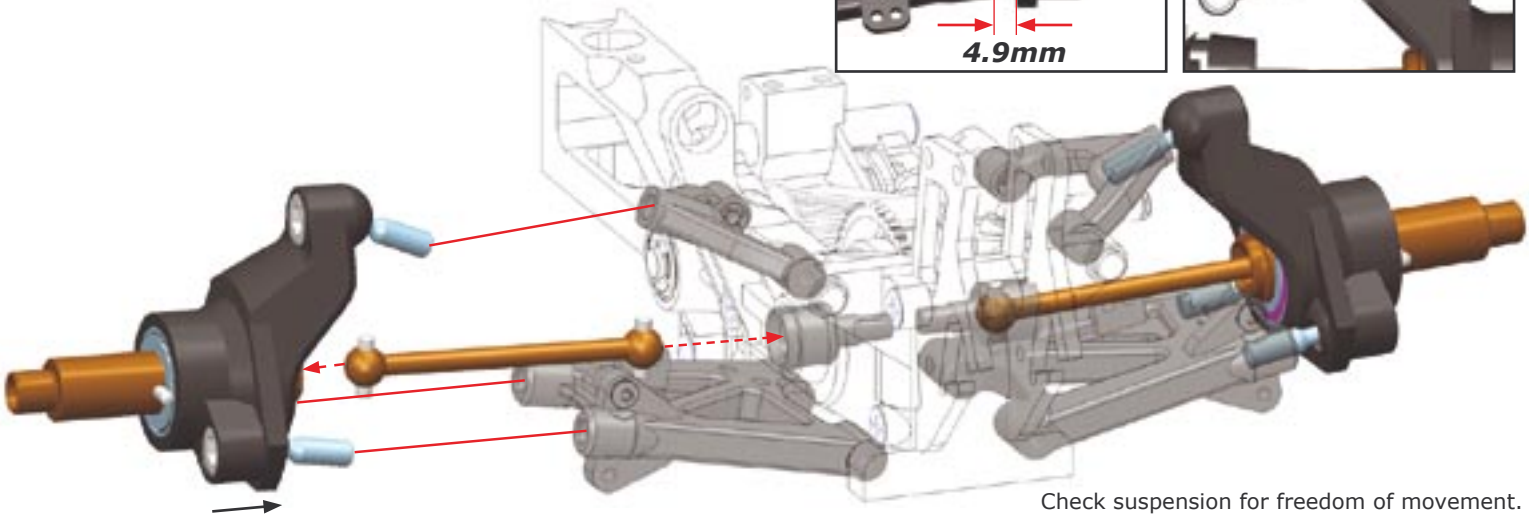


STEP 2.9

See setup Sections A5 and A7 for more information about rear camber and rear toe (respectively).







Check suspension for freedom of movement.

STEP 2.10

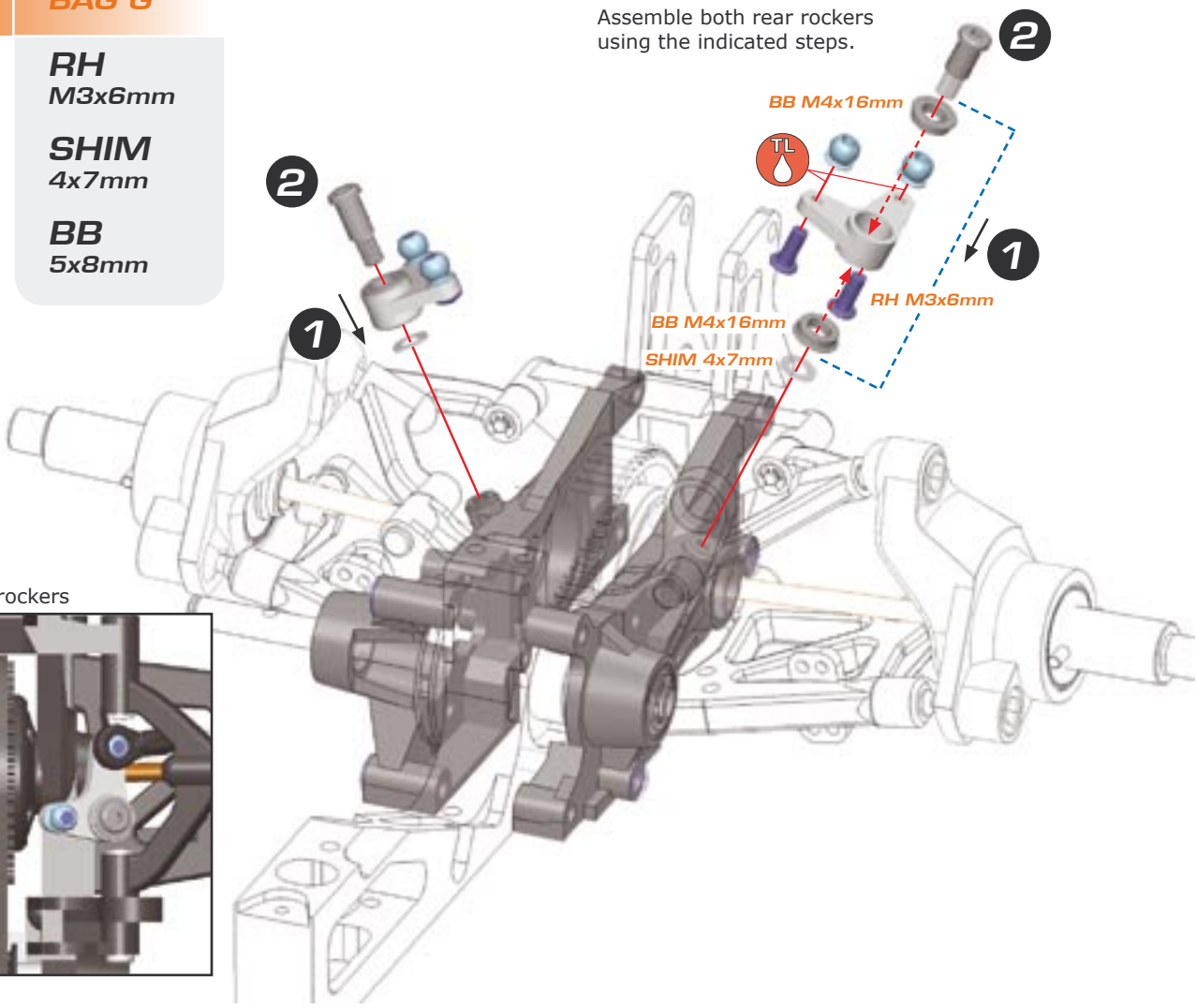
BAG G

RH
M3x6mm

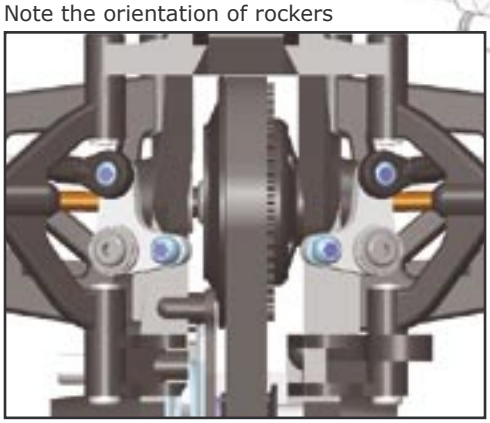
SHIM
4x7mm

BB
5x8mm

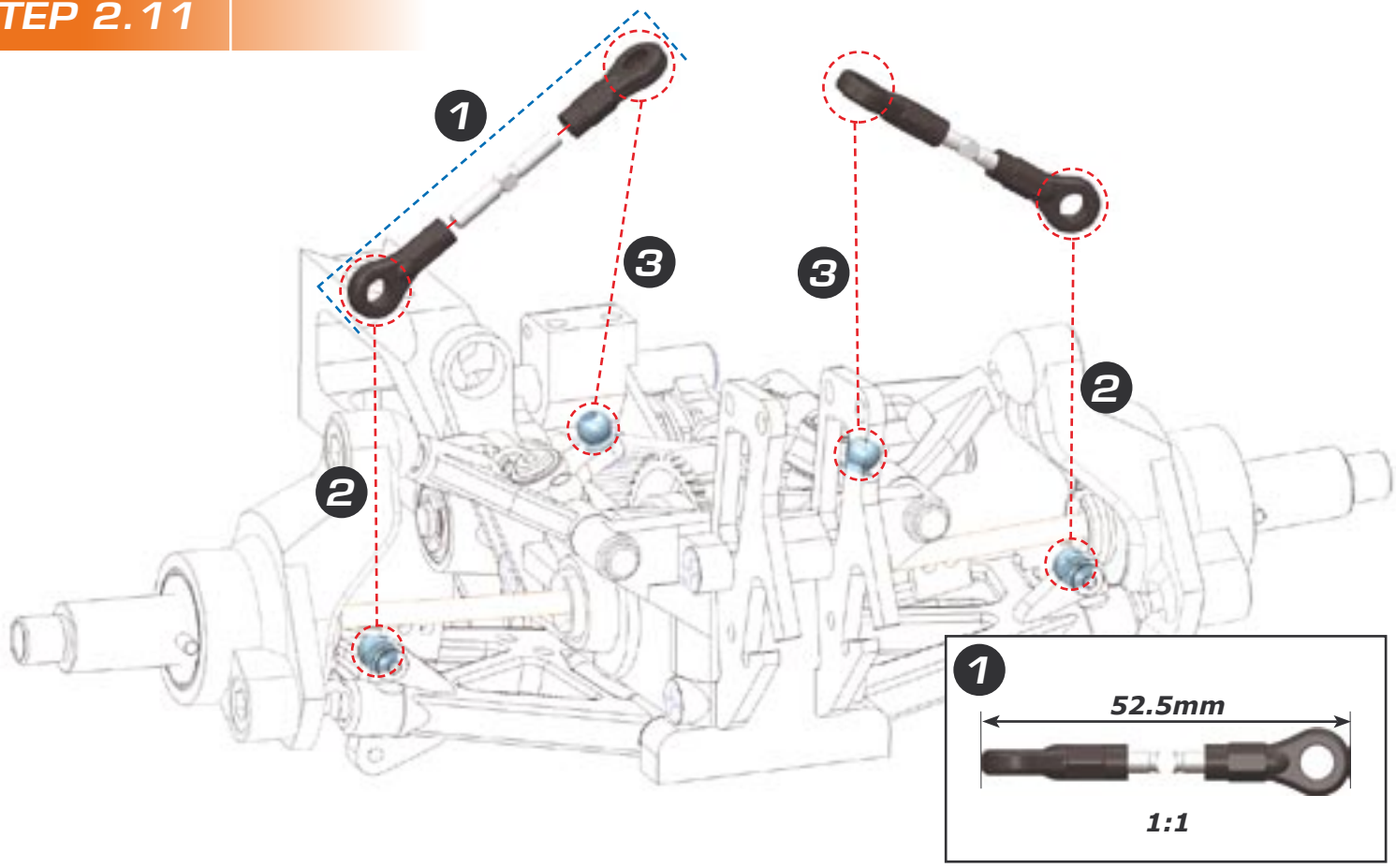
Assemble both rear rockers using the indicated steps.



Note the orientation of rockers



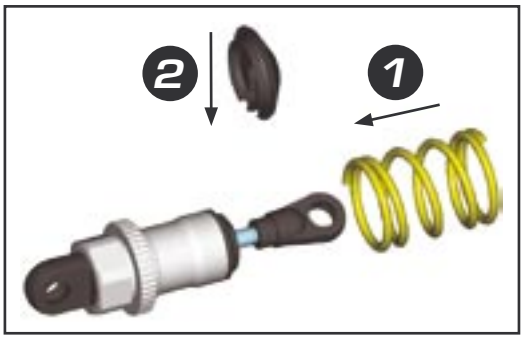
STEP 2.11

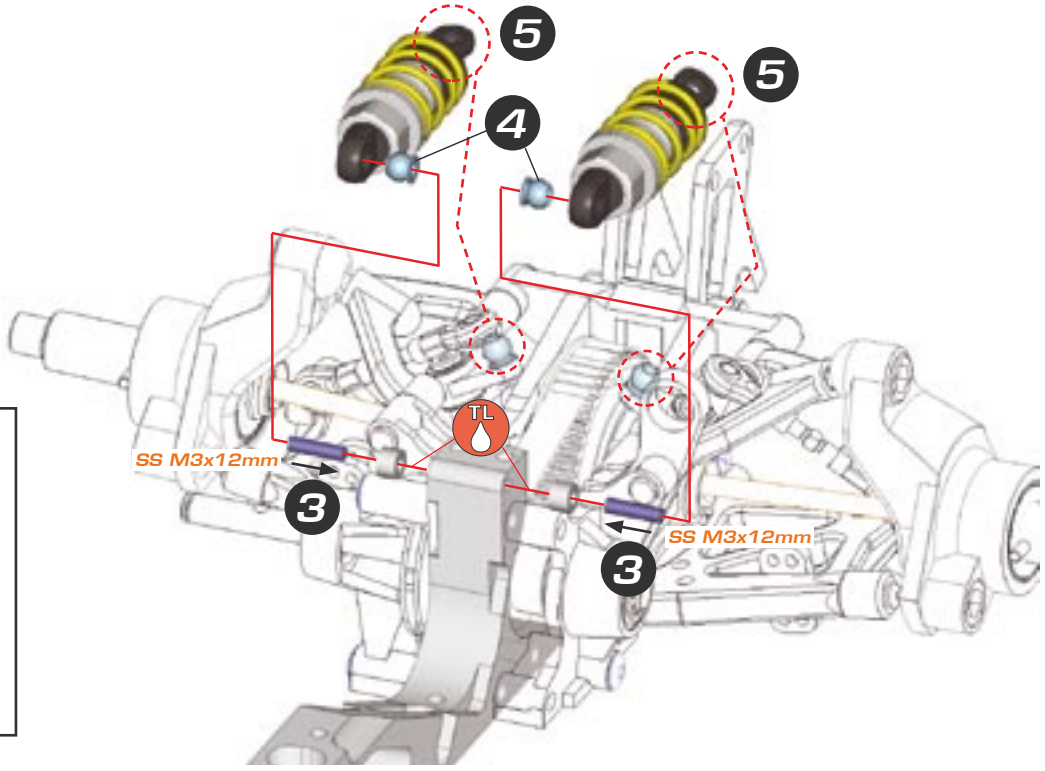


STEP 2.12

SS
M3x12mm

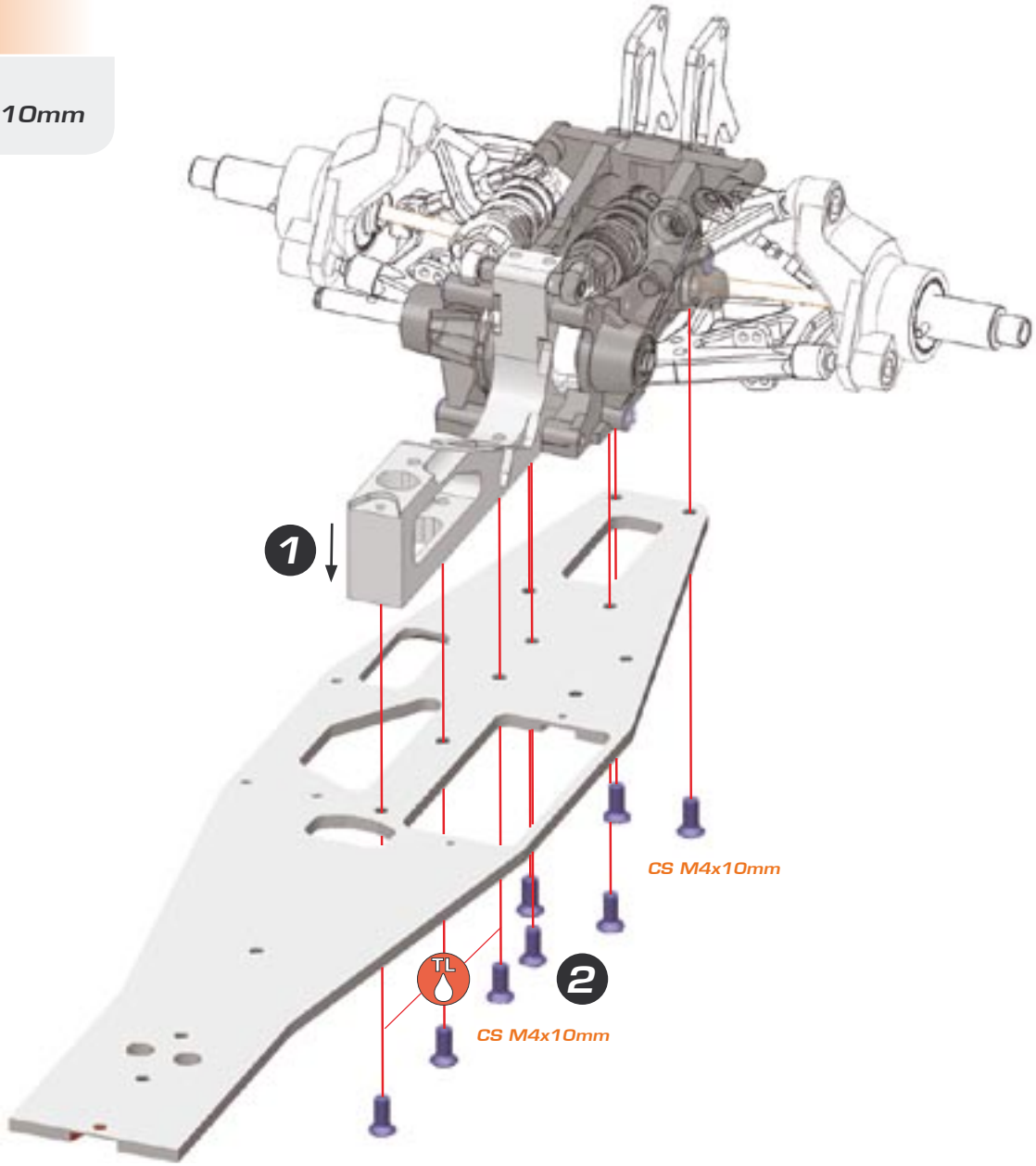
Set identical spring preload on L + R shocks





