

F1 Setup Workshop



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This workshop assumes you already have a car. If you don't then visit www.rcformula1.com.au and click on %Getting Started in F1+. Examples are primarily for the Tamiya F104 cars as it is the most popular and the chassis I have the most experience with.

Step 1 – Choose the right tyres

For outdoor asphalt low-medium grip tracks (most of Australia) start with a set of Ride R1 ϕ . You can buy them pre-mounted and pre-glued for the Tamiya F104. These tyres provide plenty of rear end grip for most track conditions but the fronts tend to push (understeer). This can be corrected to an extent with setup changes but I've found the easiest fix is to use Pit Shimizu 571 soft tyres on the front. This combination of 571 ϕ on the front and Ride R1 ϕ on the rear works well at TFTR and Boronia in Melbourne and Meakin Park in Brisbane through cool to hot temperatures.

For more info on Tyres including where to buy, part numbers, how to mount, and the different sizes between cars see the Tyres Guide on our website (menu Tech Tips > Tyres).

Step 2 – Radio / ESC Settings

ESC Settings

Reverse is illegal for racing so disable it. Some ESC ϕ will come with instant reverse meaning that if you put the brakes on the car will instantly go into reverse. This is a real problem as it causes the car to spin.

Turn off drag brake. You only want brakes applied when you are ready for them otherwise the car may veer to one side or possibly spin. Some advanced F1 racers use drag brake to assist the car to rotate into a corner but I prefer to tap the brake if needed.

Set the aggressiveness of the throttle on the ESC to a medium or midway setting. In a 4WD touring car running the same motor on an aggressive setting assists with acceleration. With an F1 car you need to feed the power on as only the rear wheels are driving the car and grabbing a handful of trigger will probably cause the car to spin.

Radio Settings

Brake EPA (End Point Adjustment):

- For a Silver Can motor set the brake EPA to 30% for a new motor or 40% for an old motor; or
- For a 21.5 or 17.5 brushless motor set the brake EPA to 80%.
- For a 17.5 consider reducing the throttle EPA until you get used to the power. 50% is a good start, then as you get used to the power increase in 15% increments until you're at 100%.

Note: at low speed you may appear to have no brakes. That's normal. Brakes are needed when approaching a tight corner at high speed and for that they should work fine.

If your radio has ABS brakes turn them on.

You will now be able to use brakes by pumping the brakes just like you would in a real car to prevent wheel lockups. Only ever brake in a straight line or the car will veer to one side.

If you brake too hard the car will veer to one side or spin. But with the right tyres for the track temperature and the right Radio / ESC settings you should now be able to brake going into corners without losing the back end.

Step 3 – Car Setup

Broadly speaking setup is adjusted to provide sufficient rear end grip so that your car doesn't lose the back end when cornering or accelerating out of a corner. When you give your car more rear end grip you often lose steering and vice versa. While this is not always true for this guide we assume that it is.

It is very achievable to have a car which has sufficient rear end grip and still has enough steering to turn tight corners.

To make sure the following tips will work you need to ensure the cars rear can roll (side to side) and droop (up and down) freely. With the car ready to race including the body fitted, hold the car in two hands, one holding the front chassis and the other holding the rear chassis (sometimes called the pod). Twist the rear pod gently from side to side. It should twist freely. Make sure it is not binding on the body or on the motor wires. Next move the rear pod up and down to check the droop. Again it should move freely with the centre shock compressing normally with no binding.

Tuning for More Rear End Grip

There are 3 types of rear suspension:

1. T-Bar rear suspension . Eg; Tamiya F103 and F104
2. Pivot Ball Link Rear Suspension . Eg; Tamiya F104 Pro v2, Exotek F1R, 3Racing F113
3. Independent rear suspension . Eg; 3Racing FGX

1. T-Bar rear suspension

The T-Bar flexes allowing the rear pod to move up and down independent of the main chassis. Broadly the more up and down movement available the more rear end grip available. Turn the car over so that you are looking at the chassis and the T-Bar is the piece of material joining the main chassis to the rear pod.

