Control

In contrast to the other component models the control model does not explicitly generate forces, rather it contains the key parameters determining the behaviour of driver controlled components.

Braking

Hydraulic brake balance & optionally, maximum total brake pressure can be specified.

Brake Balance Optimisation

There are several options for static brake balance optimisation and brake-by-wire (BBW). BBW allows us to add shaping to the through stop brake balance. When a rear electric motor is fitted, it possible to substitute out hydraulic braking in favour of motor harvest. Where we are energy limited, motor harvest is prioritised under braking up to the motor torque/power limit, with any remaining demand met by the hydraulic brakes.

Option	Definition
Fixed Brake Balance	No brake balance optimisation.
Optimal Value for Run	Dynamic Lap automatically picks static brake balance for quickest laptime.
Optimal Value each Lap	As above, but static brake balance can change every lap within a Dynamic Multi-Lap stint, which allows the brake balance to migrate through the stint.
BBW Map	We can define rear brake pressure as a function of front brake pressure and/or steering wheel angle.
Optimal BBW	This effectively gives the car two brake pedals; one for the front, another for the rear, enabling the car to achieve perfect brake balance at all points during braking. This is a useful step in finding the ideal BBW map.

For any of these brake balance optimisations we can specify rBrakeBalMin & rBrakeBalMax to keep brake balance within the physical limitations of the car.

For the BBW options, if we combine this selection with the relevant "Harvest Independence" option (found in the Powertrain section) which enables/disables regen control separate to brakes & throttle, the relevant FE and F1 regulations can be simulated according to the table below.

		Control - Brake Balance Optimisation		
		Optimal BBW	**BBW Map**	**Fixed Brake Balance**
Powertrain - Harvest Independence	**Independent Harvest**	Season 5 FE ☑ Perfect Brake Balance ☑ Regen Off Brakes ☑ Motor/Hydraulic Brake Substitution	Season 5 FE ☐ Perfect Brake Balance ☑ Regen Off Brakes ☑ Motor/Hydraulic Brake Substitution	Season 4 FE ☐ Perfect Brake Balance ☑ Regen Off Brakes ☐ Motor/Hydraulic Brake Substitution
	Achieve Target Brake Balance	F1 ☑ Perfect Brake Balance ☐ Regen Off Brakes ☑ Motor/Hydraulic Brake Substitution	F1 (BBal Shift Through Stop) ☐ Perfect Brake Balance ☐ Regen Off Brakes ☑ Motor/Hydraulic Brake Substitution	F1 (Constant BBal) ☐ Perfect Brake Balance ☐ Regen Off Brakes ☑ Motor/Hydraulic Brake Substitution

Front/rear axle slip bounding ratio

The second parameter is the front/rear axle slip bounding ratio. A common difficulty when using lap time simulation tools is their ability to balance an unstable car on a knife edge, in a manner which a real driver finds impossible. In order to avoid this undesirable situation the front and rear axle slips are constrained to operate in a user-controlled region, as shown in the figure below.

Lower numbers for the bounding slip ratio force the car to operate in an increasingly conservative region. While this number does not constitute a complete stability metric it is an effective heuristic.