STEP 2.13

CS
M4x10mm



3.0 FRONT ASSEMBLY

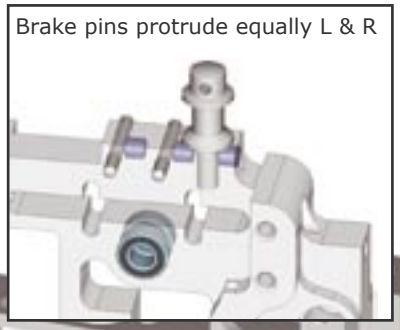
STEP 3.1

BAG H

PIN
2.5x22mm

SS
M4x4mm

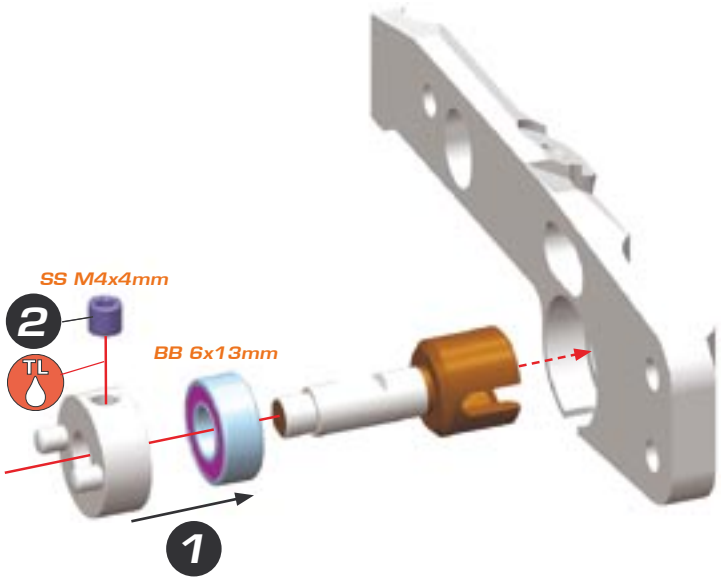
BB
5x10mm



STEP 3.2

SS
M4x4mm

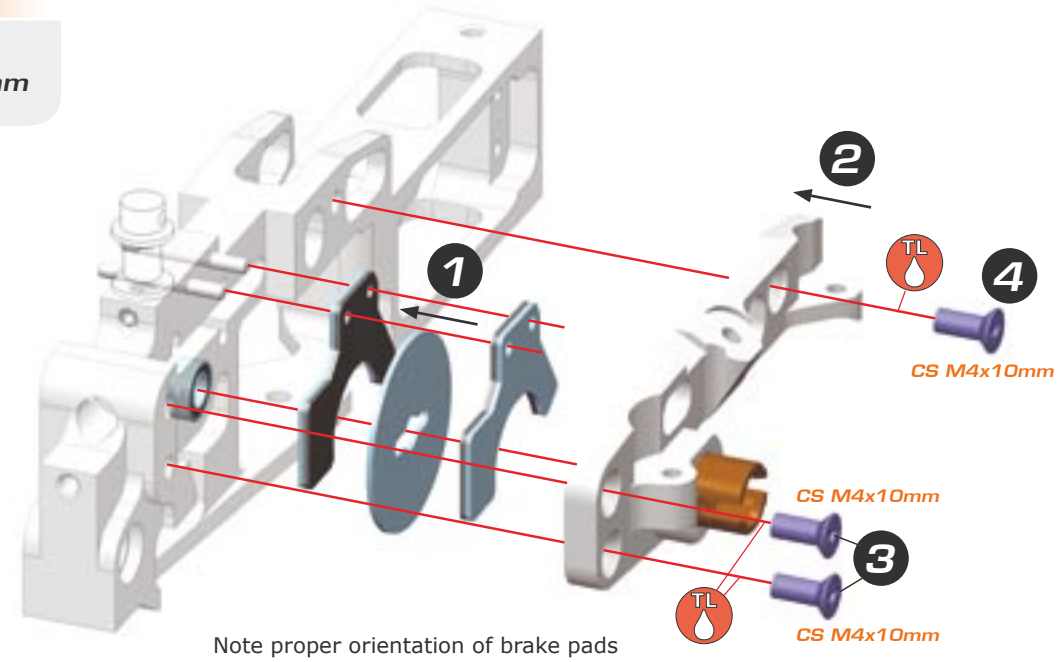
BB
6x13mm



STEP 3.3

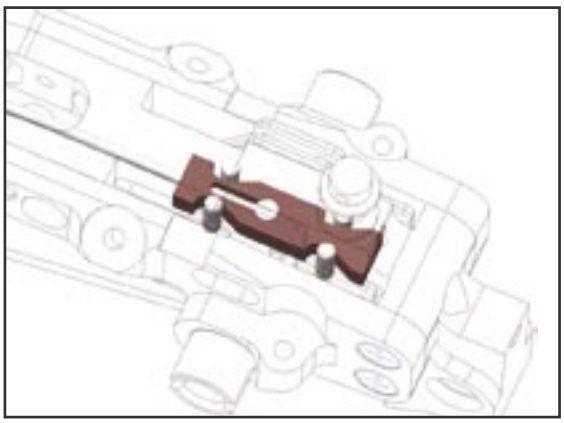
BAG I

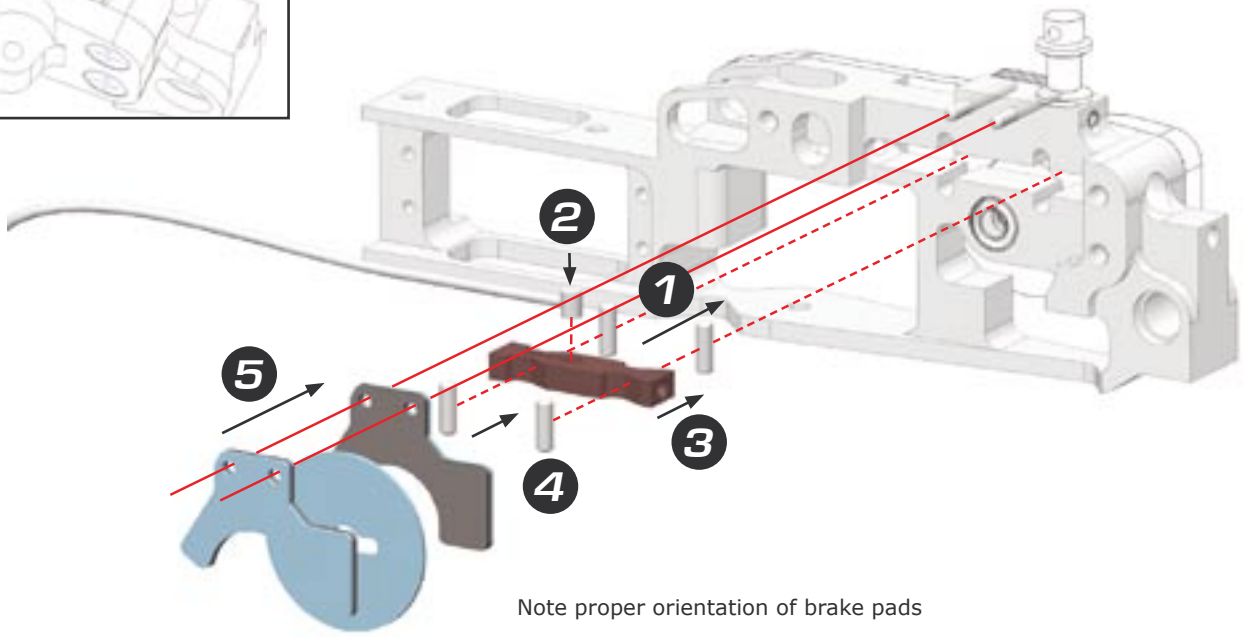
CS
M4x10mm



Note proper orientation of brake pads

STEP 3.4

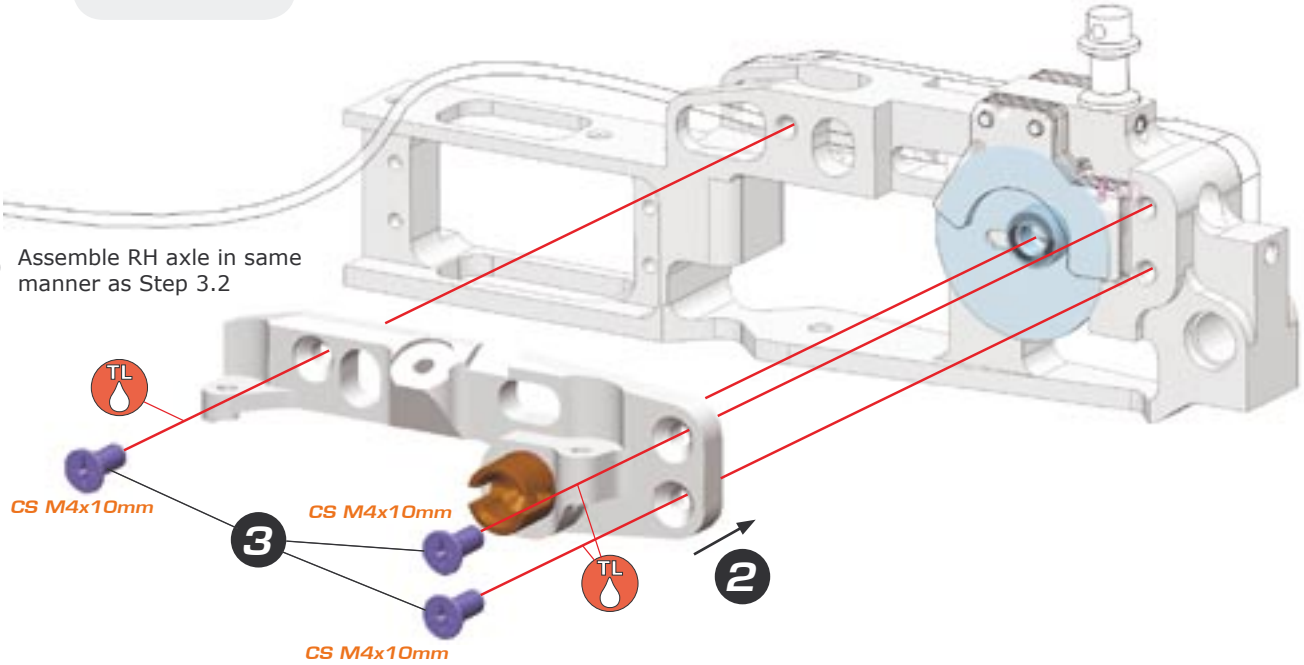




Note proper orientation of brake pads

STEP 3.5

CS
M4x10mm



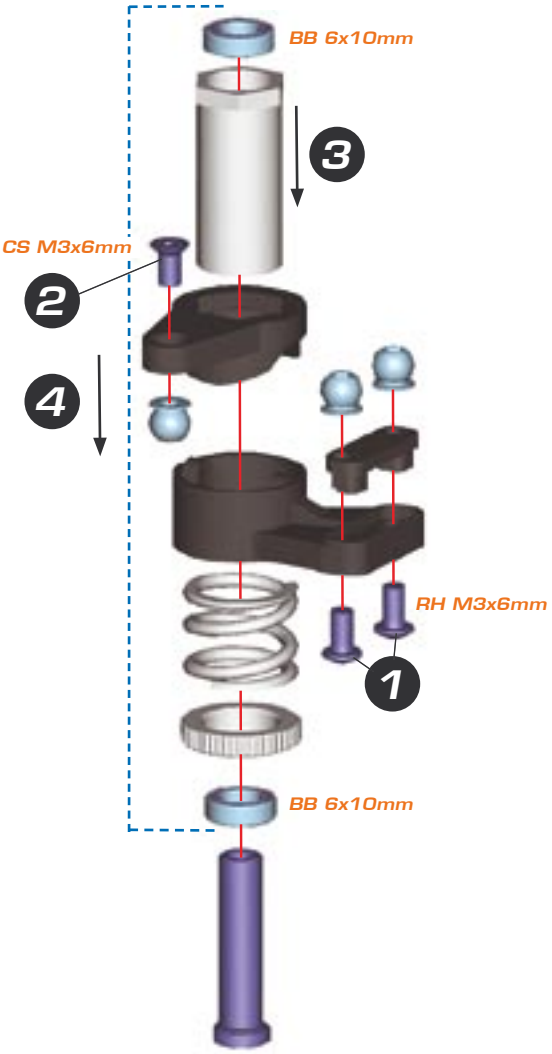
STEP 3.6

BAG J

CS
M3x6mm

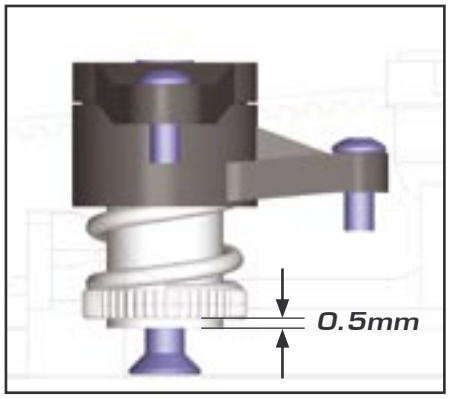
RH
M3x6mm

BB
6x10mm



Note position of insert

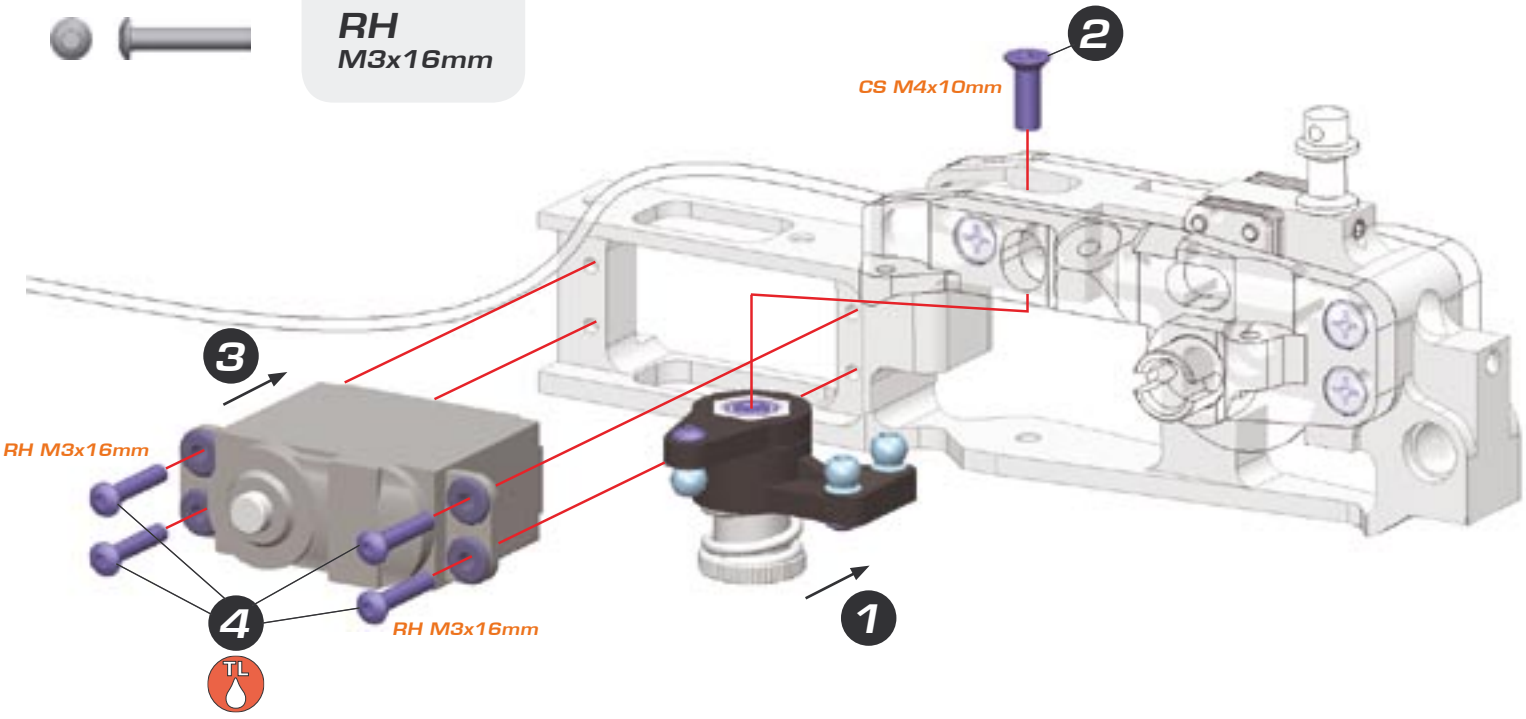
Preload collar setting



STEP 3.7

CS
M4x10mm

RH
M3x16mm

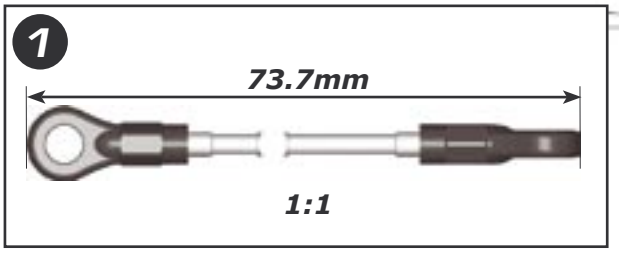


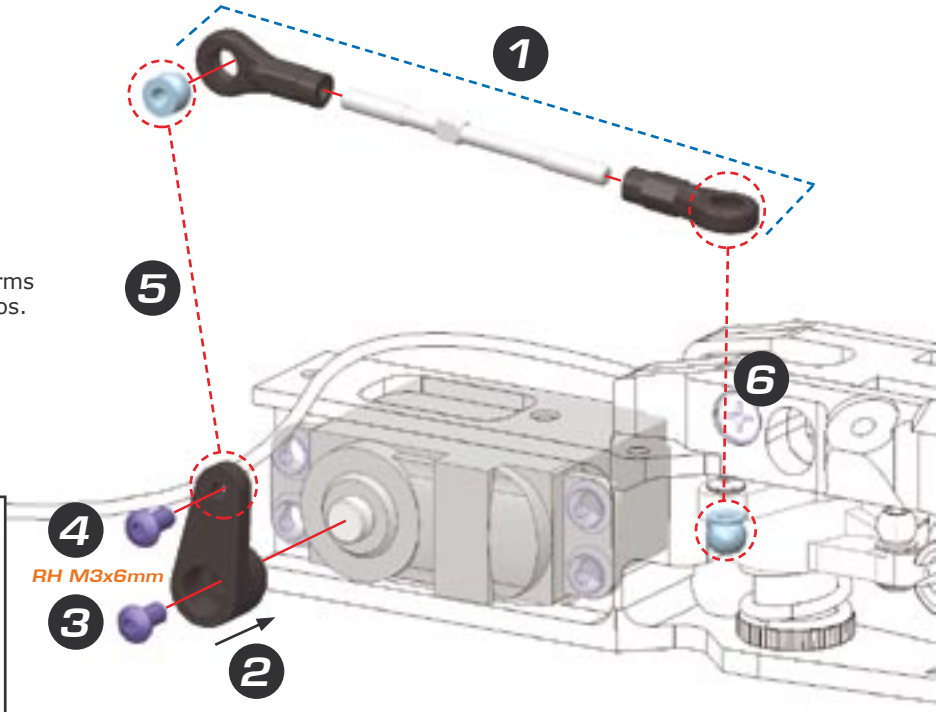
STEP 3.8

BAG K

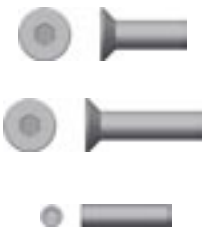
RH
M3x6mm

Use the following servo arms
with these brands of servos.
23 - Sanwa / KO / JR
24 - Hitec
25 - Futaba