This knowledge gives us 2 tuning options:

1. loosen one or more screws on the T-Bar to increase the droop of the rear pod. On the Tamiya F104 Pro series the single centre screw manages this function. Loosen the screw for more droop and therefore more rear end grip. Some people remove it completely on tracks where rear end grip is hard to find. NB: when loosening screws ensure a) the screw head doesn't drag on the ground and b) ensure that the screw won't work its way loose . use threadlock or a lock nut (a nut with a nylon insert). Note: for cars without this screw you can lengthen the centre shock shaft length (by unscrewing the lower ball cup) to achieve more droop; and / or
2. If possible change the T-Bar for a more flexible material. 3Racing make low cost T-Bars in a range of flexes. More flexible = more grip. 3R has the most flex and is roughly equivalent to the extra flex Tamiya T-Bar shipped with the F104 X1 and is recommended rather than the stock T-bar on the F104 Pro.

Tamiya cars have a damper to control the chassis roll. There are 3 types:

- a. The F104 Pro and F103 has a screw thread. Unscrew it to increase roll and therefore rear grip. Initially unscrew it all the way or even remove it.
- b. The F104 X1 and F104 W GP have a plastic damper to which you can add different weights of oil in order to change the damping. Use the lightest oil you have (or no oil at all, or even remove the damper from the car altogether) for maximum rear end grip. Do the opposite to increase steering at the cost of rear end grip (ie; tighten the damper screw [a] or add thick oil to the damper [b]). When learning I removed the damper. Once I had the hang of the car re-attaching the damper increased corner speed in high speed corners.
- c. The F104 v2 uses a shock without a spring. Use lighter oil for more roll and thicker oil for less. Less roll can be useful for maximising corner speed through high speed corners.

It is a compromise to choose settings which maximise corner speed while allowing sufficient steering in slower corners.

2. Pivot Ball Link Rear Suspension

Because there is no T-bar the side to side roll is controlled by one spring on each side. Softer springs allow more roll, stiffer springs less roll. The kit springs that come with the Tamiya F104 v2 are good all rounders. Whichever model of car you have you need to equalise the droop left and right. To do this have the car ready to go with motor and battery in but body off. Turn the car over and hold it with one hand on the main chassis so you are not touching the rear chassis (containing the motor). Hold the bottom of the chassis up to eye level. The main and rear chassis should be flush across the entire width of the chassis. ie; if you ran your finger between the main chassis and the rear chassis it should be smooth (both chassis at the same height) across the entire width of the chassis. After building the car this probably won't be the case so adjust the car to fix this. On the F104 v2 there are grub screws which adjust the height of the springs for this purpose.

3. Independent Rear Suspension

Sorry, I've never run an FGX. I would assume that similar adjustments to those you might make on a touring car may be effective. However, check out the Guide to the FGX on our website and Will Haines will take you through building and setting up the FGX.

Centre shock - At Boronia and Templestowe in Victoria I use the softest Tamiya spring to maximise rear end grip. I haven't experimented with shock oils and stayed with the Schumacher 35wt I installed when I built the car.

If after you have tried the above you still feel you need more rear end grip then add 20-30g of weight to the rear until you get used to driving the car. The Tamiya McLaren body shell comes with a wing that has an upper and a lower section and I added the weight to the lower section initially until I got used to driving the car.

Tuning for More Steering

To increase steering you can reverse many of the items above used to increase rear end grip. Unfortunately this will decrease rear end grip and we don't necessarily want that. So here are some other suggestions:

Camber . increasing camber will normally increase steering. The stock Tamiya F104 setting is 1 degree of negative camber. I found that 1.5 degrees of negative camber gave a large improvement in steering. You could try 2 degrees if you are desperate for steering but it may, or may not, have the desired effect.

Slow down - If you can't turn as tightly as you want to then slow down for those corners and you should then have enough steering to corner as tightly as you wish.

Weight - If after you have tried the above you still feel you need more front end grip then add 20g of weight to the front until you get used to driving the car.

Toe out . see Toe Out below.

Toe Out

Toe Out on the front wheels works differently on a 2WD to a 4WD. When I started in F1 I had to have my arm twisted to add toe out to my car. But what a difference it makes! Because there is no drive to the front wheels adding toe out makes the car much more stable in a straight line. I run at least 2 degrees of front toe out and more if needed. Don't be afraid to experiment. More toe out can also help with initial turn in to corners.