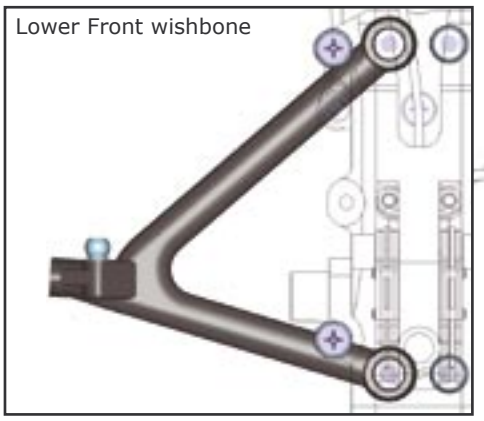
STEP 3.9

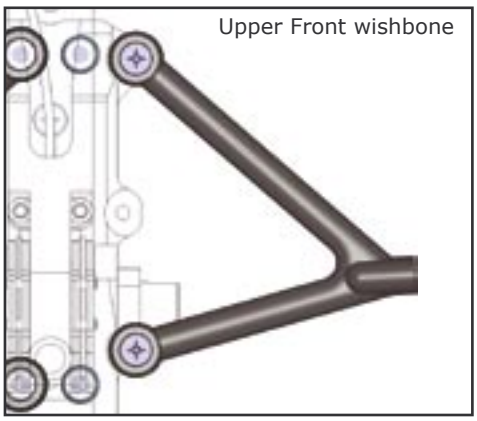


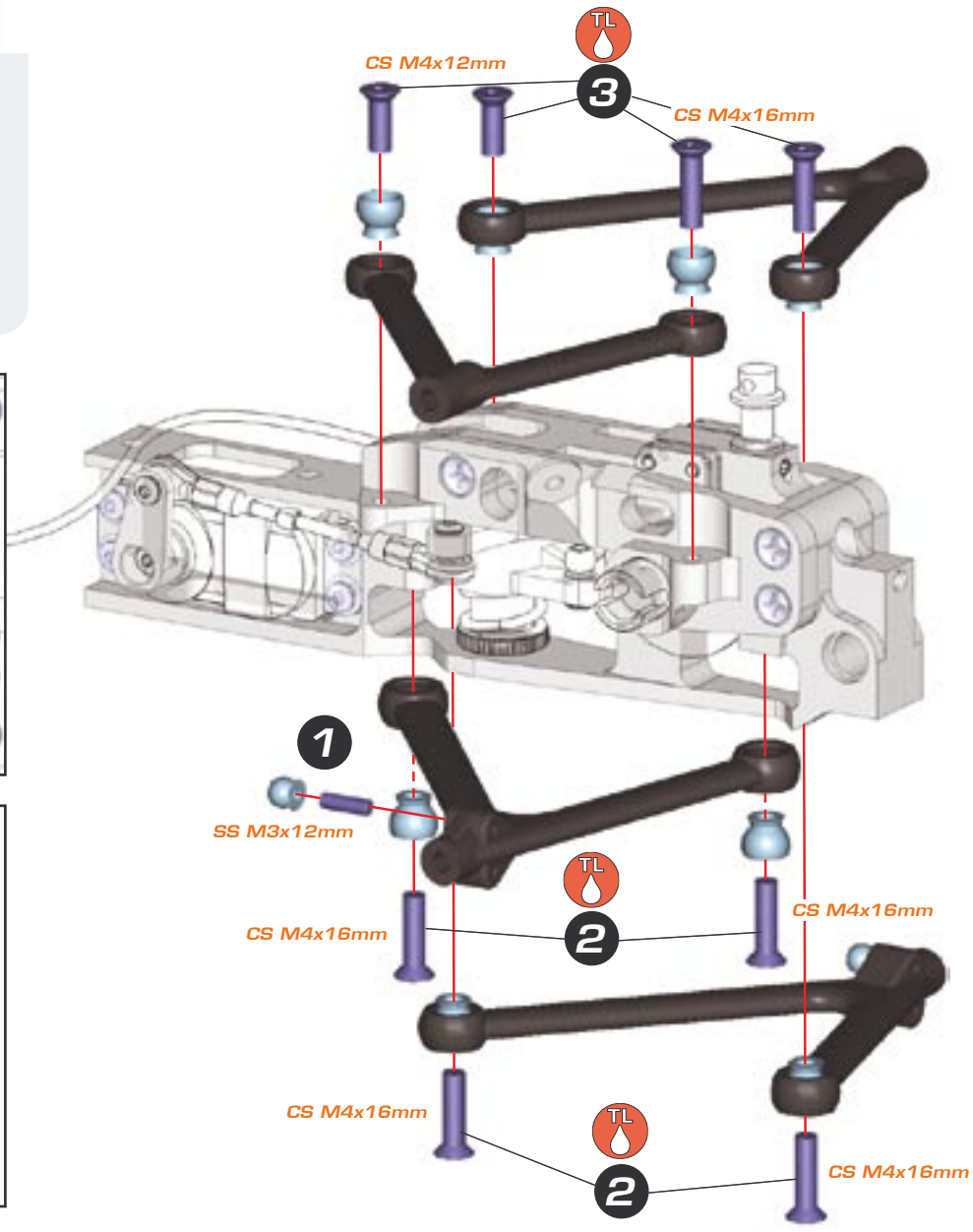
CS
M4x12mm

CS
M4x16mm

SS
M3x12mm







STEP 3.10

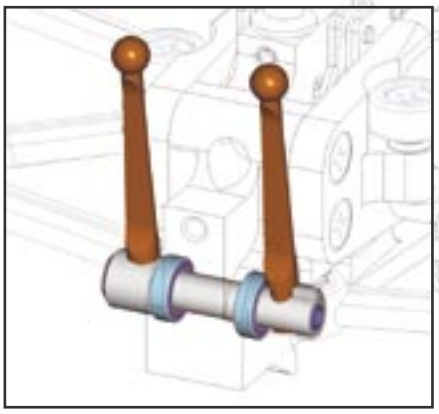
BAG L

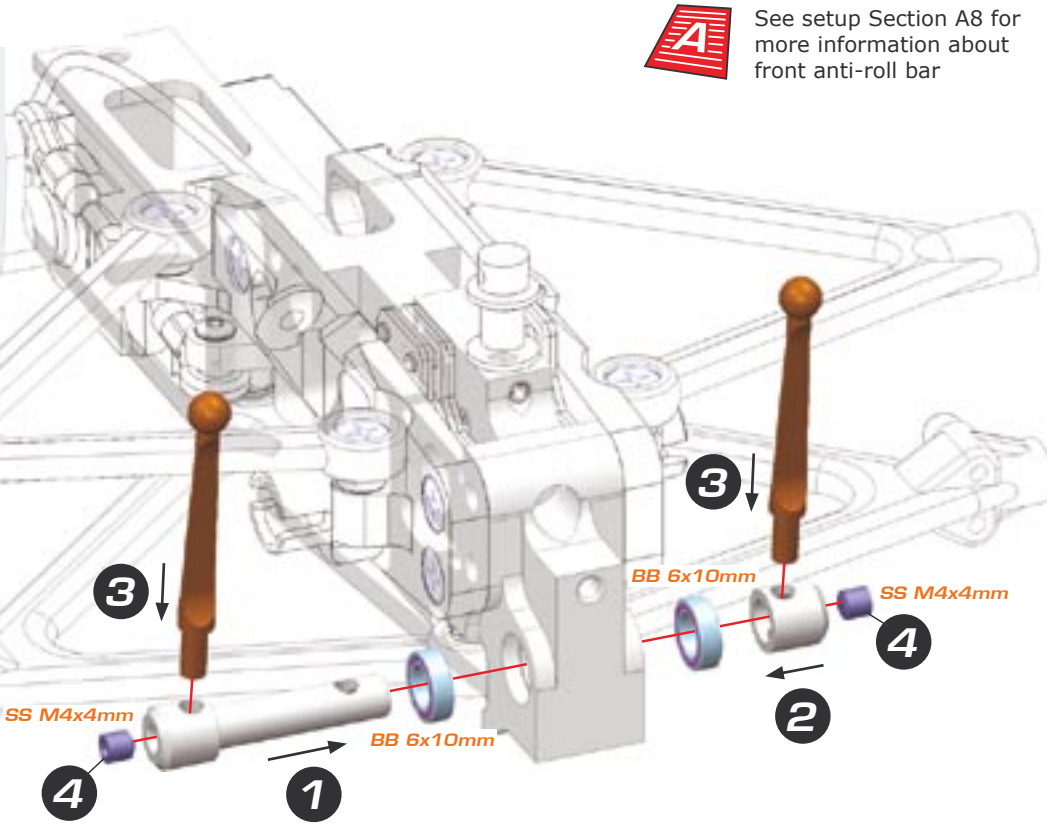
SS
M4x4mm

BB
6x10mm

See setup Section A8 for more information about front anti-roll bar

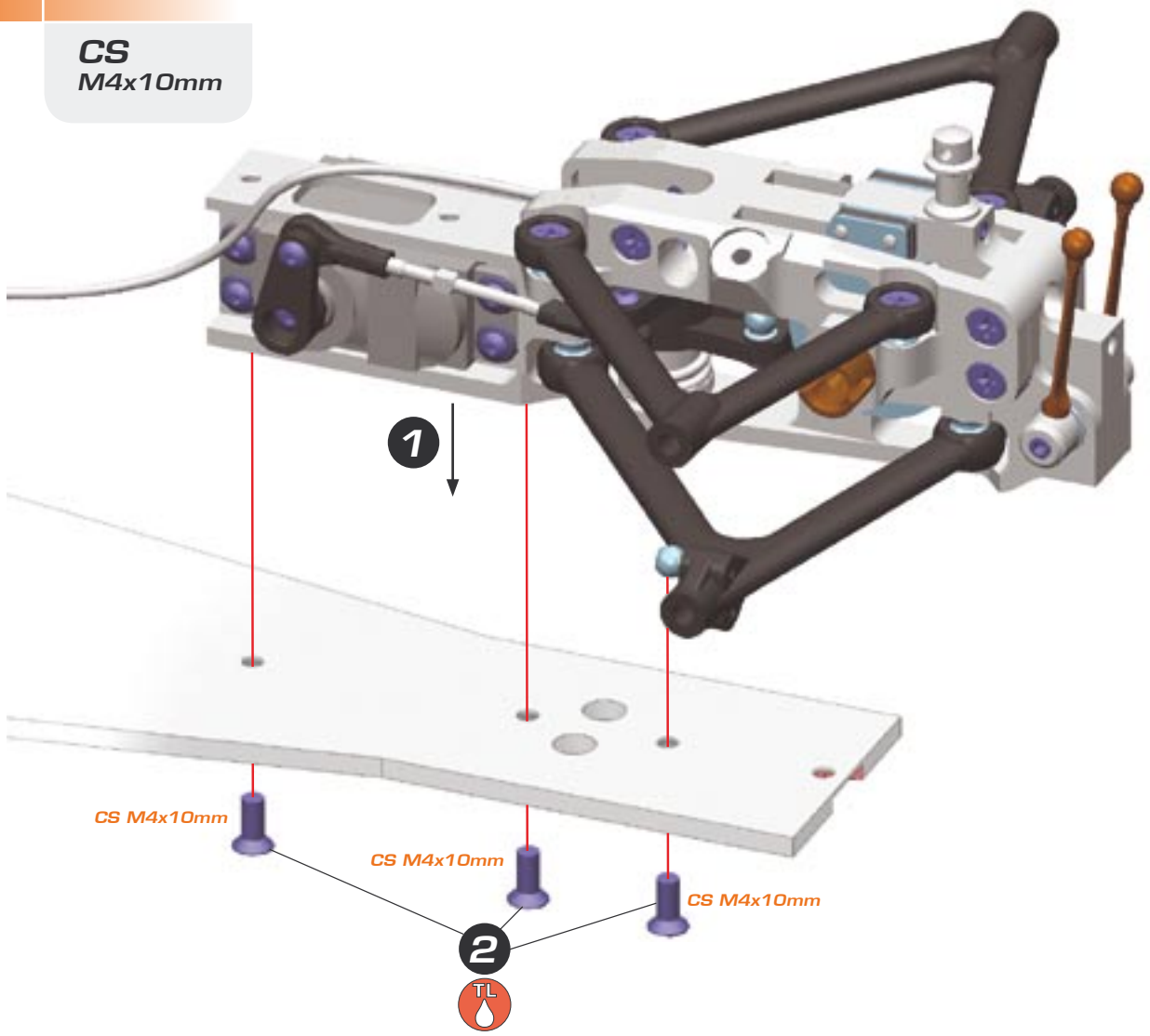
Note default orientation of swaybars (full soft)





STEP 3.11

CS
M4x10mm



4.0 LINKAGE ASSEMBLY

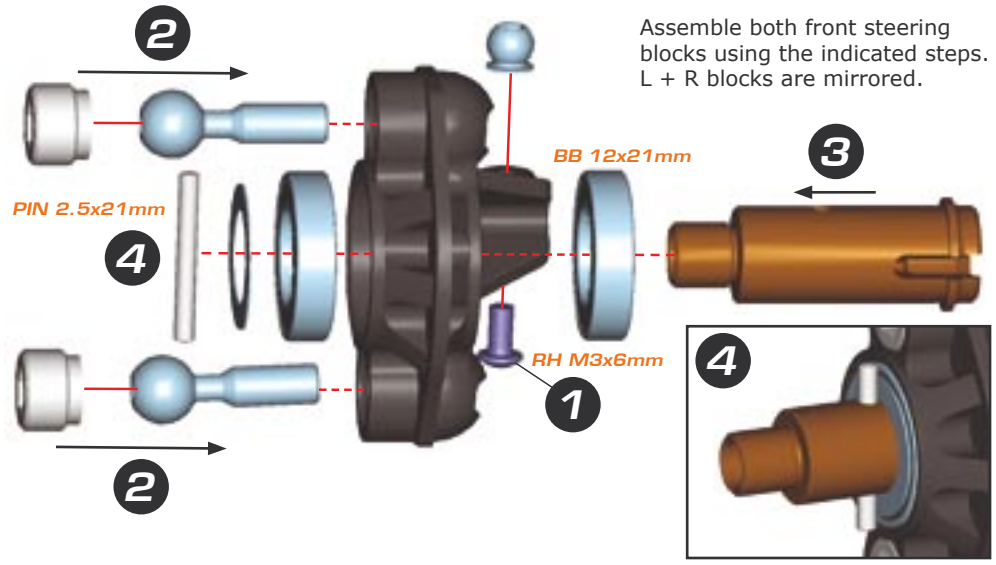
STEP 4.1

BAG M

RH
M3x6mm

PIN
2.5x22mm

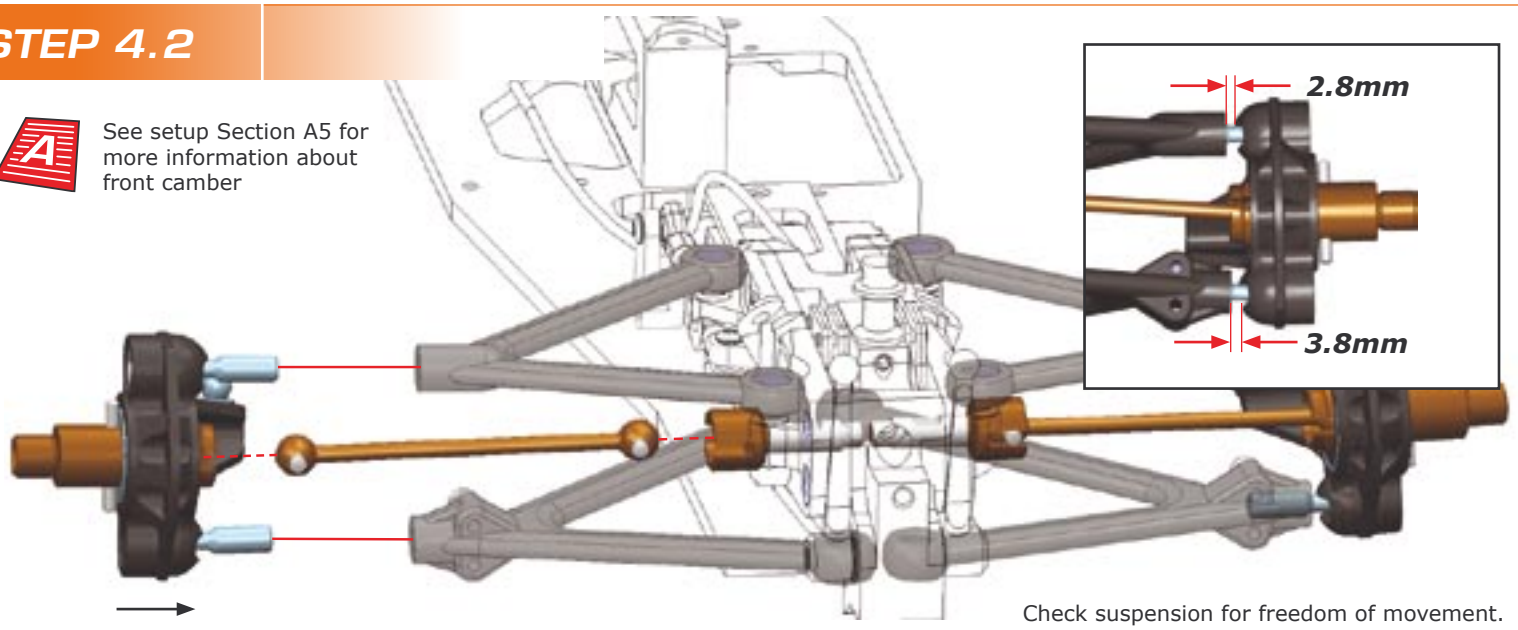
BB
12x21mm



Assemble both front steering blocks using the indicated steps. L + R blocks are mirrored.

STEP 4.2

See setup Section A5 for more information about front camber



Check suspension for freedom of movement.

STEP 4.3

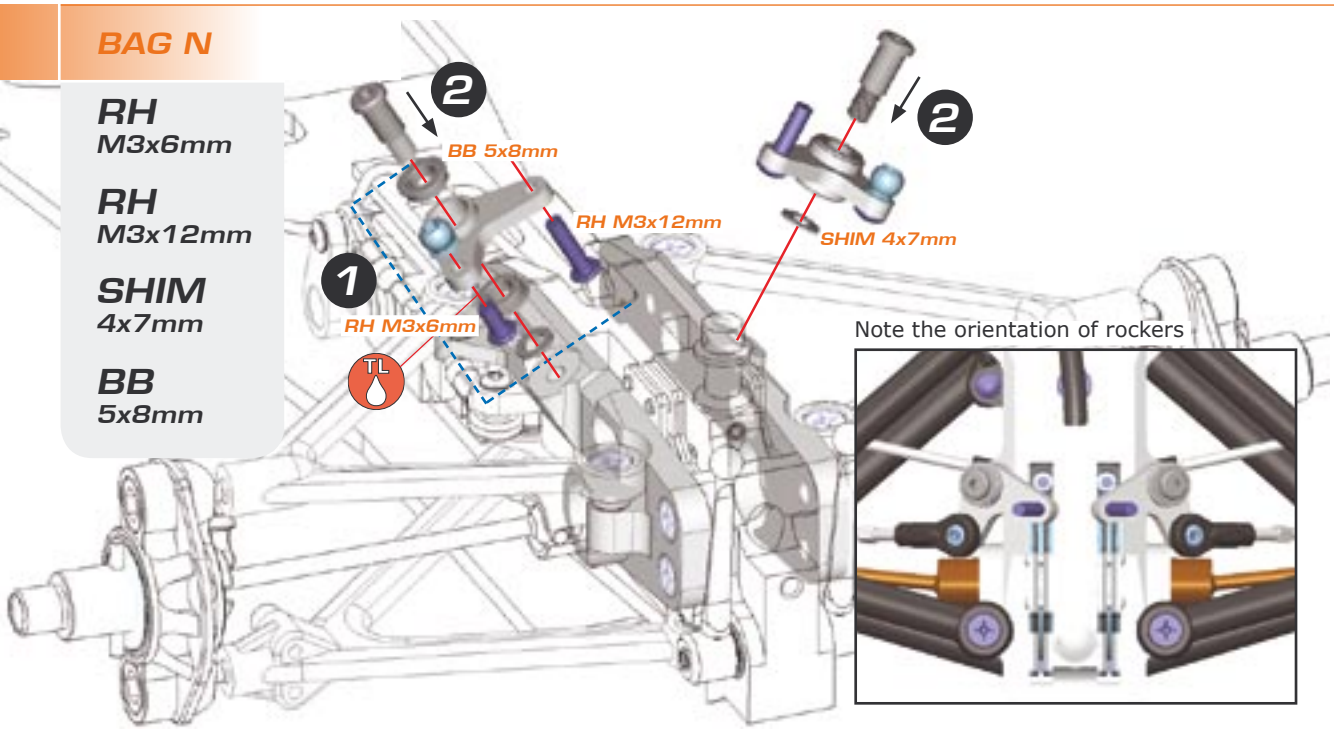
BAG N

RH
M3x6mm

RH
M3x12mm

SHIM
4x7mm

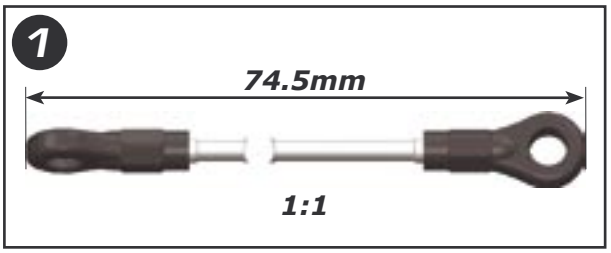
BB
5x8mm

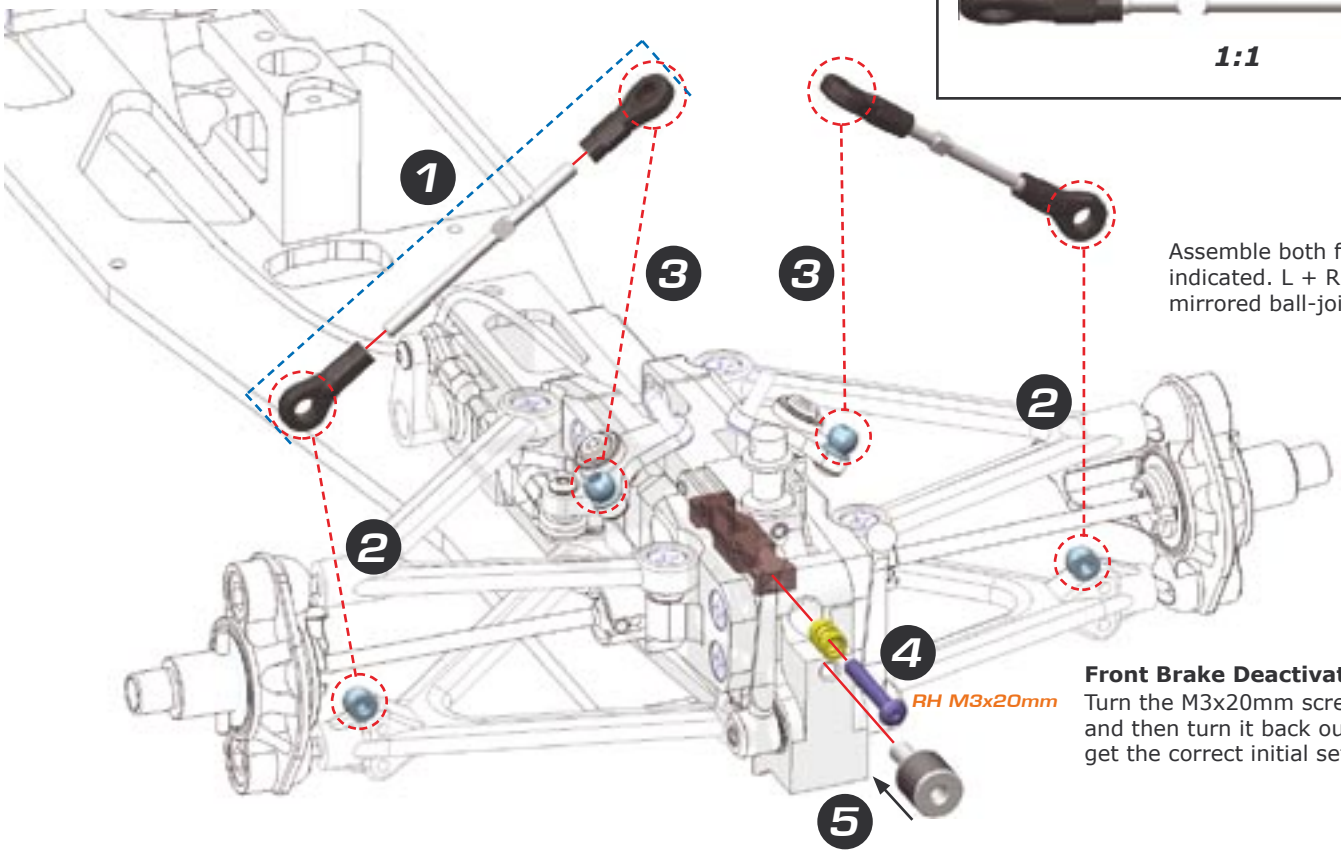


Note the orientation of rockers

STEP 4.4

RH
M3x20mm



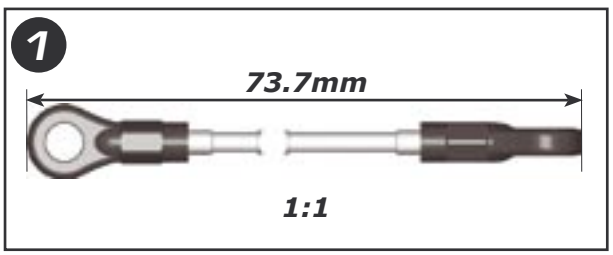


Assemble both front linkages as indicated. L + R linkages have mirrored ball-joint positions.

Front Brake Deactivation System
Turn the M3x20mm screw in all the way and then turn it back out 9 full turns to get the correct initial setting.

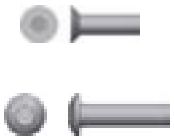
STEP 4.5

See setup Section A7 for more information about front toe



Position linkage adjustment points to OUTSIDE

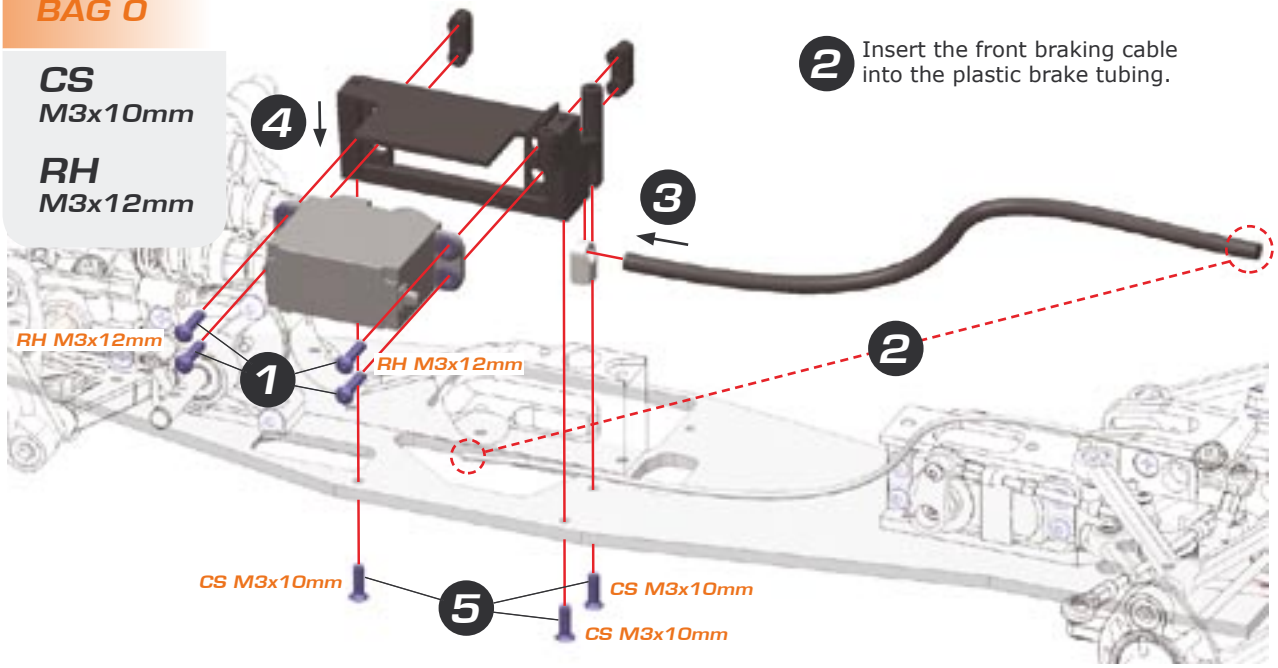
STEP 4.6



BAG O

CS
M3x10mm

RH
M3x12mm



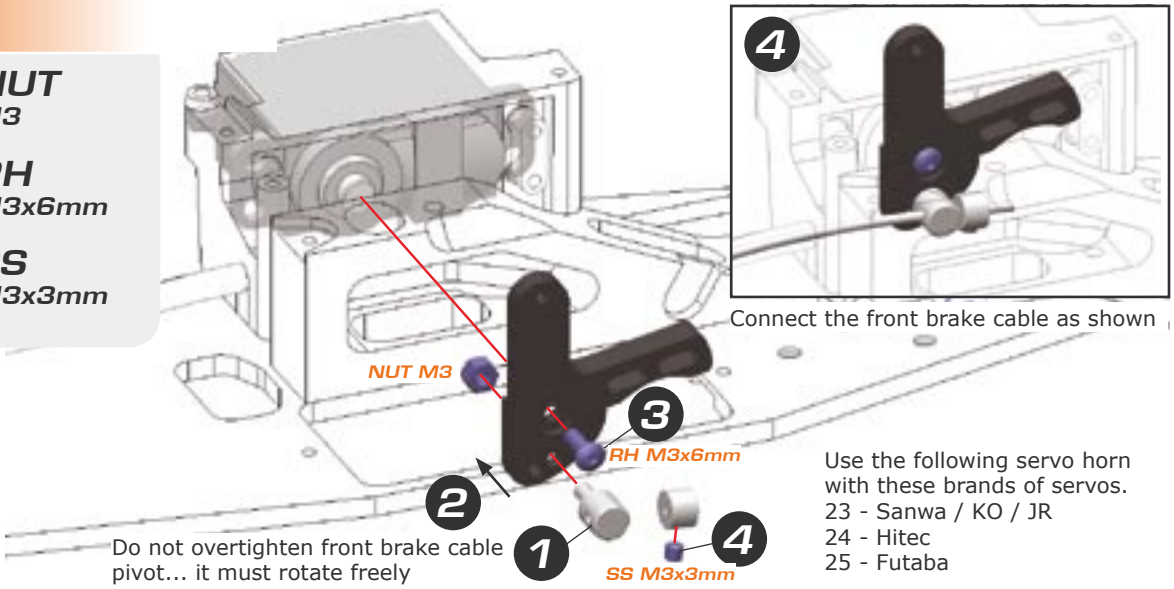
2 Insert the front braking cable into the plastic brake tubing.

STEP 4.7

NUT
M3

RH
M3x6mm

SS
M3x3mm



4 Connect the front brake cable as shown

Do not overtighten front brake cable pivot... it must rotate freely

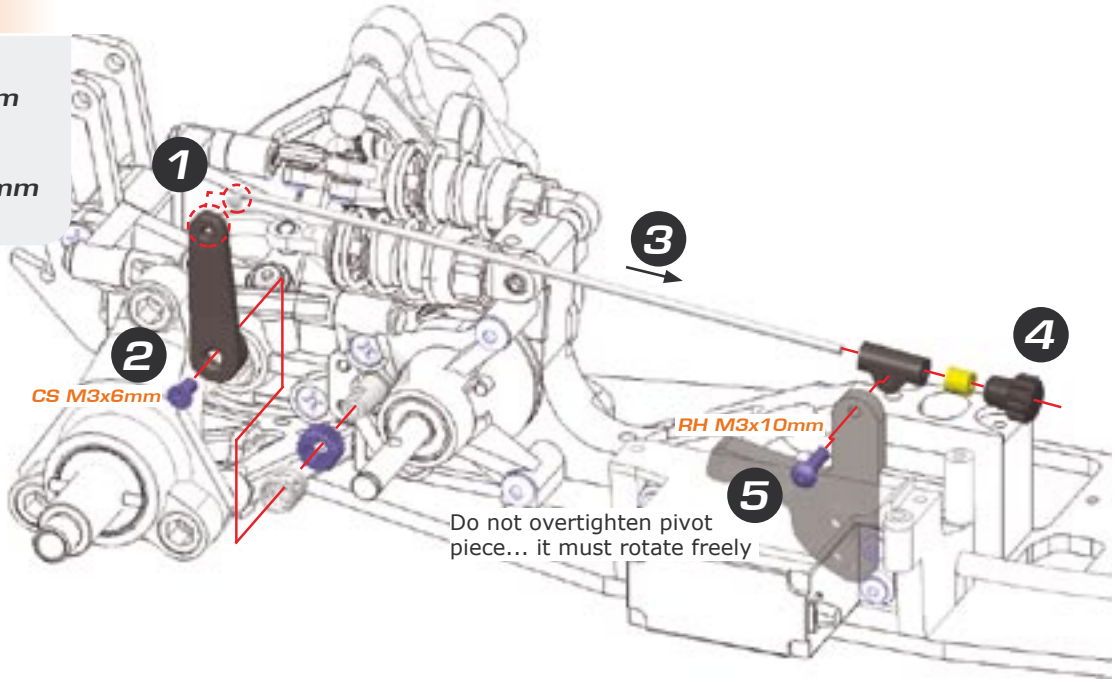
See setup Section B12 for more information about brake bias

Use the following servo horn with these brands of servos.
23 - Sanwa / KO / JR
24 - Hitec
25 - Futaba

STEP 4.8

CS
M3x6mm

RH
M3x10mm



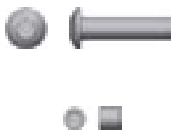
Do not overtighten pivot piece... it must rotate freely

See setup Section B12 for more information about brake bias

5.0 GEARBOX MOUNTING

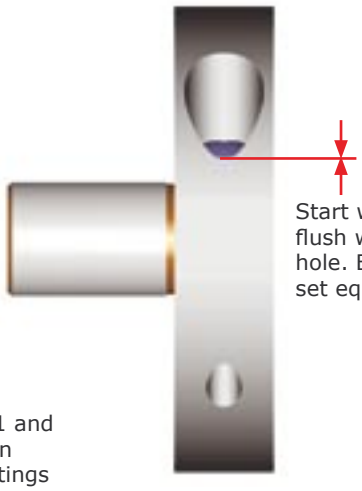
STEP 5.1

BAG P

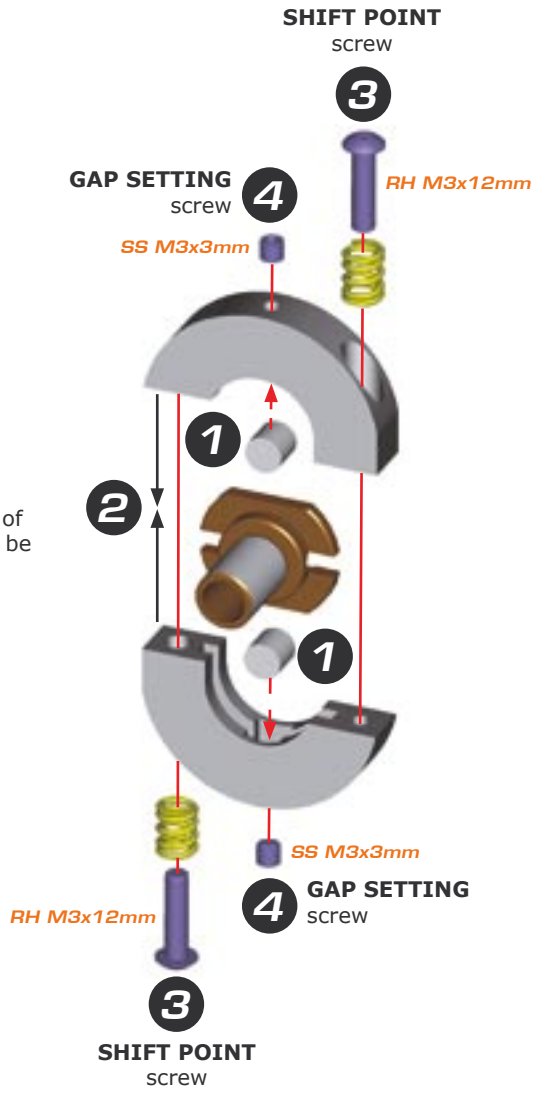


RH
M3x12mm

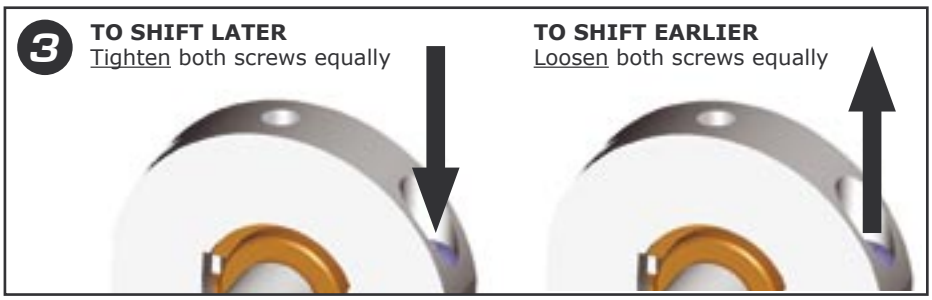
SS
M3x3mm



Start with screw head flush with bottom edge of hole. Both screws must be set equally.

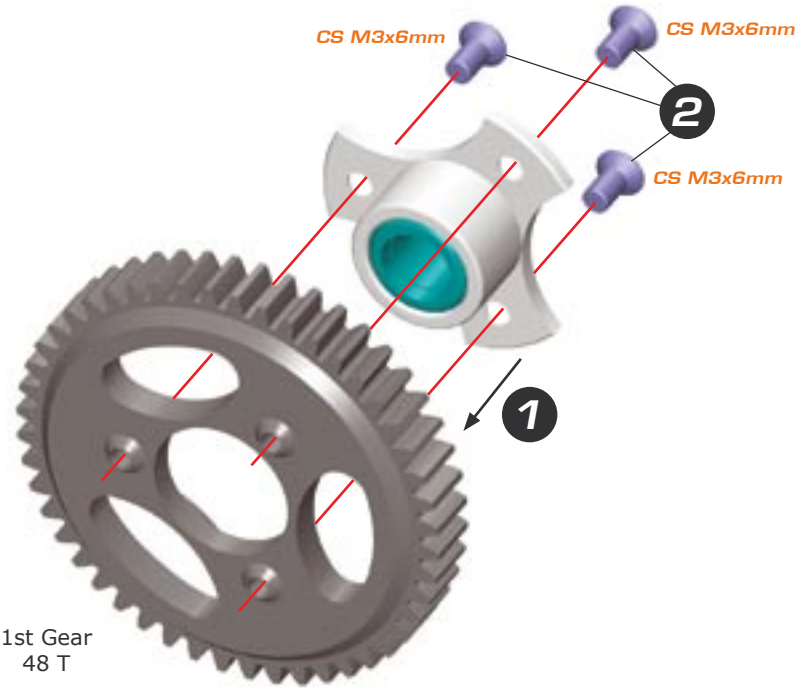


See setup Sections A11 and B9 for more information about transmission settings



STEP 5.2

CS
M3x6mm



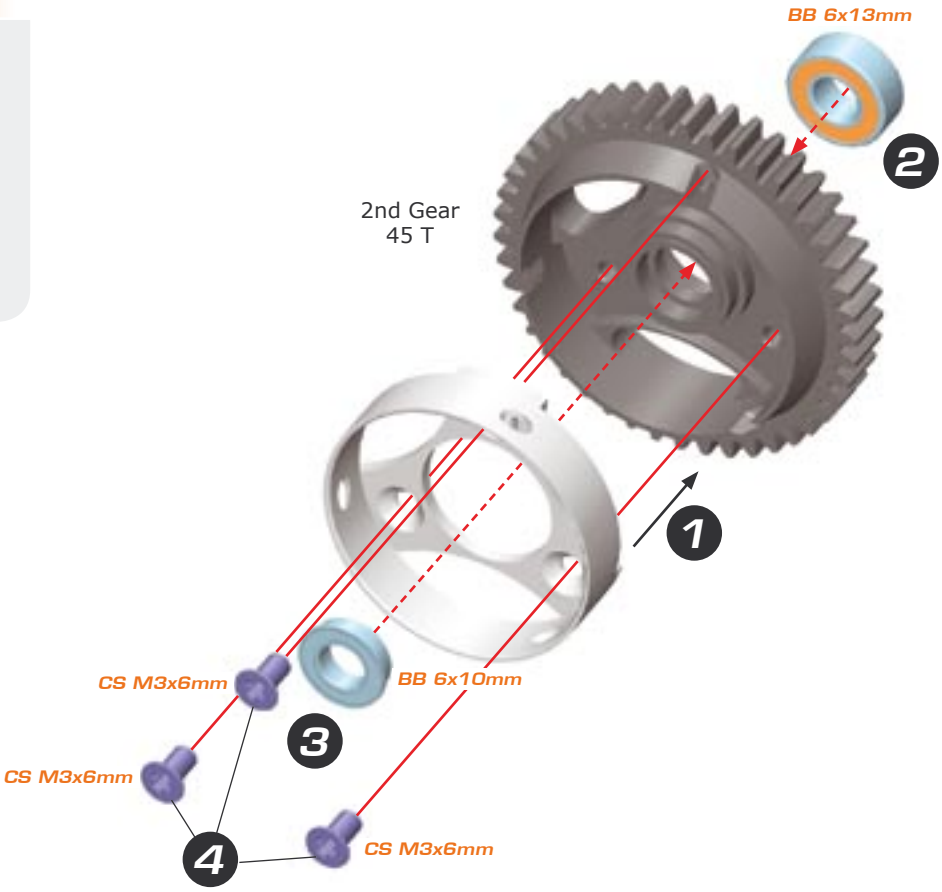
1st Gear
48 T

STEP 5.3

CS
M3x6mm

BB
6x10mm

BB
6x13mm



STEP 5.4

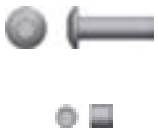
CLIP
5mm

PIN
3x14mm

See setup Section A11 for more information about shoe gap

6.0 RADIO PLATE MOUNTING

STEP 6.1



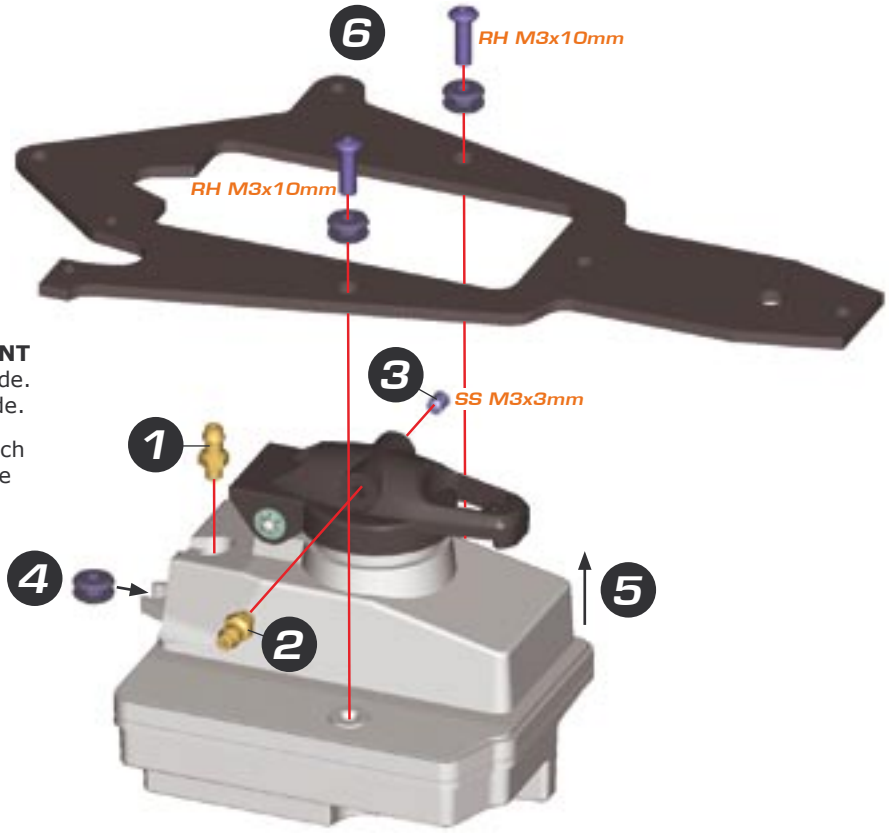
BAG Q

RH
M3x10mm

SS
M3x3mm

FUEL CAP FITTING PLACEMENT
CW tracks: Fitting on **RIGHT** side.
CCW tracks: Fitting on **LEFT** side.

Use the supplied nipple and clutch nut adjustment tool to install the fuel nipples