Ride Height

The F104 is surprisingly tolerant of ridiculous ride height settings. However, 4.5-5mm front and 5-5.5mm rear seems to work well. If your car is suddenly handling differently then it may be due to rear tyre wear changing the ride height. Use the centre shock preload collar to correct this.

The rest of the car is built as per the manual.

Step 4 - Driving

So you know how to drive a 4WD? Good. But a 2WD requires a more careful trigger finger!

Driving Tips:

- only brake in a straight line and don't jam the brakes on. Pump the brakes a couple of times to prevent the wheels locking and the car spinning
- don't accelerate too hard out of corners or you'll lose the back end

F1 rewards a very smooth style on the trigger. Avoid hard transitions from full brake to full power to full brake, etc. Squeeze on the power.

Also check out the [How to drive](#) tutorial on our site (menu Tech Tips > Driving the Racing Line).

Step 5 - Speed

Gear ratios below are the Final Drive Ratio (FDR). To calculate this divide the number of teeth on the spur gear by the number of teeth on the pinion gear. Eg; Spur has 100 teeth and pinion has 25 teeth so $100/25 = 4$ so the gear ratio is 1: 4. This is the case for all direct drive F1 cars. The 3Racing FGX has a gearbox and the ratio is multiplied by 2.7. In our above example $(100/25) \times 2.7 = 1:9.8$

Silver Can

Gear Ratio . 1 : 3.7 works well for a Silver Can but I've been as low as 3.4. Don't try this on a 4WD touring car. Being 2WD and lighter the F1 puts less strain on the motor. Drop below 1 : 4.0 in a 4WD touring car and say goodbye to the motor!

If you are running a silver can then solder the ESC motor wires directly to the motor end bell eliminating the voltage drop experienced with normal connectors (or if your motor wires aren't long enough you can replace the stock connectors with a high quality connector such as Deans plugs).

21.5 Brushless Motor

1 : 2.9 with a 21.5 motor and a blinky ESC is a good starting point.

17.5 Brushless Motor

1 : 3.2 with a 17.5 motor and a blinky ESC is a good starting point.

For a comprehensive guide to gearing in F1 see the Gearing Guide on our site (menu Tech Tips > A-Z of Gearing with Blinky ESCs).

Troubleshooting Rear End Grip Issues

If your car has been handling well and then begins to lose grip at the rear here is a checklist of potential causes:

1. **Are the tyres cold?** . Make sure you do a couple of warm up laps or better still use tyre warmers. 5 min on 55 degrees C (130F) should be sufficient unless you are using tyre goop.
2. **Track Temperature** . has the track temperature changed? Are the tyres you are using the correct ones for the new temperature? (refer to our Tyres Guide on the website)
3. **Tyre gluing** . check your tyres to see if any of them have come unglued.
4. **Differential** . is the differential still set correctly? Turning one rear wheel clockwise, while holding the spur gear still, should rotate the opposite rear wheel anti-clockwise. If it doesn't the diff may need attention. Also if you hold one rear wheel and the spur gear with one hand to prevent either of them moving and then try to turn the other rear wheel it shouldn't move. If it does the diff is too loose and needs tightening.
5. **Rear wing** . has the rear wing been damaged?
6. **Screws** . are all the chassis screws done up properly. Losing screws can cause unpredictable handling.

Other Problems

1. **Rear end of the car “skips” / bounces under acceleration.** Particularly with more powerful motors such as a 17.5. . the stock plastic motor mounts can cause this, especially if worn from repeatedly unscrewing and re-screwing motors. Change to an alloy motor mount.
2. **Car has slowed noticeably** . check the grub screws that hold the diff / spur onto the rear axle. May have come lose or if using a non-steel axle it may have become worn allowing the spur to spin without driving the axle. Also check the differential isn't too loose (refer 4 above).
3. **Cars steering has changed**
 - a. Are the front top steering arms bent?
 - b. Is the bottom steering arm sitting parallel with the chassis or has it shifted?
 - c. Do the front arms move up and down on the springs and return to rest correctly?
 - d. Is the servo working correctly?
 - e. Has the servo horn stripped?

We hope that this guide helps you to get started with your F1 RC car as quickly and smoothly as possible.

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