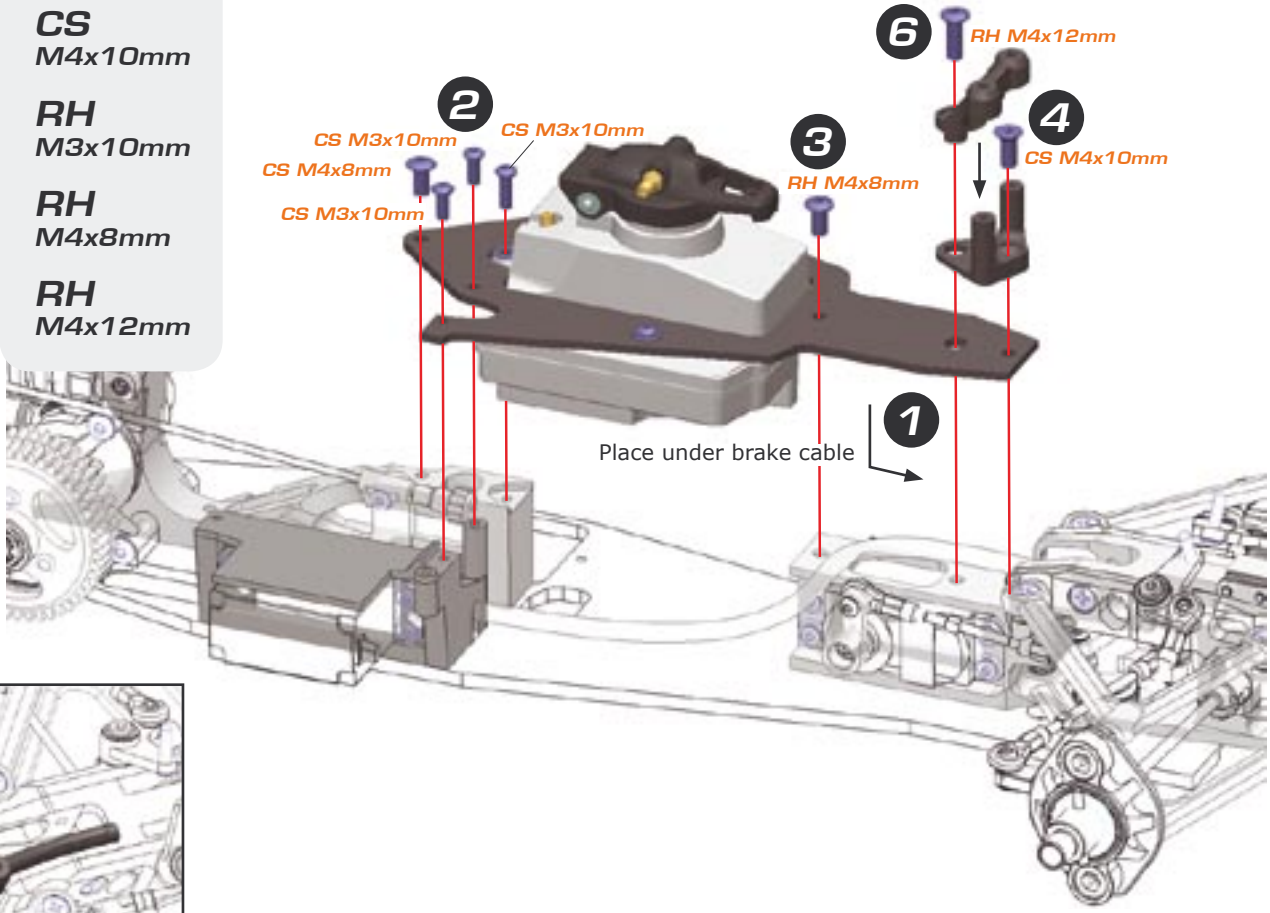
STEP 6.2

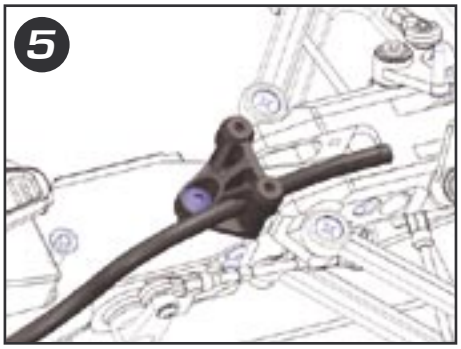
CS
M4x10mm

RH
M3x10mm

RH
M4x8mm

RH
M4x12mm

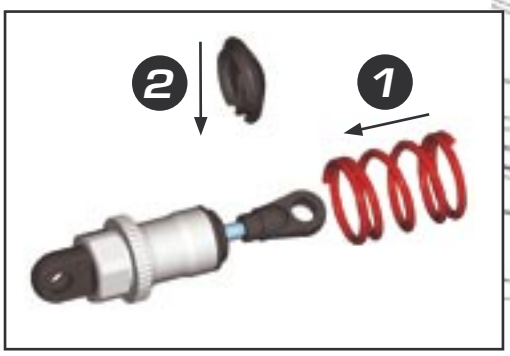


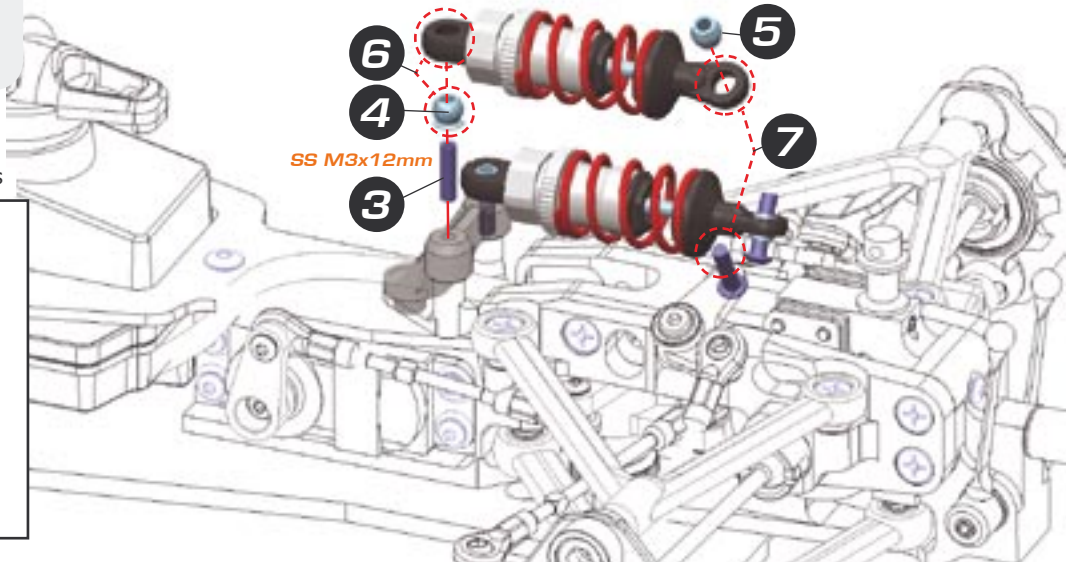


STEP 6.3

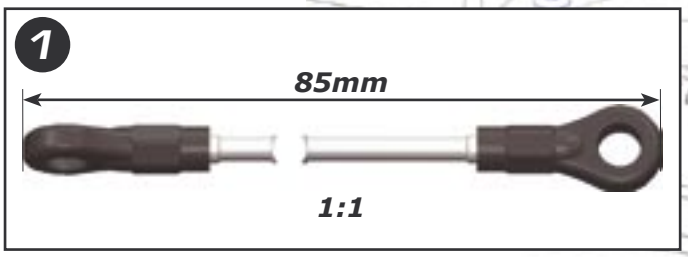
SS
M3x12mm

Set identical spring preload on L + R shocks



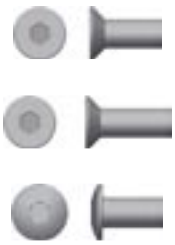


STEP 6.4



STEP 6.5

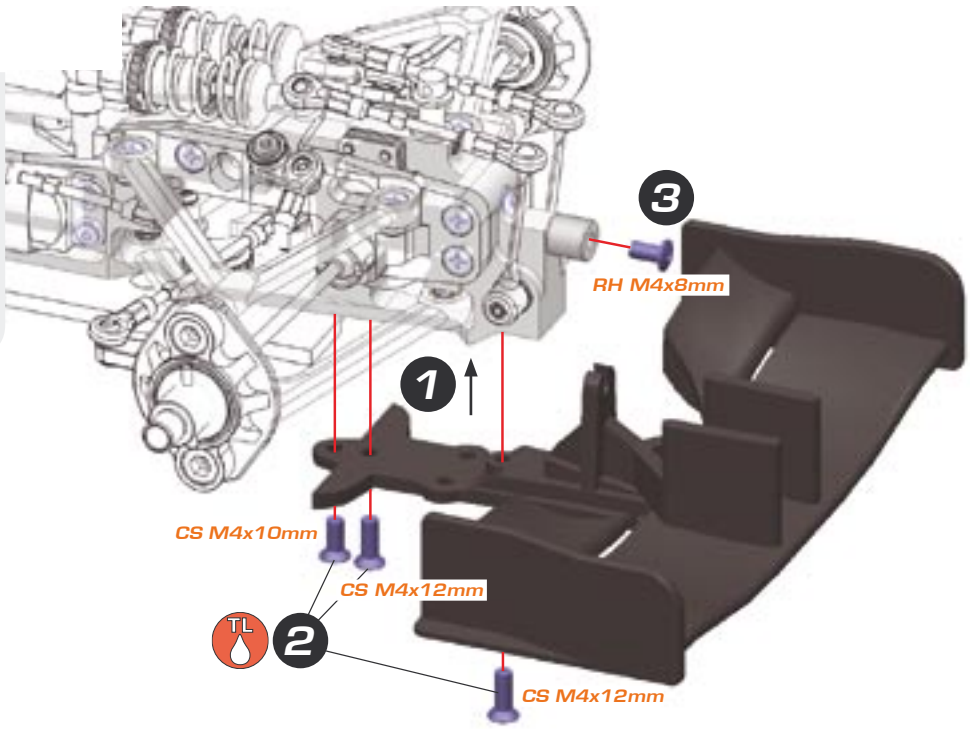
BAG R



CS
M4x10mm

CS
M4x12mm

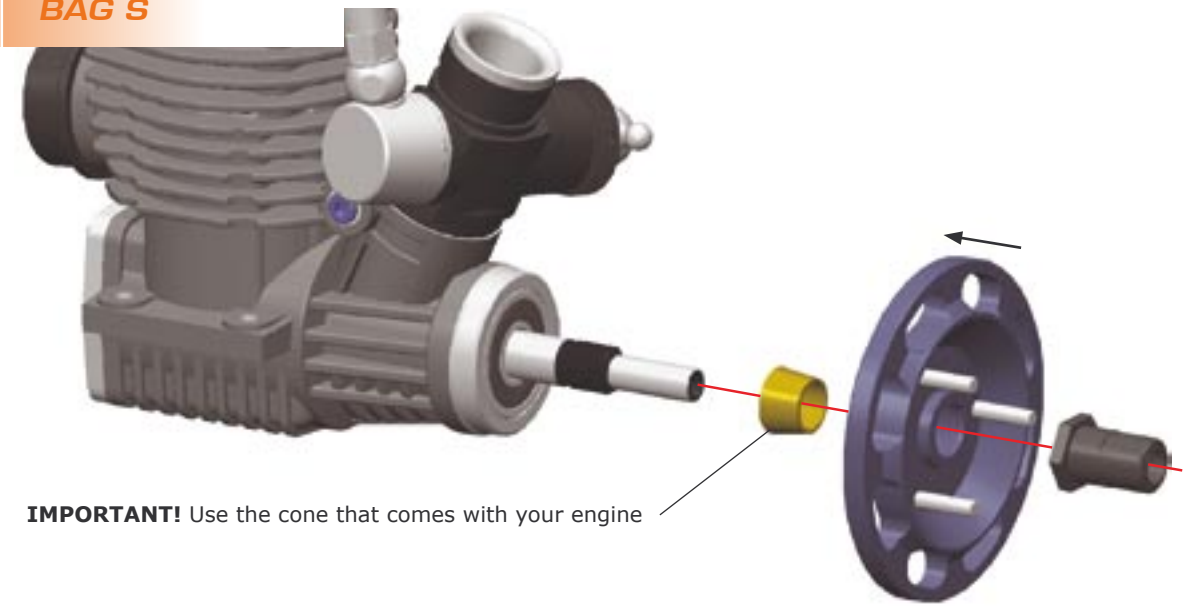
RH
M4x8mm



7.0 CENTAX ASSEMBLY

STEP 7.1

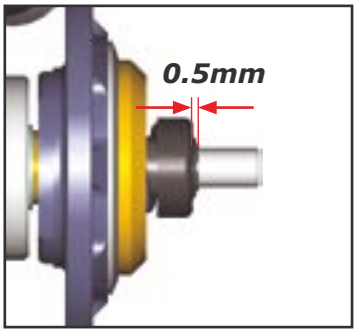
BAG S



IMPORTANT! Use the cone that comes with your engine

STEP 7.2

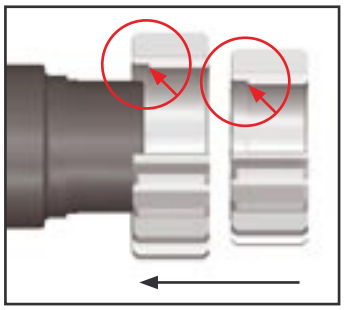
Preload initial setting

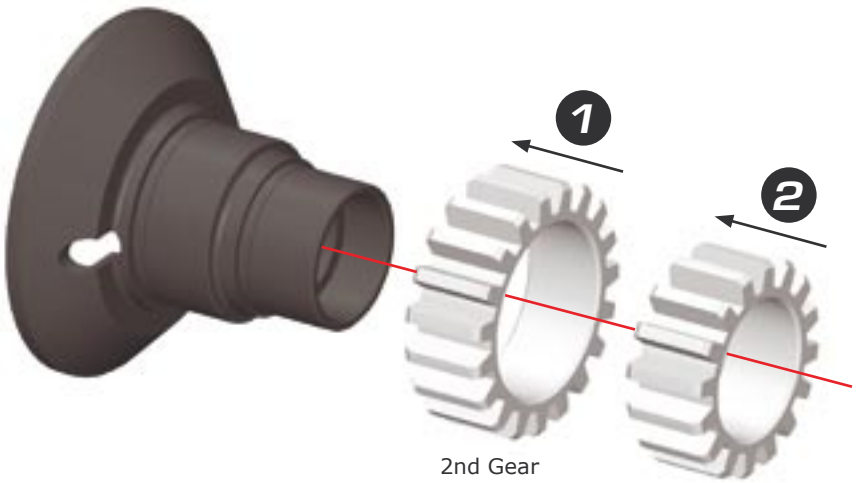


See setup Sections A10 and B8 for more information about clutch spring preload

STEP 7.3

Note inside shoulders



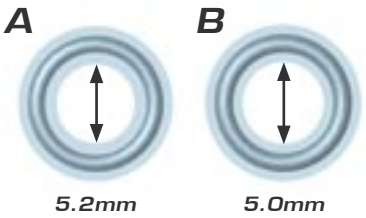


2nd Gear
19 T

1st Gear
16 T

STEP 7.4

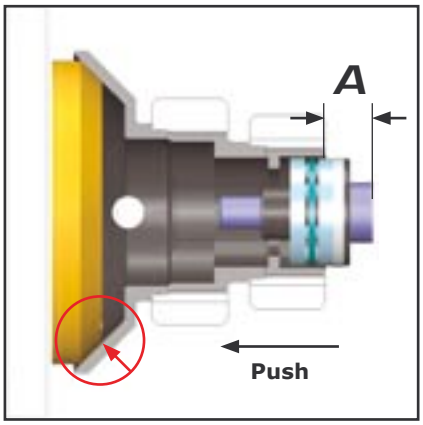
CH
M3x16mm

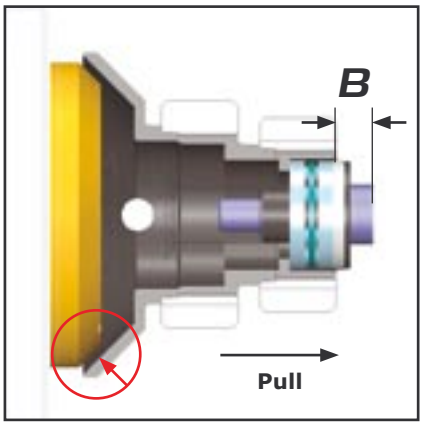


IMPORTANT! Install thrust bearing plates as shown

STEP 7.5

ADJUSTING THE CLUTCH GAP





1 Install only the clutchbell and the thrustbearing assembly on the engine crankshaft. Push the clutchbell onto the clutch shoe, and then measure the distance A as indicated.

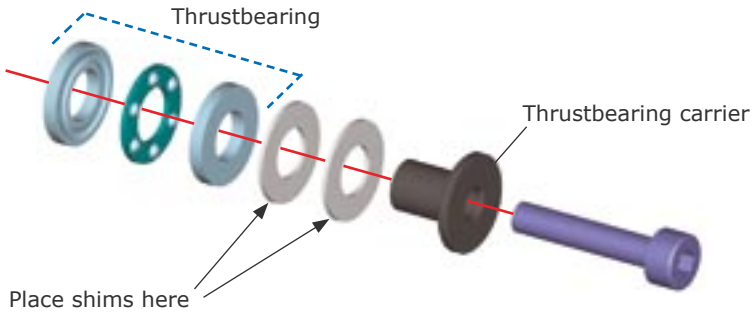
2 Pull the clutchbell away from the clutch shoe, and then measure the distance B as indicated.

3 The clutch gap is A – B; the correct gap is 0.7mm.
If the clutch gap is greater than 0.7mm, you can easily calculate the thickness of shims required to set the correct gap:
Thickness of shims required (in mm) = A – B – 0.7

For example, using the values A=1.3mm, B=0.3mm
Shim thickness = 1.3 – 0.3 – 0.7 = 0.3mm

4 Place shims between the outer thrustbearing plate and the rim of the thrustbearing carrier as shown.

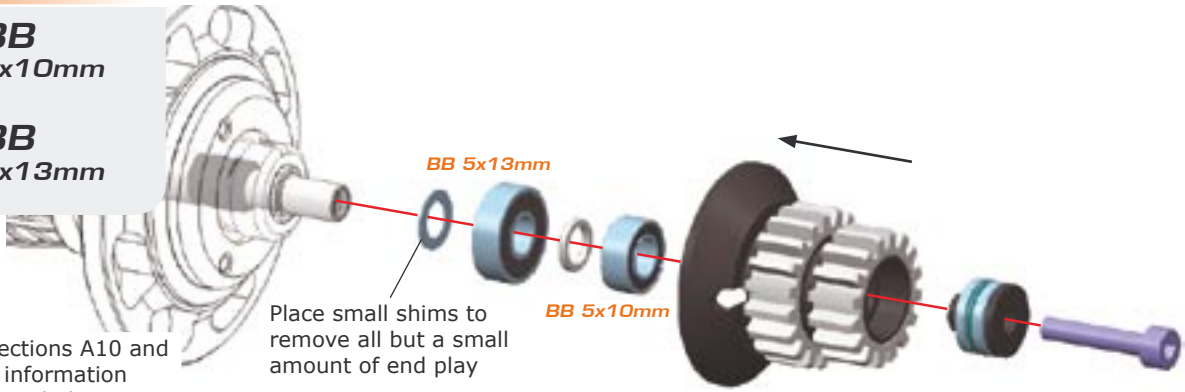
See setup Sections A10 and B8 for more information about clutch gap



STEP 7.6

BB
5x10mm

BB
5x13mm



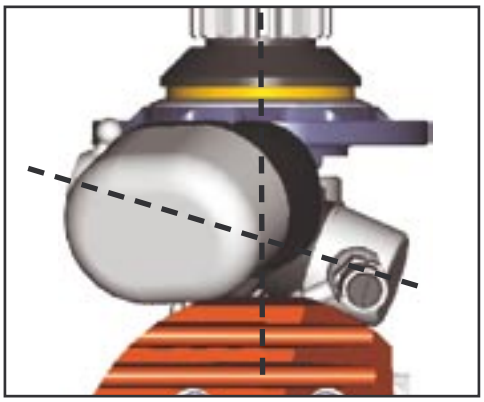
Place small shims to remove all but a small amount of end play

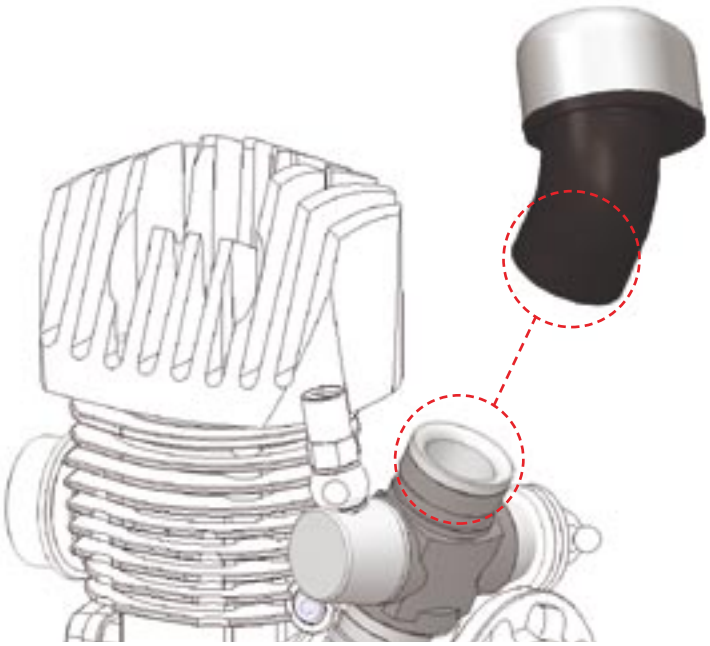
See setup Sections A10 and B8 for more information about clutch end play

STEP 7.7

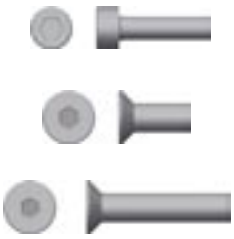
BAG T

Note the angle of the carb and position of the airfilter





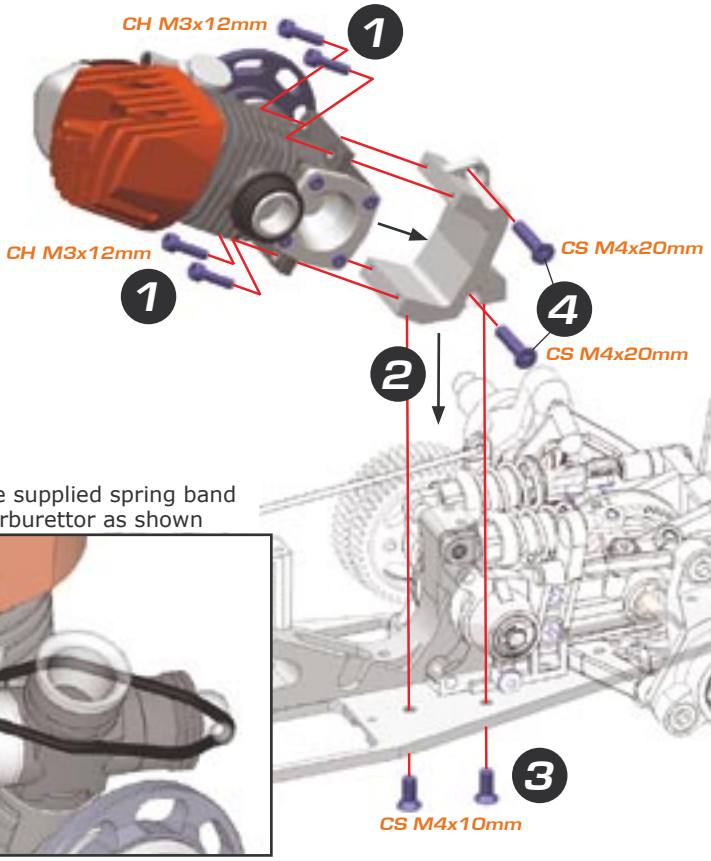
STEP 7.8



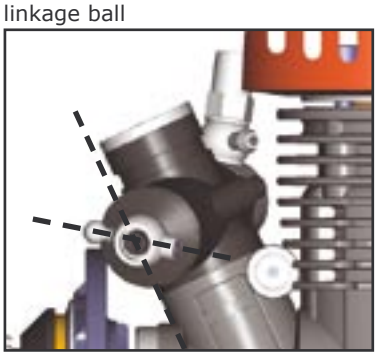
CH
M3x12mm

CS
M4x10mm

CS
M4x20mm



Note the angle of the carb linkage ball



Apply the supplied spring band to the carburettor as shown

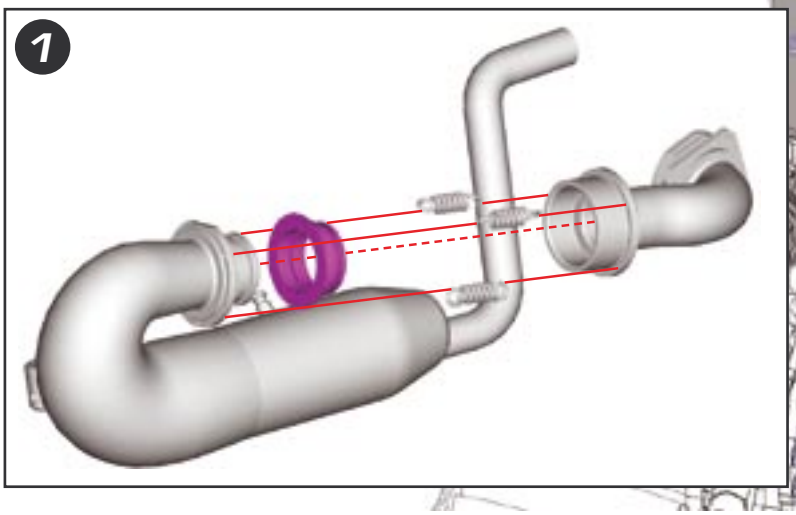
8.0 FINAL ASSEMBLY

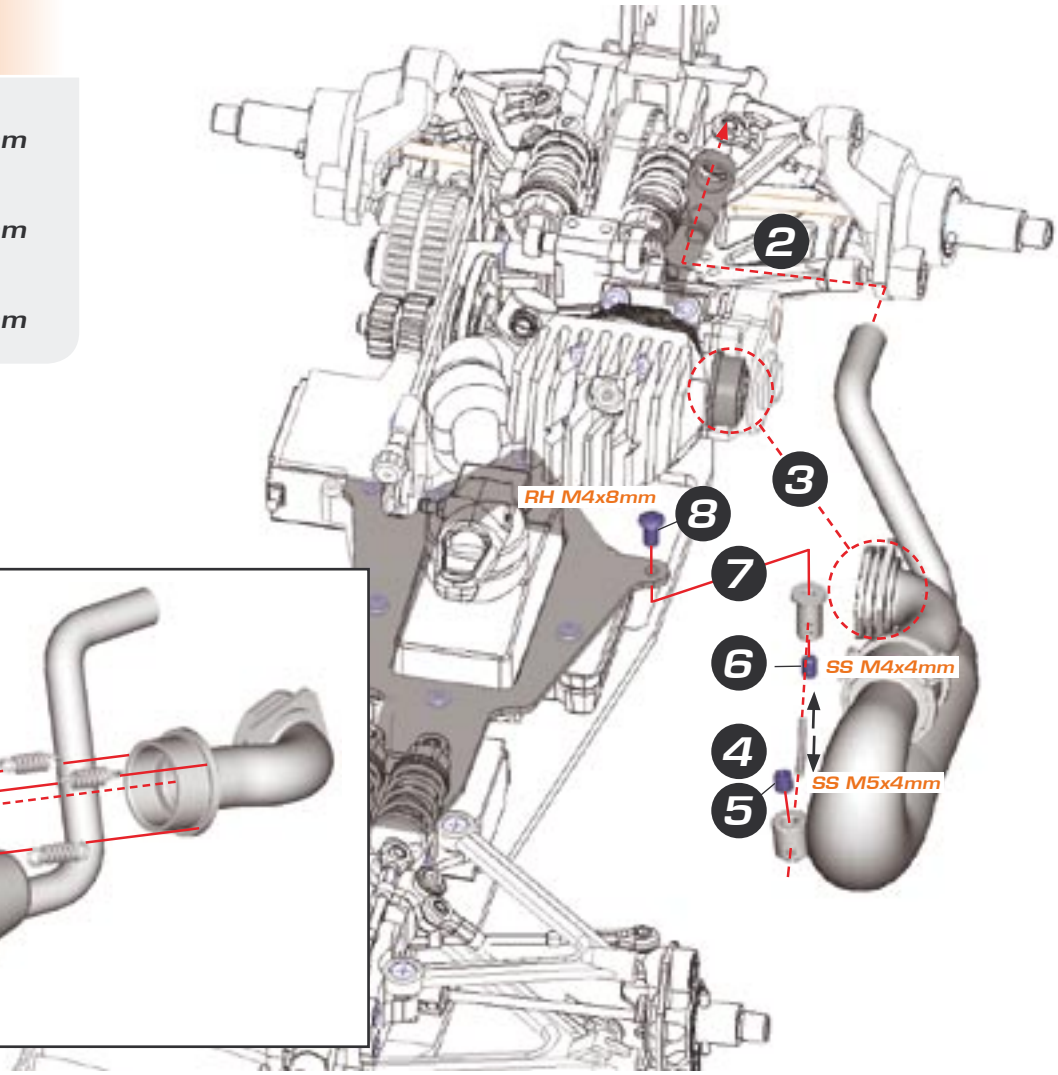
STEP 8.1

RH
M4x8mm

SS
M4x4mm

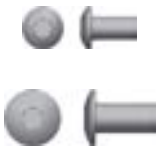
SS
M5x4mm





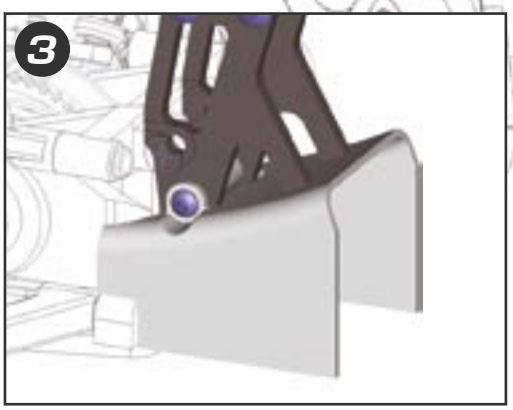
STEP 8.2

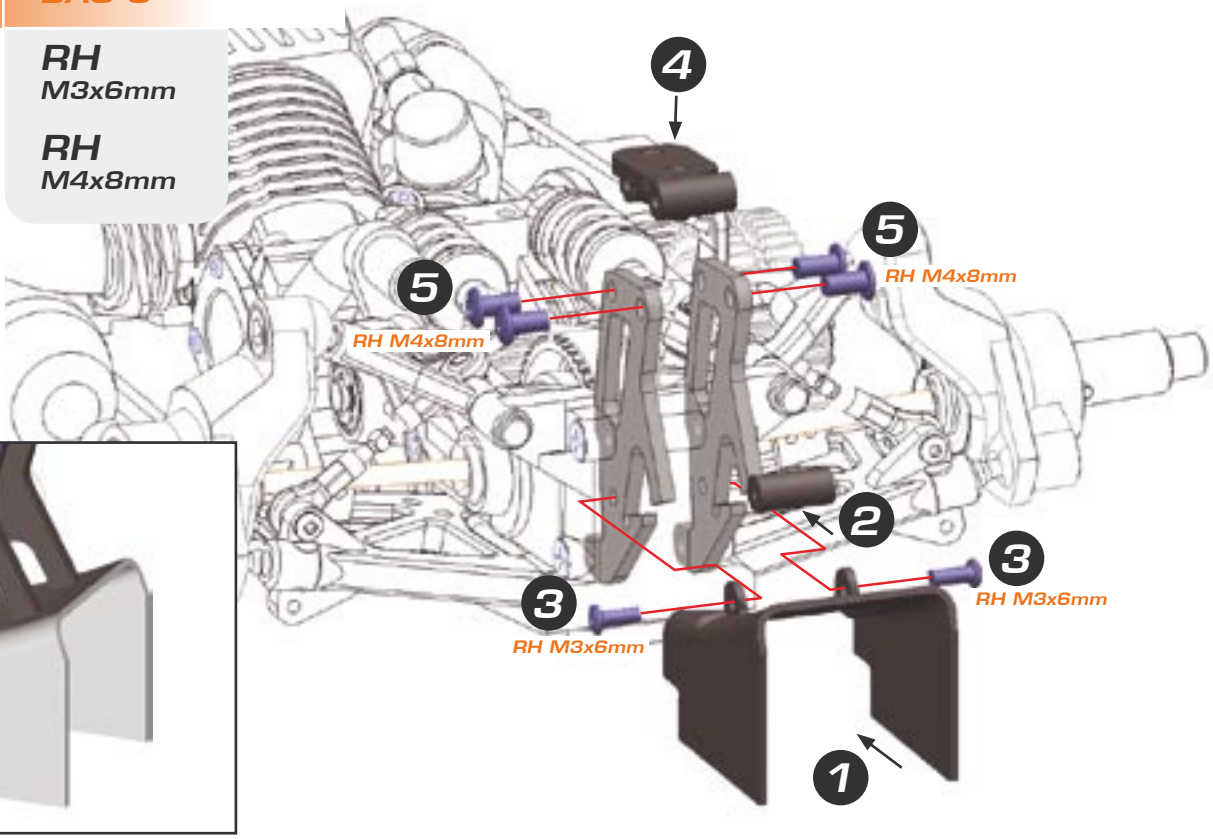
BAG U



RH
M3x6mm

RH
M4x8mm

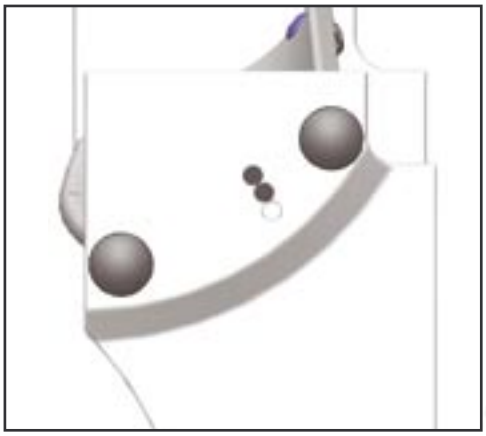


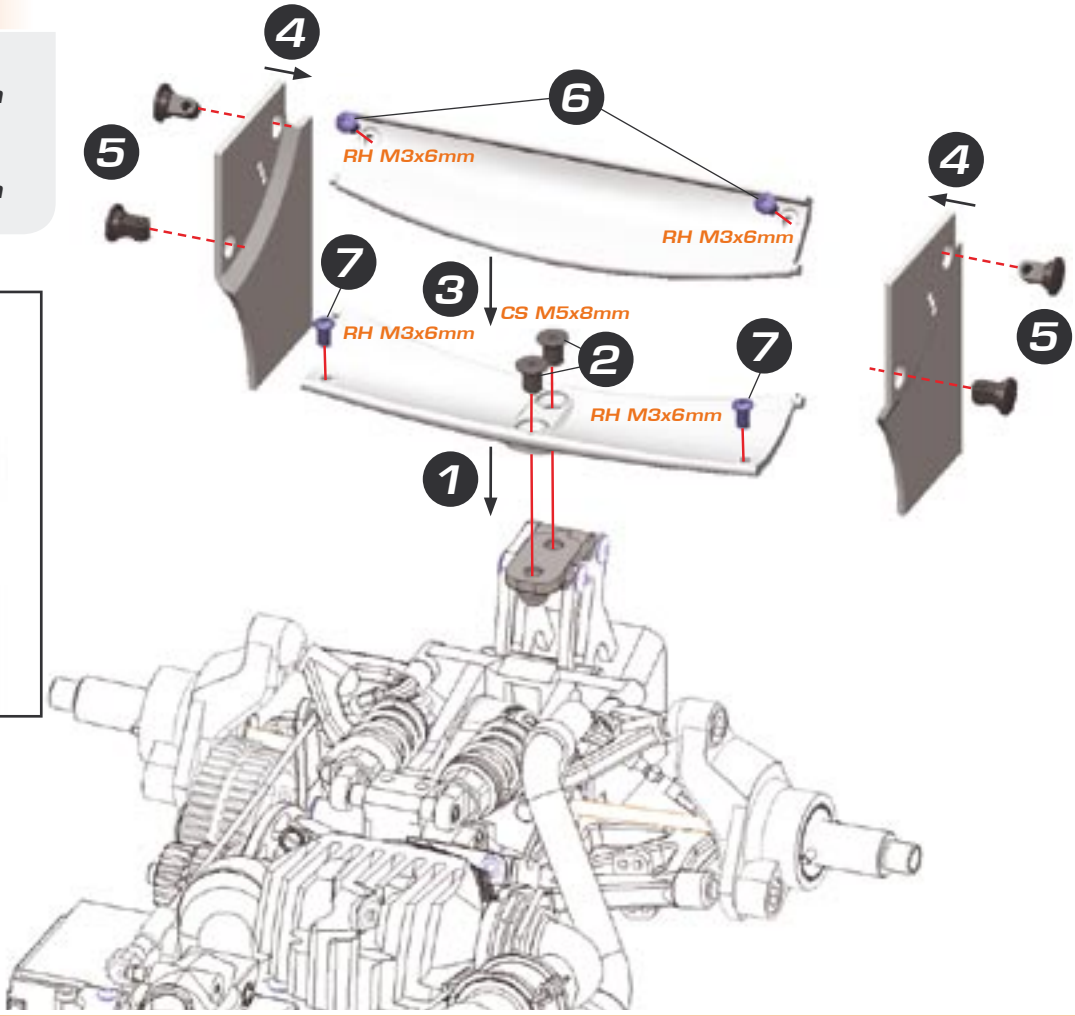


STEP 8.3

CS
M5x8mm

RH
M3x6mm

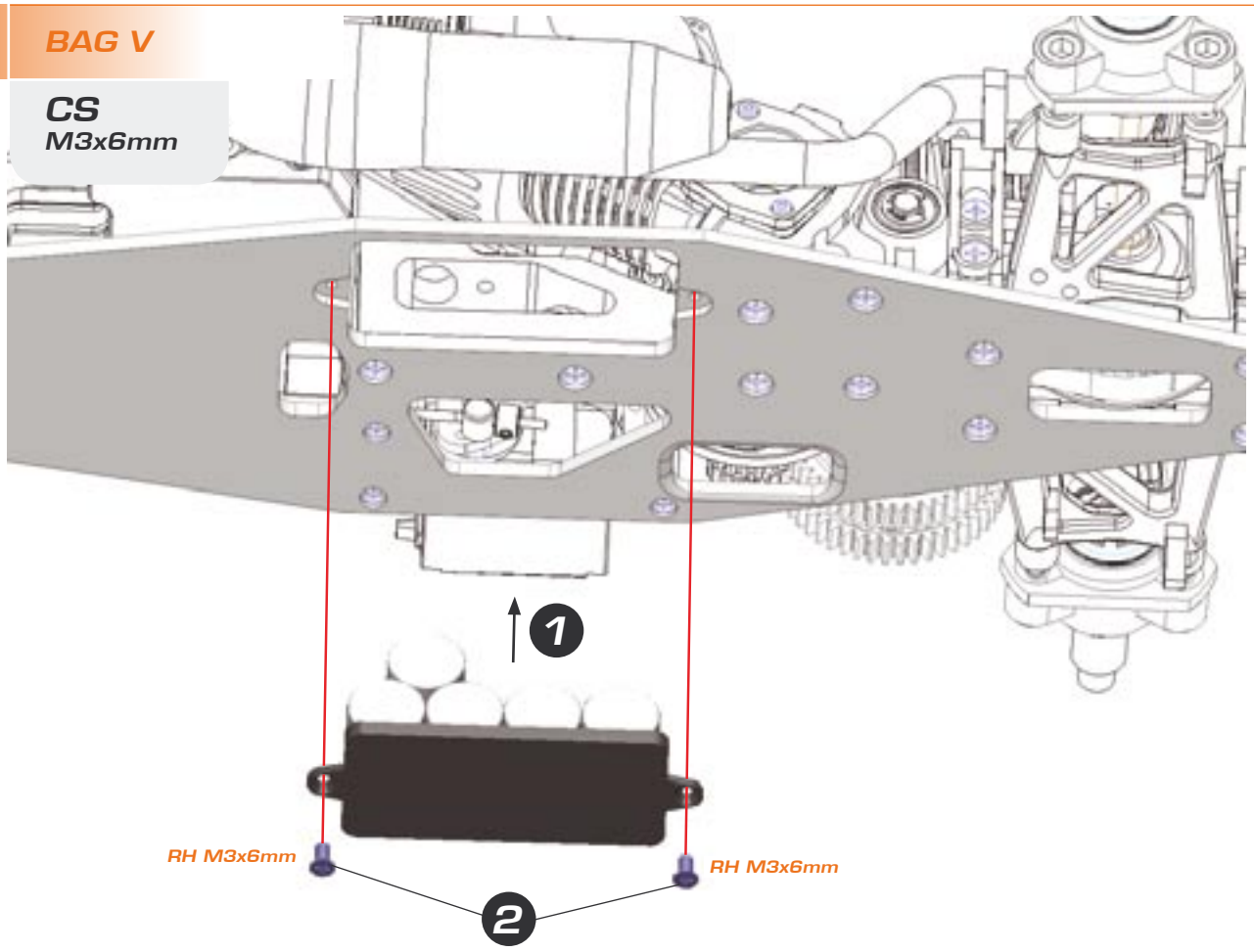




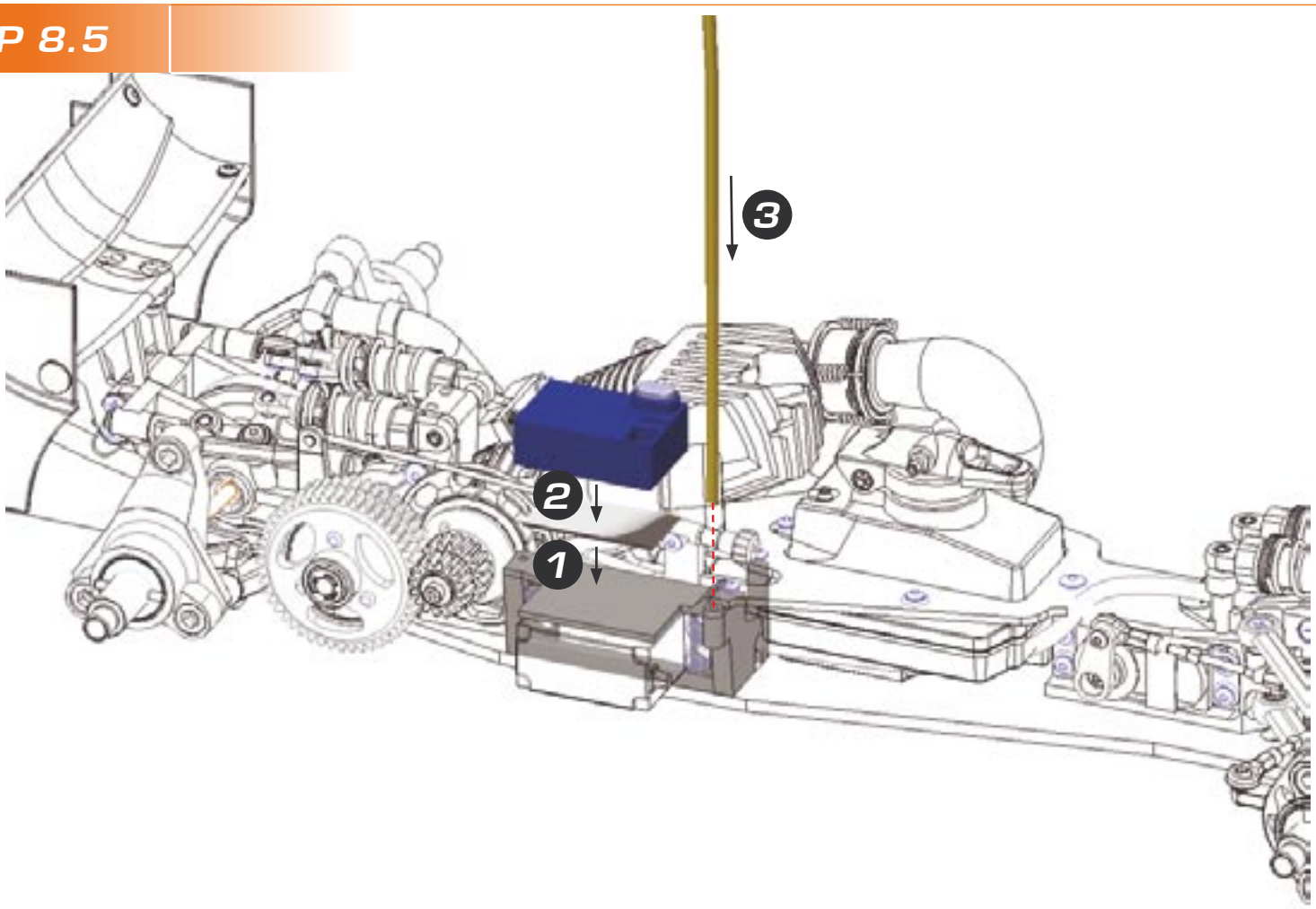
STEP 8.4

BAG V

CS
M3x6mm



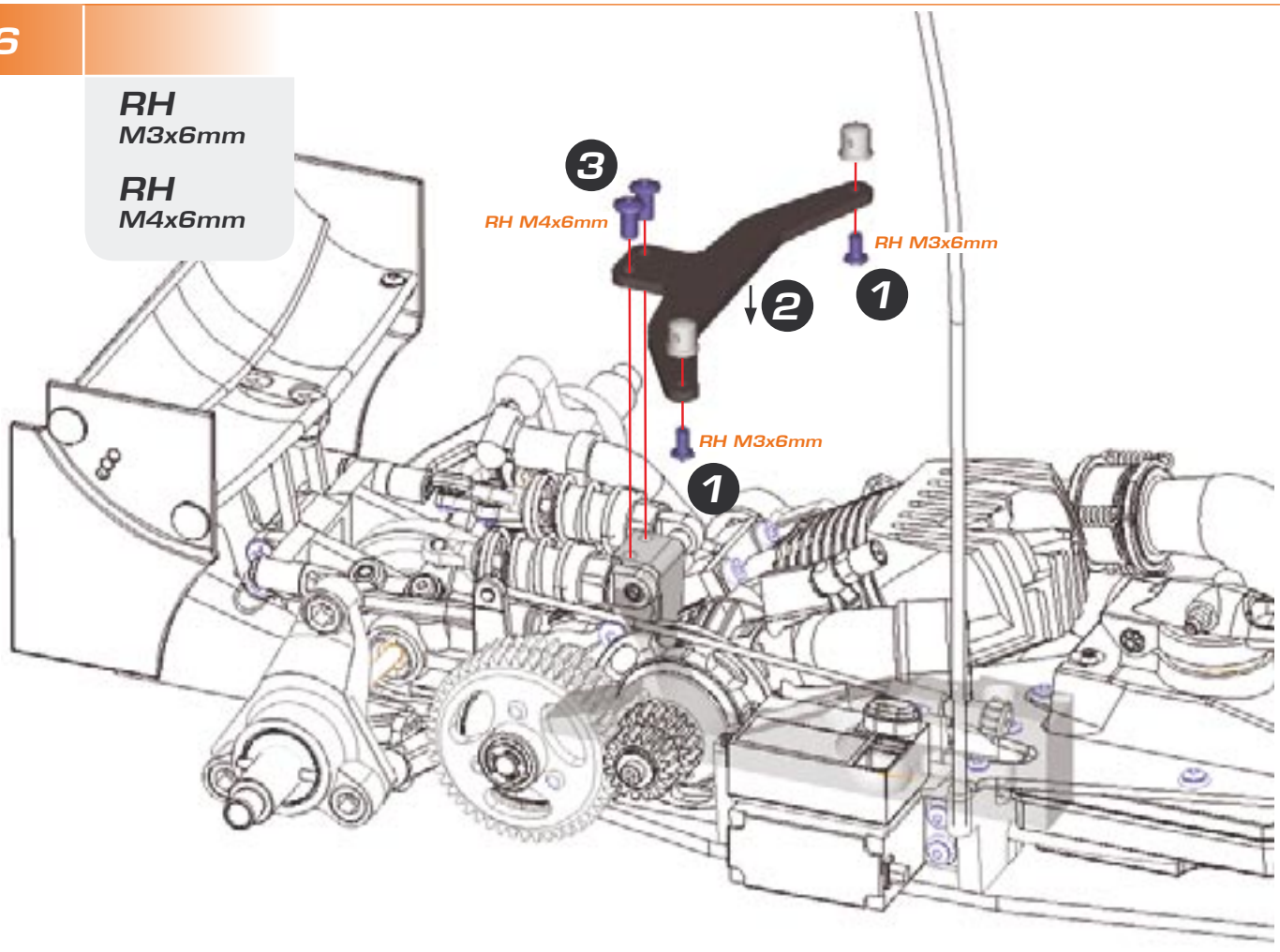
STEP 8.5

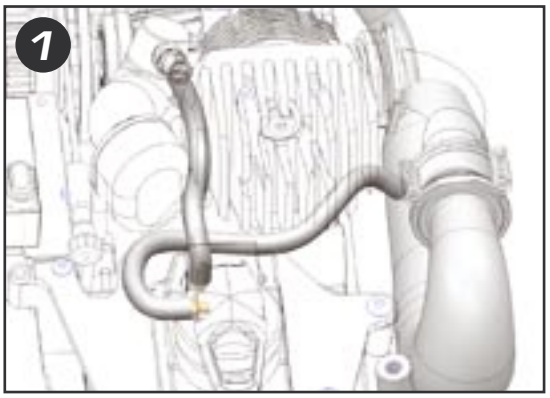


STEP 8.6

RH
M3x6mm

RH
M4x6mm





Tighten wheel nuts securely

9.0 SETUP SECTION

INTRODUCTION

Setting up a racecar with fully-independent suspension, clutch, and multi-speed transmission — like your Serpent F180 — is necessary to make the car perform well. We have developed these straightforward procedures to help you set up your F180 properly and easily.

Always follow these procedures step-by-step, in the order presented, and always make sure that you make equal adjustments on both left and right sides of the car.

These setup guidelines are divided into two sections.

- Section A – F180 Basic Setup describes the default chassis, clutch, and transmission settings for your Serpent F180
- Section B – F180 Advanced Setup describes the effects of setup changes on the Serpent F180

Chassis Setup

We have determined that you should set up your F180 chassis in the order indicated in the table below. The order of the settings has been determined as the most logical to set up your F180 chassis properly and easily. Also, certain settings must be made before others, as changing one setting may impact another setting.

The table below gives you a breakdown of what components need to be attached on the car, and what you will need to measure the settings.

	Shocks	*Anti-roll bar*	*Wheels*	*Flat Board*
Shock Absorbers	+			
Track-Width	+		+	+
Ride Height	+	-	+	+
Camber	+	-	+	+
Toe	+		+	+
Anti-Roll Bar		+		
Suspension Tweak	+		+	+

(+) attach or use this component or apparatus
(-) DO NOT attach or use this component or apparatus

For example, to set the ride height:

- Attach the shocks
- Detach the front anti-roll bar
- Mount the wheels
- Use a flat board

Clutch and Transmission Setup

Sections A10 & A11 described how to properly set up the Centax-2 clutch and 2-speed transmission to optimize power delivery and drivability.

- Centax-2 clutch requires setup for preload, clutch gap, and endplay
- 2-speed transmission requires setup for shift point and shoe gap

SECTION A — F180 BASIC SETUP

Section A – F180 Basic Setup describes the default settings for the Serpent F180 and how to adjust those settings. We strongly recommend you thoroughly read this section so you can understand how the settings are adjusted.

The setup described here is a good starting point. After rebuilding the chassis, or in case you become lost with your setup, always return to the basic setup described here.

If you choose to adjust the chassis settings to better suit different track conditions, see Section B – F180 Advanced Setup.

Always make small adjustments, one at a time, and see if you find any improvement in handling with each adjustment. We advise you to keep track of your setup changes, and record which setups work best at different racetracks under various conditions.

A1. DOWNSTOPS

Downstops limit how far the wishbones travel downward (which determines how far upwards the chassis travels).

By default, the downstops on the F180 are non-adjustable.

However, it is however possible to adjust the rear downstops by using a setscrew in the rear lower suspension arms. If you do adjust the rear downstops, it is very important to make equal adjustments on both left and right sides. Please refer to Section B – F180 Advanced Setup.

A2. SHOCK ABSORBERS

Shock absorbers, or shocks, are the suspension components that allow the wheels to keep as much contact as possible with the track surface. The Serpent F180 has fully-independent front and rear suspension, meaning that the suspension at each corner of the car (front left, front right, rear left, rear right) moves and may be adjusted independently of the others. As such, there is a shock absorber at each corner of the car.

Damping, spring tension, and spring preload are all characteristics that determine how the shock performs. The shock absorbers at the F180 must be disassembled to change the shock oil and pistons in order to alter the damping.

Initial Steps

- Shocks: To adjust shock damping, remove the shocks from the car by unscrewing the upper and lower shock pivotballs. You do not need to disconnect the shocks to adjust spring preload (for ride height adjustment).

Setup Apparatus
None

A2.1 ADJUSTING SHOCK ABSORBER DAMPING
To adjust shock absorber damping, disassemble the shocks and change the pistons or shock oil.

- To get softer damping, use a piston with more holes or use thinner shock oil
- To get harder damping, use a piston with less holes or use thicker shock oil

IMPORTANT!
After reassembling the shocks, make sure you bleed the shock properly.

A3. TRACK-WIDTH

Track-width is the distance between the outside edges of the wheels, front or rear. It is important that front and rear track-width is adjusted symmetrically, meaning that the left and right wheels (at one end of the car) must be the same distance from the centerline of the chassis.

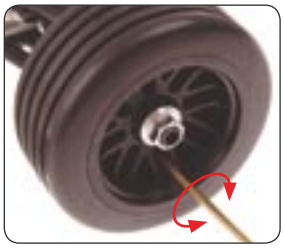
Initial Steps

- Shocks: Connect the front and rear shocks
- Wheels: Mount all four wheels

Setup Apparatus
Measure track-width with the car resting on a flat measuring surface

A3.1 MEASURING TRACK-WIDTH
Measure front track-width on the outside edges of the front wheels.
Measure rear track-width on the outside edges of the rear wheels.

A3.2 SETTING FRONT TRACK-WIDTH
Front Track-width Default Setting = 256mm



Set the front track-width to 256mm.
(The outer edge of each front wheel should be 128mm from the centerline of the chassis.)

Adjust front track-width using both pivotballs in the front steering blocks:
- To increase front track-width, turn OUT both upper and lower pivotballs equally
- To decrease front track-width, turn IN both upper and lower pivotballs equally

IMPORTANT!
Make equal adjustments on both left and right sides. Track-width must be symmetrical on both left and right sides of the car.
Changing front track-width will also affect the front toe setting.

A3.3 SETTING REAR TRACK-WIDTH
Rear Track-width Default Setting = 262mm

Set the rear track-width to 262mm.
(The outer edge of each rear wheel should be 131mm from the centerline of the chassis.)

Adjust rear track-width using all 3 pivotballs in the upright:
- To increase rear track-width, turn OUT all 3 pivotballs equally
- To decrease rear track-width, turn IN all 3 pivotballs equally

IMPORTANT!
Make equal adjustments on both left and right sides. Track-width must be symmetrical on both left and right sides of the car.

A4. RIDE HEIGHT

Ride height is the distance between the bottom of the chassis and the reference surface on which the car is resting. Adjust ride height with the car ready-to-run but without the body.

Initial Steps
- Shocks: Attach the front and rear shocks
- Anti-roll bar: Detach the front anti-roll bar
- Wheels: Attach all four wheels

Setup Apparatus
Measure ride height with the car resting on a flat reference surface

A4.1 MEASURING RIDE HEIGHT
Measure the ride height from the very end points at the front and rear of the car, using calipers or a ride height gauge.

IMPORTANT!
Make equal adjustments on both left and right sides of the car.

A4.2 SETTING FRONT RIDE HEIGHT
Front Ride Height Default Setting = 7mm

Adjust front ride height by increasing or decreasing the preload on the front shock springs.
- Increase front ride height by tightening the spring preload collars on the front shocks (increasing the preload).This moves the collars DOWN the shock bodies.
- Decrease front ride height by loosening the spring preload collars on the front shocks (decreasing the preload).This moves the collars UP the shock bodies.

A4.2 SETTING REAR RIDE HEIGHT
Rear Ride Height Default Setting = 8mm

Adjust rear ride height by increasing or decreasing the preload on the rear shock springs.
- Increase rear ride height by tightening the spring preload collars on the rear shocks (increasing the preload).This moves the collars DOWN the shock bodies.
- Decrease rear ride height by loosening the spring preload collars on the rear shocks (decreasing the preload).This moves the collars UP the shock bodies.

A5. CAMBER

Camber is the angle of a wheel to the surface on which the car is resting (with wheels and shock absorbers mounted) when looked at from the front or rear of the car.

- Zero degrees (0°) of camber means the wheel is perpendicular to the reference surface
- Negative camber (e.g., –2°) means the top of the wheel is leaning inward (toward the centerline of the car)
- Positive camber (e.g., +2°) means the top of the wheel is leaning outward (away from the centerline of the car)

Initial Steps
- Shocks: Attach the front and rear shocks
- Anti-roll bar: Detach the front anti-roll bar
- Wheels: Attach all four wheels

Setup Apparatus
Measure camber using Serpent's Camber Gauge #1460 and a flat reference surface

A5.1 MEASURING CAMBER
Measure the camber using the camber gauge.
Before measuring camber, lift and drop the end of the car (front or rear) a few cm's to let the suspension settle.

A5.2 SETTING FRONT CAMBER
Front Camber Default Setting = -2.0°

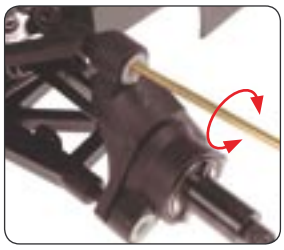
Set the camber of each front wheel to –2.0° (top of front wheel leaning inward).

Adjust the front camber using ONLY the upper pivotball in each front steering block.
- To get more negative camber (more inclined), turn IN the front upper pivotball
- To get less negative camber (more upright), turn OUT the front upper pivotball

IMPORTANT!
Make equal adjustments on both left and right sides of the car.

A5.3 SETTING REAR CAMBER
Rear Camber Default Setting = -1.0°

Set the camber of each rear wheel to –1.0° (top of rear wheel leaning inward).



Adjust the rear camber using ONLY the upper pivotball in each rear upright.
- To get more negative camber (more inclined), turn IN the rear upper pivotball
- To get less negative camber (more upright), turn OUT the rear upper pivotball

IMPORTANT!
Make equal adjustments on both left and right sides of the car.

IMPORTANT!
After you set the camber, re-check the ride height settings. Camber and ride height settings affect each other, so be sure to check each one when you adjust the other.

A6. CASTER

Caster is the forward/rearward angle of the front steering block with respect to a line perpendicular to the ground.

Caster is non-adjustable on the F180.

A7. TOE

Toe is the angle of the wheels when viewed from above the car.

- Zero degrees (0°) of toe means the wheel is parallel with the centerline of the car
- Negative toe (toe-out) (e.g., –1.0°) means the front of the wheel is open toward the front of the car
- Positive toe (toe-in) (e.g., +2°) means the front of the wheel is closed toward the front of the car

Initial Steps
- Shocks: Attach the front and rear shocks

Setup Apparatus
Place the car on a flat reference surface

IMPORTANT!
Make equal adjustments on both left and right sides of the car.

A7.1 MEASURING TOE
When measuring front toe, use your eye as a measuring tool to make the front wheels parallel.

When measuring rear toe, place a long straightedge (such as a ruler) against the outside edge of a rear rim, and see where the straightedge points on the front tire.

A7.2 SETTING FRONT TOE
Front Toe Default Setting = 0.0°

Set the toe value of each front wheel to 0.0° (front wheels are parallel).

Adjust front toe by adjusting the lengths of the front steering rods.
- To turn wheels IN, LENGTHEN each steering rod equally
- To turn wheels OUT, SHORTEN each steering rod equally

A7.3 SETTING REAR TOE
Rear Toe Default Setting = +2.0° (toe-in)

Set the toe value of each rear wheel to +2.0° (fronts of rear wheels pointing inward slightly).
A straightedge placed against the outer edge of the rear rim should point to the outermost groove of the front tire.

Adjust the rear toe using ONLY the 2 lower pivotballs in each rear upright; the pivotballs must be adjusted in equal but opposite directions.

- To set more toe-in (rear tires point in more), turn IN the forward lower pivotball, and turn OUT the rearward lower pivotball
- To set less toe-in (rear tires point in less), turn OUT the forward lower pivotball, and turn IN the rearward lower pivotball

IMPORTANT!
Ensure you adjust both rear lower pivotballs in equal but opposite directions, or you will change the camber setting.

A8. ANTI-ROLL BAR

Anti-roll bars are used to adjust the car's side traction and alter chassis roll.
The F180 features a front anti-roll bar, but not a rear anti-roll bar.

Initial Steps
- Anti-roll bar: Attach the front anti-roll bar

Setup Apparatus
None

A8.1 SETTING THE FRONT ANTI-ROLL BAR
Front anti-roll bar setting = 0º relative to driving direction (hardest)

Adjust the front anti-roll bar by turning both blades to an equal angle relative to the driving direction (centerline of the car).
- To set the front anti-roll bar to the softest setting, turn each blade so the flat part is perpendicular (90°) to the driving direction.
- To set the front anti-roll bar to the hardest setting, turn each blade so the flat part is parallel (0°) to the driving direction.

A9. SUSPENSION TWEAK

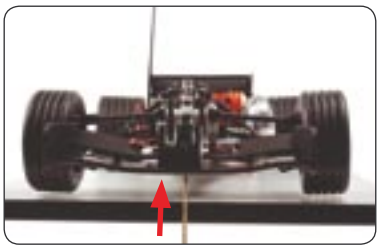
A "tweaked" car is an unbalanced car, and has a tendency to pull to one side under acceleration or braking. Tweak is caused by an uneven wheel-load on one particular axle. You should check for suspension tweak after you have set up all other suspension settings.

Initial Steps
- Shocks: Attach the front and rear shocks
- Anti-roll bar: Disconnect the front anti-roll bar (initially)
- Wheels: Attach all 4 wheels; ensure that each set of left/right tires is the same size

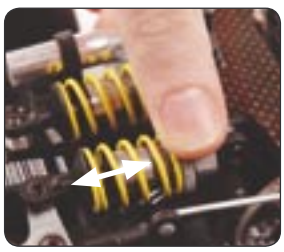
Setup Apparatus
Measure tweak with the car sitting on a flat reference surface

CHECKING FOR REAR TWEAK
Determine if the REAR of the car is tweaked by checking at the FRONT of the car

A9.1 Lift and drop the front and rear ends of the car a few cm's to let the suspension settle.



A9.2 Place a pointed tool underneath the front end of the chassis at its middle point, and lift the front end.
If one front wheel lifts before the other, the rear end of the car is tweaked.

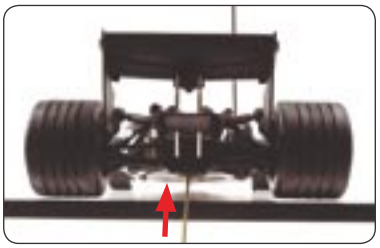


A9.3 Adjust the preload on the rear springs until both front wheels lift at the same time.

Increase the preload on the rear spring diagonally across from the front wheel that lifted first, and decrease the preload on the rear spring diagonally across from the front wheel that lifted last. Adjust both rear springs in equal but opposite directions, otherwise you will change the rear ride height.

Example: If the front right wheel lifts first, increase the preload on the rear left spring, and decrease the preload on the rear right spring by an equal but opposite amount.

CHECKING FOR FRONT TWEAK
Determine if the FRONT of the car is tweaked by checking at the REAR of the car



A9.4 Lift and drop the front and rear ends of the car a few cm's to let the suspension settle.

A9.5 Place a pointed tool underneath the rear end of the chassis at its middle point, and lift the rear end.
If one rear wheel lifts before the other, the front end of the car is tweaked.

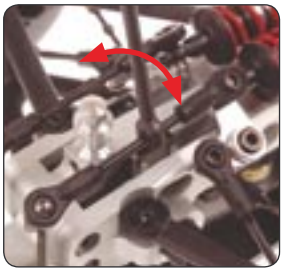
A9.6 Adjust the preload on the front springs until both rear wheels lift at the same time.

Increase the preload on the front spring diagonally across from the rear wheel that lifted first, and decrease the preload on the front spring diagonally across from the rear wheel that lifted last. Adjust both front springs in equal but opposite directions, otherwise you will change the front ride height.

Example:
If the rear right wheel lifts first, increase the preload on the front left spring, and decrease the preload on the front right spring by an equal but opposite amount.

A9.7 Reconnect the front anti-roll bar, and check for front tweak again by lifting the rear end of the car.
If one rear wheel lifts before the other, the front anti-roll bar is tweaked.

A9.8 Adjust the lengths of the front anti-roll bar pushrods (which connect the front anti-roll bars to the rockers) until both rear wheels lift at the same time.



Increase the length of the front pushrod diagonally across from the rear wheel that lifted first, and decrease the length of the front pushrod diagonally across from the rear wheel that lifted last. Adjust both pushrods in equal but opposite directions.

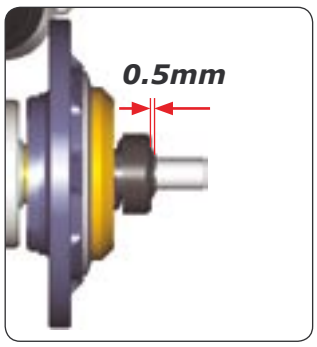
Example:
If the rear right wheel lifts first, increase the length of the front left pushrod, and decrease the length of the front right pushrod by an equal but opposite amount.

A10. CENTAX-2 CLUTCH

The Centax-2 clutch must be properly shimmed and set up to ensure proper operation, drivability, and long life.
There are three settings on the Centax-2 clutch: preload, clutch gap, and end play. Each of these is adjusted independently of the others.

Clutch spring preload is adjusted using a threaded preload collar.
Clutch gap and end play are adjusted using shims of different types and in different locations.

A10.1 SETTING CLUTCH SPRING PRELOAD
Clutch Spring Preload Default Setting = 0.5mm



Clutch spring preload affects the point at which the clutch engages, and is altered by tightening or loosening the spring preload collar.

Adjust the clutch spring preload to 0.5mm as indicated.

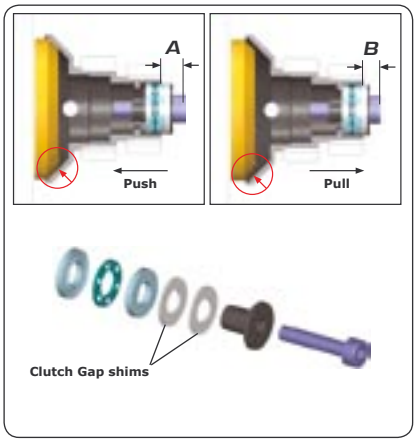
For more information, refer to assembly Step 7.2 and setup Section B8.2.

A10.2 SETTING THE CLUTCH GAP
Clutch Gap Default Setting = 0.7mm

Clutch gap is the amount that the clutch shoe moves before it contacts the clutch housing.Clutch gap must be adjusted before adjusting end play, and is done with the two internal ball-bearings and spacer NOT installed.

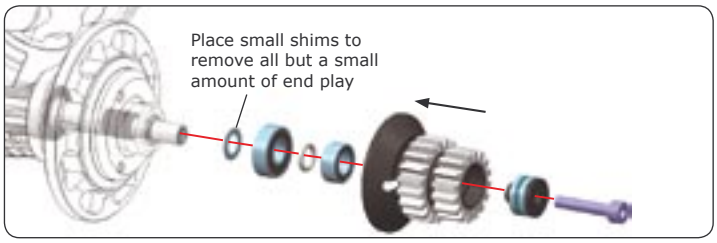
For more information, refer to assembly Step 7.5.

In the images shown here, clutch gap is the difference between values A and B. You adjust clutch gap by placing shims (medium size) on the thrustbearing holder in front of the thrustbearing assembly.



1. Install only the clutchbell and thrustbearing assembly on the engine crankshaft; DO NOT install the two ball-bearings or spacer.Push the clutchbell onto the clutch shoe, and then measure the distance A as indicated.
2. Pull the clutchbell away from the clutch shoe, and then measure the distance B as indicated.
3. The clutch gap is A–B; the correct gap is 0.7mm.
   If the clutch gap is greater than 0.7mm, you can easily calculate the thickness of shims required to set the correct gap: Thickness of shims required (in mm) = A–B–0.7
   For example, using the values A=1.3mm, B=0.3mm
   Shim thickness = 1.3 – 0.3 – 0.7 = 0.3mm
4. Place shims between the outer thrustbearing plate and the rim of the thrustbearing carrier as shown.

A10.3 SETTING THE END PLAY
End Play Default Setting = minimal (0.05–0.15mm)

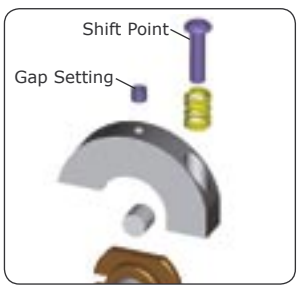


Clutch housing end play is the amount that the clutch housing moves along the crankshaft. End play is adjusted AFTER adjusting the clutch gap. Adjust the end play to a minimal amount (0.05–0.15mm) so that there is only a slight amount of movement detectable. The clutch housing should rotate freely.When adjusting end play, build the clutch with all parts (including all bearings and spacers).

For more information, refer to assembly Step 7.6.

1. Set the clutch gap.
2. Fully reassemble the clutch using all bearings and spacers.
3. Push/pull the clutchbell along the crankshaft to measure the end play. There should be minimal movement (0.05–0.15mm).
4. If there is excessive end play, remove the thrustbearing and clutchbell assemblies (including all bearings and spacers) and place shims (small size) over the end of the crankshaft, in front of the flywheel nut as indicated.
5. Repeat steps 2–4 until the appropriate end play is achieved.

A11. 2-SPEED TRANSMISSION



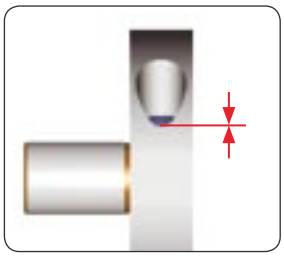
The 2-speed transmission included with the Serpent F180 may be adjusted for shift point and shoe gap.

- Two "shift point" button-head screws (spring-loaded) are on opposite sides of the 2-speed shoes
- Two "gap setting" setscrews are in the middle of the 2-speed shoes

A11.1 SETTING THE SHIFT POINT
Shift Point Screw Default Setting = screw head flush with hole bottom edge

When building the 2-speed shoe assembly, set the two spring-loaded shift point screws so the edges of the screw heads are flush with the bottom edges of the holes. Both screws must be set equally.

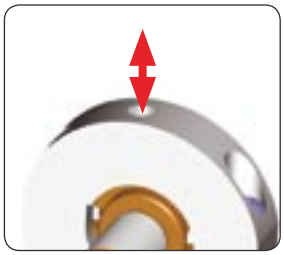
For more information, refer to assembly Step 5.1 and setup Section B9.1.



A11.2 SETTING THE 2-SPEED SHOE GAP
2-speed Shoe Gap Default Setting = ½ turn loose

When building the 2-speed shoe assembly, set the shoe gap so that the two shoes are equal distance from the aluminum 2nd gear drum. Both setscrews must be set equally.

For more information, refer to assembly Step 5.4.



1. Install the 2nd gear assembly onto the transmission layshaft.
2. Loosen the two gap-setting setscrews to allow the 2-speed shoes to rest on their adapter.
3. Install the 2-speed shoe assembly in the 2nd gear drum, but do NOT install the 1st gear assembly.
   There should be equal but minimal spacing between the 2-speed shoes and the inside of the 2nd gear drum.
4. Tighten BOTH gap-setting setscrews until each 2-speed shoe touches the inside of the aluminum 2nd gear drum, then loosen BOTH setscrews by ½ turn each (CCW).
5. Ensure the 2nd gear spins freely.
6. Install the 1st gear assembly and E-clip.

SECTION B — F180 ADVANCED SETUP

Setting up a racecar with fully-independent suspension, clutch, and multi-speed transmission — like your Serpent F180 — is necessary to make the car perform well. Section B – F180 Advanced Setup describes the effects of changing settings on your Serpent F180. The information in this section complements the information presented in Section A – F180 Basic Setup, providing in-depth information about the effects of changing the various settings on the car.

Throughout this section, we refer to handling effects of the car in the corner. We distinguish three corner sections and three throttle/brake positions as follows:

- corner entry
- mid-corner
- corner exit
- braking
- off-throttle
- on-throttle

Chassis Setup
Car setup is a complex matter because all adjustments interact. Fine-tuning the setup will make the car faster and often easier to drive near its performance limit. This means that all the effort you put into your car to prepare it and optimize the setup should give better results and more satisfaction.

If you choose to adjust the settings to better suit different track or driving conditions, make small adjustments, one at a time, and see if you find any improvement in handling with each adjustment. We advise you to keep track of your setup changes, and record which setups work best at different racetracks under various conditions.

Remember that for the car to work and respond to setup changes properly, it must be in good mechanical shape. Check for the well functioning of critical areas such as the free movement of the suspension, smoothness of shock absorbers, and lubrication and wear of transmission parts after each run, and especially after a collision.

After rebuilding the chassis, or in case you become lost with your setup, always return to the setup described in Section A – F180 Basic Setup.

Clutch, Transmission, and Drivetrain Setup
Sections B8–B12 described how to alter the setups of the clutch, transmission, and drivetrain to optimize power delivery and drivability.

TERMINOLOGY

The terms "understeer" and "oversteer" appear throughout this manual. These terms describe a particular handling characteristic of the car.

Understeer
Also known as "push."

A car understeers when the front wheels do not grip enough and the rear tires grip too much. This results in a front end that slides too much rather than turning. A car that understeers is easier to drive, but it is slower than a car that oversteers slightly.

Oversteer
Also known as "loose."

A car oversteers when the front wheels grip too much and the rear tires do not grip enough. This results in a rear end that slides too much. Excessive oversteer causes the rear tires to "break loose" allowing the car to spin out.

WEIGHT TRANSFER

Weight transfer is the key to car handling. Consider that a car has a certain amount of "weight" on various parts of the car and this weight is distributed by a certain amount into each wheel. When the car corners, weight is transferred to the outside tires, when it accelerates weight is transferred to the rear, and when it brakes weight is transferred to the front. By transferring weight to one side of the car (left or right) or one end of the car (front or rear), the tires on that side (or at that end) will be forced onto the racing surface more, resulting in more grip or traction there; conversely, weight is removed from the other side/end of the car.

The amount of weight transfer is affected by the car's center-of-gravity (CG), the distribution of the weight by the car's setup, and by the way that you drive. Before you start adjusting your car setup to maximize the car's performance and ease of handling, you should ensure that the car is in good mechanical shape with no broken, binding or loose parts, and that the car has proper weight balance left/right.

CENTER-OF-GRAVITY (CG)
The center-of-gravity (CG) of the car is the point on the car (in 3-dimensional space) around which the car would be in total balance, if you could support it at that very point. Center-of-gravity is affected by the physical weight of the car, and the placement of all components on the car. If the car is not equally balanced left/right, the car's CG will not be centered. This will cause the car to handle differently when it turns one direction as opposed to the other direction.

Center-of-gravity is also the point at which all centrifugal and other forces of inertia are applied while the car is in motion.

- When the car corners, centrifugal force causes weight to be transferred to the outside wheels
- When the car accelerates, the force pushes backward on the car's CG causing weight to be transferred to the rear wheels
- When the car brakes, the force pushes forward on the car's CG causing the weight to be transferred to the front wheels

It is always best to make the car's CG as low as possible to minimize the negative effects of weight transfer.

WEIGHT TRANSFER AND CAR SETUP
Car setup is always a matter of compromise, and every aspect of car setup affects the way that weight transfers on the car. There is no one magical setup change that will solve all the car's handling problems. Car setup is a complex interaction of the various components that make up the car, and all of these aspects of setup will affect one another.

B1. DOWNSTOPS

Downstops limit how far the suspension arms travel downward, which determines how far upward the chassis rises. This affects the car's handling (due to effects on camber and roll-center) and the ability of the tires to "follow" the track. The effects may change with the type of track and/or amount of grip available.

More suspension travel (lower downstop value) makes the car more responsive but less stable; it is also typically better on a bumpy tracks or tracks with slow corners. Less suspension travel (higher downstop value) makes the car more stable and is typically better on smoother tracks.

The F180 does not feature adjustable downstops.
However, it is possible to make adjustable rear downstops by adding an M4 setscrew in the rear lower arm.

IMPORTANT!
It is very important to have the same rear downstop settings on the left and right sides of the car.

B1.1 EFFECTS OF REAR DOWNSTOP ADJUSTMENT

Higher
- Decreases rear chassis upward travel off-throttle or under braking
- Increases stability under braking
- Better on smooth tracks

Lower
- Increases rear chassis upward travel off-throttle or under braking
- Increases steering in slow corners
- Better on bumpy tracks

Initial Steps
- Shocks: It is not absolutely necessary to remove the shocks, however you must be sure they are long enough not to limit the suspension travel. Be sure the suspension is reaching the downstop limits before the shocks are fully extended. Also ensure that there is not an excessive amount of preload on the shocks, or the downstop values may appear to be lower than actual.
- Wheels: Remove the wheels

Setup Apparatus
Check downstops using a downstop measuring set and flat reference surface.

B1.2 MEASURING REAR DOWNSTOPS

Using the measuring gauge, measure the distance from the reference surface to the bottoms of the rear uprights
- Positive numbers on the gauge indicate the distance (in mm) ABOVE the top level of the elevating blocks (or, above the bottom of the chassis).
- Negative numbers on the gauge indicate the distance (in mm) BELOW the top level of the elevating blocks (or, below the bottom of the chassis).

B1.3 SETTING REAR DOWNSTOPS

- To increase the rear downstop value, turn IN (CW) the rear downstop setscrews so they protrude more below the rear lower arms.
- To decrease the rear downstop value, turn OUT (CCW) the rear downstop setscrews so they protrude less below the rear lower arms.

IMPORTANT!
Make sure you adjust rear downstops so they are equal on both left and right sides.

B2. SHOCK ABSORBERS

Shock absorbers are a key component to setting up your Serpent F180. There are various aspects of shock absorbers that can be adjusted: spring tension, preload, position, and damping.

B2.1 SPRING TENSION

Spring tension determines how much the spring resists compression, which is commonly referred to as the "hardness" of the spring. Different spring tensions determine how much of the car's weight is transferred to the wheel relative to the other shocks. Spring tension also influences the speed at which a shock rebounds after compression. Spring tension selection depends on whether the track is fast or slow, or has high or low grip.

Spring tension is determined by the characteristics of the spring itself, and NOT by the amount of preload placed on the spring by the preload collars. Characteristics such as wire material, wire thickness, and other factors determine spring tension. Spring tension is usually rated in a "spring weight" number that indicates how much weight (or force) is required to compress the spring by a specific amount. A spring with a higher "spring weight" number (such as a 5N/mm) is considered "harder" since it will be more difficult to compress than a spring with a lower "spring weight" number (such as a 3N/mm spring).

Serpent shock springs are color-coded so that all springs of a specific "spring weight" have the same external colour. Note that spring colours are NOT standardized; a Serpent red spring will not have the same spring tension as a red spring from another manufacturer.

Softest → Hardest						
Orange	White	Yellow	Red	Blue	Purple	Grey
#909414	#909415	#909416	#909417	#909418	#909419	#909420

Effects of Spring Tension

Softer Springs
- Makes the car feel as if it has increased traction in low-grip conditions
- Better for bumpy and very large and open tracks
- Springs that are too soft make the car feel sluggish and slow, and will allow more chassis roll

Harder Springs
- Increases the car's responsiveness
- Increases the car's reaction to steering inputs
- Harder springs are suited for tight, high-traction tracks that aren't too bumpy
- Usually when you use harder springs you lose a small amount of steering, and reduce chassis roll

Softer Front Springs
- Increases steering, especially mid-corner and at corner exit
- Front springs that are too soft can make the car understeer under braking

Harder Front Springs
- Increases mid-corner and corner-exit understeer
- Increases steering under braking
- Increases the car's responsiveness, but makes it more "nervous"

Softer Rear Springs
- Increases rear side traction in mid-corner, through bumpy sections, and while accelerating(forward traction)

Harder Rear Springs
- Decreases rear traction, but increases steering mid-corner and at corner exit. This is especially apparent in long, high-speed corners.

B2.2 SPRING PRELOAD

Spring preload is used primarily for adjusting ride height, and is not used for altering camber or other suspension settings or characteristics. Spring preload may also be used to adjust the tweak in the car. For more information, see the section for setting ride height and adjusting suspension tweak.

Adjusting Spring Preload
Adjust the alu. spring collar so you get the desired ride-height when the car is fully equipped, ready-to-run.
Hint: File a small notch on the top of each spring collar so you can tell when you have adjusted it one full rotation.

Adjusting spring preload does not alter spring tension. To change spring tension, switch to a softer or harder spring.

B2.3 SHOCK DAMPING

Shock damping manages the resistance of the shock to movement, as the internal shock piston moves through the shock oil when the shock compresses and rebounds.

Damping mainly has an effect on how the car behaves on bumps and how it reacts initially to steering, braking, and acceleration. Damping only comes into play when the suspension is moving (either vertical wheel movement, or chassis movement due to chassis roll), and loses its effect when the suspension has reached a stable position. Without damping, the shock springs would cause the shock to "pogo" or "bounce" (compressing and rebounding) until it stabilized.

When the shock is compressing or rebounding, the shock oil resists the movement of the piston through it. The amount of resistance is affected by several factors:
- Viscosity (thickness) of the shock oil
- Restriction of oil flow through the piston (affected by the number of holes in the piston)
- Velocity (speed) of the piston

Damping is affected by both shock oil and shock piston settings; getting the optimum shock damping typically requires a lot of "hands on" experience.

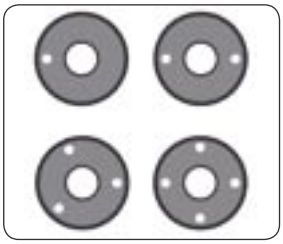
Shock Oil
Shock oil is rated with a "viscosity" number that indicates the thickness of the oil, which determines how much the oil resists flowing and how much it resists the shock piston moving through it. Shock oil with a higher viscosity (for example, 40W oil) is thicker than shock oil with a lower viscosity (for example, 20W oil).

We recommend using only highest-grade Serpent Silicone Shock Oil, which is available in numerous viscosities. Serpent Silicone Shock Oil is specially formulated to be temperature-resistant and low-foaming for use in Serpent shocks.

Thinnest ⟶ ***Thickest***

20W	***25W***	***30W***	***35W***	***40W***	***45W***	***50W***
(#1670)	*(#1674)*	*(#1671)*	*(#1675)*	*(#1672)*	*(#1676)*	*(#1673)*

Shock Pistons
Shock pistons affect shock damping by affecting how easily the piston travels through the shock oil when the shock is compressing or decompressing (rebounding). The piston has holes through which shock oil flows as the piston travels up and down inside the shock body. The number of holes helps control how quickly the shock compresses or decompresses.



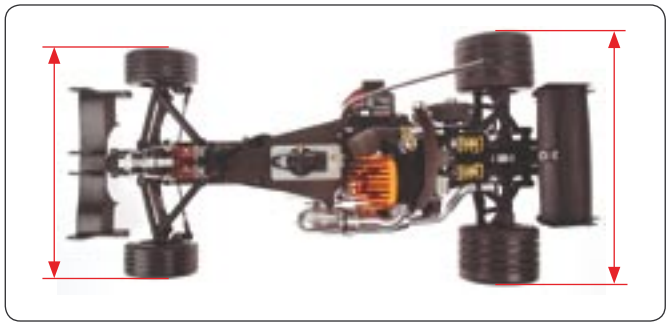
A piston with fewer holes moves more slowly through shock oil compared to a piston with more holes (which moves faster). Therefore a piston with fewer holes gives harder damping, and a shock piston with more holes gives softer damping. The shocks in the Serpent F180 have non-adjustable pistons, however you may disassemble the shock to change the piston to another with fewer or more holes.

Effects of Shock Damping
The effects of damping are often difficult to distinguish since there is an adjustment where grip is optimum. When you get away from the optimum damping setting, either softer or harder, the car will always lose grip.

The table below describes the handling effects by changing damping on one end of the car; the starting point is always the ideal "optimum."

	Adjusting with...		***Effect***
	Shock Oil	***# Piston Holes***	
Front Shocks			
Softer Damping	Thinner	More holes	• Slower steering response • Decreases initial steering at corner entry • Increases oversteer at corner exit/under acceleration
Harder Damping	Thicker	Fewer holes	• Faster steering response • Increases initial steering at corner entry • Increases understeer at corner exit/under acceleration
Rear Shocks			
Softer Damping	Thinner	More holes	• Slower steering response • Decreases rear grip at corner exit/under acceleration • Increases rear grip under braking
Harder Damping	Thicker	Fewer holes	• Faster steering response • Increases rear grip under acceleration • Decreases rear grip under braking

B3. TRACK-WIDTH



Track-width is the distance between the outside edges of the wheels at one end of the car. Track-width affects the car's handling and steering response. It is important that front or rear track-width is adjusted symmetrically, meaning that the left and right wheels at one end of the car are the same distance from the centerline of the chassis.

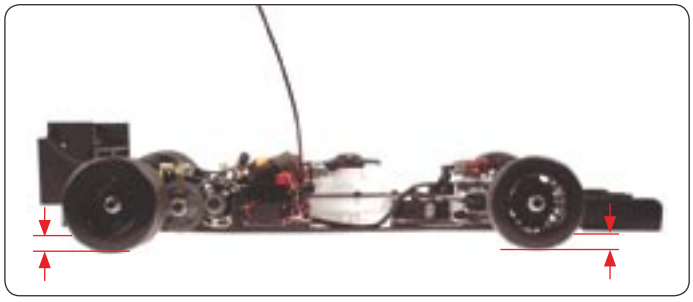
B3.1 EFFECTS OF TRACK-WIDTH ADJUSTMENT
Front Track-width
Wider
- Decreases front grip
- Increases understeer
- Slower steering response

Narrower
- Increases front grip
- Decreases understeer
- Faster steering response

Rear Track-width
Wider
- Increases rear grip at corner entry
- Increases high-speed on-throttle steering

Narrower
- Increases grip at corner exit
- Increases high-speed understeer
- Increases front grip in hairpin turns

B4. RIDE HEIGHT



Ride height is the height of the chassis in relation to the surface it is resting on, with the car ready to run. Ride height affects the car's grip since it alters the car's center-of-gravity (CG) and roll center (RC). Because of changes in suspension geometry and ground clearance, there are negative consequences to altering ride height too much.

Measure and adjust ride height with the car ready-to-run but without the body. Use the shock preload collars to raise and lower the ride height.

B4.1 EFFECTS OF RIDE HEIGHT ADJUSTMENT
Lower Ride Height
- Increases overall grip
- Better on smooth tracks

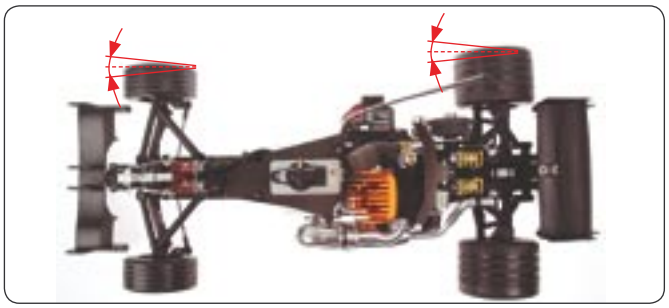
Higher Ride Height
- Decreases overall grip
- Better on bumpy tracks (prevents bottoming)

B5. CAMBER

Camber affects the car's traction. Generally more negative (inward) camber results in increased grip since the side-traction of the wheel increases.

Since the F180 features rubber tires, it is very important to use the whole possible tire width. We strongly suggest to use the default camber settings.

B6. TOE



Toe is the angle of the wheels when viewed from above the car.
- Zero degrees (0°) of toe means the wheel is parallel with the centerline of the car
- Negative toe (toe-out) (e.g., –1.0°) means the front of the wheel is open toward the front of the car
- Positive toe (toe-in) (e.g., +2°) means the front of the wheel is closed toward the front of the car

Toe is used to stabilize the car at the expense of traction, as it introduces friction and therefore some slip in the tires.
- Front wheels may be set to toe-in, neutral, or toe-out
- Rear wheels should always have toe-in; rear wheels should never have toe-out

B6.1 EFFECTS OF TOE ADJUSTMENT

Front Toe
Increased (front wheels turned in more)
- Increases understeer (decreases oversteer)
- Decreases steering at corner entry
- Increases straight-line stability

Decreased (front wheels turned out more)
- Decreases understeer (increases oversteer)
- Increases steering at corner entry
- Decreases straight-line stability

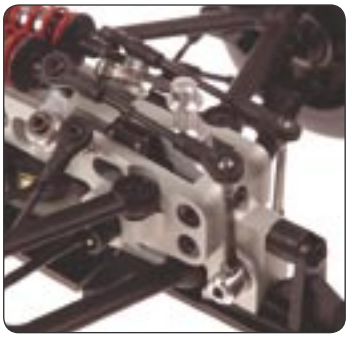
Rear Toe-In
Increased (rear wheels turned in more)
- Increases understeer
- Increases on-power stability at corner exit and braking at corner entry
- Less chance of losing rear traction
- Increases straight-line stability

Decreased (rear wheels turned in less)
- Decreases on-power stability at corner exit and braking
- More chance of losing rear traction

B7. FRONT ANTI-ROLL BAR

Anti-roll bars are used to distribute the car's side (lateral) grip. Anti-roll bars resist chassis roll and by doing so transfer wheel load from the inside wheel to the outside wheel; the harder the anti-roll bar, the more wheel load is transferred. However, as the outside wheel is not able to convert the extra wheel load into extra grip, the sum of the grip of both wheels is actually reduced. This changes the balance of the car to the axle at the other end of the car; increasing the hardness of an anti-roll bar on one particular axle (front or rear) decreases the side grip of that axle and increases the side grip of the axle at the other end of the car.

The overall grip of a car cannot be changed, but it can be balanced by distributing wheel loads. Anti-roll bars are a very useful tool to change the balance of a car. Note that chassis stiffness plays a very important role in the effectiveness of anti-roll bars, and a stiffer chassis makes the car more responsive to anti-roll bar changes.



The F180 features an adjustable front anti-roll bar, but not a rear anti-roll bar.

B7.1 EFFECTS OF FRONT ANTI-ROLL BAR ADJUSTMENT
The front anti-roll bar affects mainly off-power steering at corner entry.

Softer
- Increases chassis roll
- Increases front grip (decreases rear grip)
- Decreases off-power steering at corner entry
- Slower steering response

Stiffer
- Decreases chassis roll
- Decreases front grip (increases rear grip)
- Increases off-power steering at corner entry
- Quicker steering response

B7.2 ADJUSTING THE FRONT ANTI-ROLL BAR
Adjust the front anti-roll bar by turning both blades to an equal angle relative to the driving direction (centerline of the car).
- To set the front anti-roll bar to the softest setting, turn each blade so the flat part is perpendicular (90°) to the driving direction.
- To set the front anti-roll bar to the hardest setting, turn each blade so the flat part is parallel (0°) to the driving direction.

B8. CENTAX-2 CLUTCH

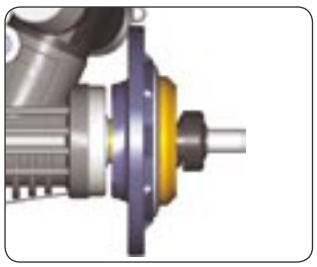
The Centax-2 clutch included with the Serpent F180 may be used to tune the performance of the car. It is important to note that there are many factors that may affect engine and clutch performance. Factors such as proper engine tuning, proper clutch assembly, clutch gap, clutch endplay can all affect clutch performance.

B9.1 BUILDING AND MAINTAINING THE CENTAX-2 CLUTCH
When building a Centax-2 clutch, it is very important to shim it properly for proper operation and long life. An improperly built Centax-2 clutch may cause excessive slip, too early or too late engagement, engine bogging, and premature thrustbearing failure.

Greasing & Oiling
The thrustbearing in the Centax-2 clutch should be re-greased at least once every 30 minutes, or more often if you run on dirty tracks or your car goes off the track often. We recommend using a thick, high-tack grease such as graphite grease.The ball-bearings in the Centax-2 clutch should be oiled regularly with a good, light bearing oil. The ball-bearings are subjected to high heat for extended periods, and have a tendency to get "rusty" after a short time (which may lead to failure if not oiled).

Thrustbearing Installation
The thrustbearing has two rings — one with a large inner diameter, and one with a small inner diameter. The ring with large inner diameter MUST go towards the flywheel.

B8.2 CLUTCH SPRING PRELOAD
Clutch spring preload affects the point at which the clutch engages, and is altered by tightening or loosening the spring preload collar. This is done with the engine stopped, and without disassembling the clutch.



For more information, refer to assembly Step 7.2 and setup Section A10.1.

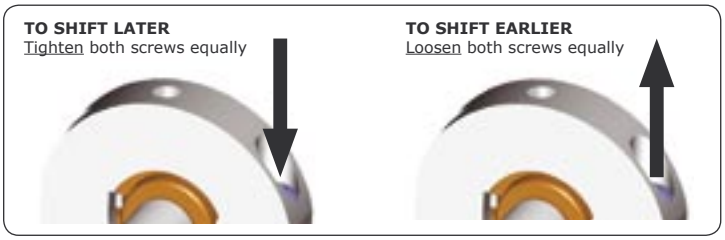
Effects of Clutch Spring Preload Adjustment
Lighter Spring Preload
- Earlier engagement
- Better on slippery tracks

Heavier Spring Preload
- Later engagement
- Better on smooth, high-traction tracks

B9. 2-SPEED TRANSMISSION

The 2-speed transmission included with the Serpent F180 may be adjusted for shift point and shift smoothness.

B9.1 SHIFT POINT
The shift point determines when the transmission shifts into 2nd gear, and is set by the two shift-point screws on the sides of the 2-speed shoes. It is VERY important to set both shift-point screws equally for proper shifting operation.



Both shift-point screws must be set equally.
For more information, refer to assembly Step 5.1 and setup Section A11.1.

B10. GEAR RATIOS

Gear ratio affects the balance between a car's acceleration and top speed:
- Smaller pinion + larger spur = high ("long/tall") gear ratio = faster acceleration but lower top speed
- Larger pinion + smaller spur = low ("short") gear ratio = slower acceleration but higher top speed

The 1st and 2nd gear ratios of the F180 may be altered by the use of different combinations of pinion and spur gears on the Centax-2 clutchbell and 2-speed transmission, respectively.

Serpent offers the following gearing options for the pinion and spur gears on the F180:

Clutchbell pinions
1st gear (smaller, outer pinion)
15T Taller 1st gear pinion
16T Standard 1st gear pinion
17T Shorter 1st gear pinion

2nd gear (larger, inner pinion)
18T Taller 2nd gear pinion
19T Standard 2nd gear pinion
20T Shorter 2nd gear pinion

Spur gears
1st gear (larger, outer spur)
47T Shorter 1st gear spur
48T Standard 1st gear spur
49T Taller 1st gear spur

2nd gear (smaller, inner spur)
44T Shorter 2nd gear spur
45T Standard 2nd gear spur
46T Taller 2nd gear spur

B11. REAR GEAR DIFFERENTIAL

The rear gear differential allows the rear wheels to rotate at different speeds. Why is this important? When a car turns in a circle, the outer wheel has a larger diameter circle to follow than the inner wheel, so it needs to rotate faster to keep up. If the differential is too tight, the result is that the wheels "fight" each other for the proper rotation speed; the result is a loss of traction. Generally, the more grip a track has, the tighter the diff action should be.

The rear gear differential gives smooth differential action and high durability. Also, due to its geared design, there is none of the slippage that is associated with ball differentials.

B11.1 EFFECTS OF REAR GEAR DIFFERENTIAL ADJUSTMENT
Lighter Rear Differential (thinner oil)
- Decreases on-throttle steering
- Less acceleration if the grip is high
- Less on-throttle oversteer (snap-oversteer)
- Less turn-in understeer

Heavier Rear Differential (thicker oil)
- Increases on-throttle steering
- Better acceleration if the grip is high
- More on-throttle oversteer (snap-oversteer)
- More turn-in understeer

B11.2 ADJUSTING THE REAR GEAR DIFFERENTIAL
Gear differential action is adjusted by filling the gear differential with differential oil of a specific viscosity.

- To make a gear differential LIGHTER, fill it with thinner oil.
- To make a gear differential HEAVIER, fill it with thicker oil.

Differential oil is rated with a "viscosity" number that indicates the thickness of the oil, which determines how much the oil resists flowing. Differential oil with a higher viscosity (for example, 40W oil) is thicker than differential oil with a lower viscosity (for example, 20W oil).

We recommend using only highest-grade Serpent Silicone Differential Oil, which is available in numerous viscosities. Serpent Silicone Differential Oil is specially formulated to be temperature-resistant and low-foaming for use in Serpent gear differentials. To be able to compare your gear differential setup with other Serpent drivers, we advise using only Serpent Silicone Differential Oil.

Thinnest

1,000cst	***(#160001)***
3,000cst	***(#160003)***
5,000cst	***(#160005)***
7,000cst	***(#160007)***
10,000cst	***(#160010)***
20,000cst	***(#160020)***
30,000cst	***(#160030)***
40,000cst	***(#160040)***
50,000cst	***(#160050)***
60,000cst	***(#160060)***

Thickest

B12. BRAKE BIAS

The F180 features front and rear brakes. To achieve the best possible balance beween the front and rear brake, follow this little procedure:

First adjust the front brake. Usually you want as much front brake as possible. You do this by attaching the collar on the front brake cable as tight as possible to the servo lever (see assembly Step 4.7).

The rear brake may be adjusted on the track. Dial in as much rear brake as possible without locking up the rear. You do this by turning in (=more rear brake) or turning out (=less rear brake) the adjuster on the rear brake linkage.

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