McLaren-Honda MP4-30 Quick Users Guide

In this guide we will briefly explain a number of key setup parameters which are distinct to the MP4-30. We hope this introduction will enable members to familiarize themselves with these features and hit the track quickly, rather than being overwhelmed by a number of new and unknown variables.

Table of Contents

Aerodynamics

As the McLaren-Honda MP4-30 and other modern grand prix cars are very much influenced by aerodynamics, we have decided to offer a choice of three downforce trim levels: *low, medium and high*. The speed of the track should determine which trim level to select. Typically, extremely fast tracks such as Monza, Montreal, or Spa may be best suited *to low downforce* trim, slower more technical tracks such as Zandvoort or Laguna Seca might require *high downforce* trim to be fastest.

The simplest way to adjust aerodynamic balance is by using the *front flap angle* and/or *rear wing wicker* adjustments. To increase oversteer or decrease understeer, increase front flap angle and/or decrease rear wing wicker (vice versa to decrease oversteer or increase understeer). Both adjustments are only available in the garage or during pit stops with the MP4-30.

The included *aero calculator* will allow you to visualize aerodynamic balance shifts while experimenting with ride heights and front and rear wing adjustments.

While working with the aerodynamics of the car, keep in mind that drag also increases as downforce is increased. The *downforce to drag* ratio in the aero calculator will provide detail on how much drag will change as the result of increasing or decreasing downforce.

The MP4-30 features a drag reduction system (DRS). The primary purpose of the DRS is to facilitate overtaking. Many tracks have pre-defined zones in which the angle of incidence of the rear wing flap may be set to reduce overall aerodynamic drag and increase top speed. During practice and qualifying sessions, every car may always use DRS when in these pre-set zones. However, during races, only cars that are within 1 second of the car in front when crossing a specified DRS detection point may use the DRS. Note that DRS use is completely disabled during the first two laps of every race. The steering wheel display and in-car controls are used to determine DRS availability and engagement. When the driver crosses a detection point, a single blue light will illuminate on the left-hand side of the steering wheel display unit if DRS will be available in the next zone. When the driver subsequently crosses the start of the next DRS zone, a second blue light illuminates to indicate that DRS is available. The driver must then manually use the control *DRS* (available to be mapped in the Options menu) to engage the DRS. When the DRS is engaged, two more blue lights illuminate. DRS may be disengaged manually by toggling the DRS control OR by lifting off of the throttle OR by applying the brakes.

Chassis

Although the MP4-30 suspension layout is quite similar to that of the FW31, in actuality it is more analogous to those found on most other single-seat racecars.

Both the front and rear suspensions include conventional corner springs (torsion bars as opposed to coil springs) and, unlike the FW31, anti-roll bars at both ends. Also included are third springs front and back. We refer to these springs as *heave springs*. The heave springs add additional wheel rate stiffness in vertical heave, or bounce motion, only. Their primary function is to help control the chassis platform in order to keep consistent aerodynamic performance. High heave rate settings will result in less ride height change while the car rides over bumps and while downforce increases as vehicle speed rises versus softer heave rate settings.

The key in adjusting these components is finding the appropriate amount of stiffness to help aid the aerodynamics while maintaining an adequate amount of front mechanical grip. At faster tracks the best compromise might be to use stiffer heave rate and give up some mechanical grip in exchange for better aerodynamics control, whereas at much slower tracks where raw tire grip would take precedence, perhaps less heave rate would be required. The correct way to set both the front and rear heave spring is to choose the *rates* and adjust their *perch offsets* until the springs are at least slightly preloaded while the car has no fuel. This will ensure that, as fuel weight burns off, the heave springs will always be carrying vehicle load rather than 'floating' off of their perches, thus forcing the corner springs to do extra work to hold up either end of the car.

Ballast adjustability as also available in the MP4-30. Ballast placement, and correspondingly calculated nose weight percentage, allows members to shift weight forwards and rearwards to affect static front and rear corner weights and consequently mechanical balance in corners. More forward weight distribution will reduce oversteer/ increase understeer during cornering events. However, it may reduce the amount of acceleration traction available powering out of a corner. More rearward percentage will produce just the opposite effects.

In keeping with our previous high level racing cars, we have made available multiple brake pressure settings to enable drivers to reduce or increase braking force to their preference. These settings are scaled to downforce trim level, so the recommended setting aligns with which downforce trim has been selected.

Finally, in addition to brake pressure the MP4-30 also has an innovative way of changing front to rear braking bias percentage with pedal travel. Typically, at higher speeds more front brake bias would be advantageous to help decelerate the vehicle due to aerodynamic down load; however, as speeds decrease the optimal brake bias may need to be more rearward. *Base, peak and begin bias ramping* parameters allow the driver to set the minimum and maximum front brake bias, and ramping determines where the minimum value will start to ramp up towards the peak number. Play around with these settings at different race tracks and see which settings work best for you. New to the McLaren is the ability to not only alter the *base brake bias*, via a typical cockpit adjuster, but also the *peak brake bias* individually via a control dial (BAL) in-car on the steering wheel. The idea is to allow the driver to alter both *peak* and *base brake bias* settings individually on-track to suit track, downforce level, and driving style.

Dampers and Inerters

Not only does the McLaren MP4-30 have typical corner dampers, it also has dampers assigned to each heave spring. These *heave dampers*, similar to the additional third springs, only work with vertical heave, or bounce, motion. Each corner damper has *low speed* and *high speed* adjustments in both compression and rebound in order to optimize the ride and handling performance of the car. However, the *heave dampers* utilize *low speed damping* and something we call *high speed slope* adjustments. The *high speed slope* adjustments have a very broad range of damping adjustability in order to allow for large force tuning at high damper shaft speeds. The allowable range can exhibit fairly linear force behavior, which keeps high levels of damper force, as well as the ability to '*blow-off*' damper force, resulting in very low levels of damping; much more damping adjustment than is typical compared to our low speed or high speed damping adjustments. A bumpy track or one with large curbs might require a different set of parameters than a smooth track or one where curbs don't come into play.

Other innovative tuning elements featured include front and rear *inerters*. These inerters literally add inertial mass to the un-sprung suspension without actually adding weight to the wheels, thereby avoiding the pitfalls associated with extra weight. More inertia will reduce the ride frequency or response time of the suspension just like a heavier wheel would, and may be beneficial over different types of track surfaces. In some instances a lot of inerter mass will be beneficial and at other times no inertial mass will be preferable.

Power Unit

The Honda power unit in the MP4-30 consists primarily of a turbocharged internal combustion engine, two motor generator units (MGU's), and an electrical energy store. The MGU's and electrical energy store are part of an energy recovery system (ERS), the purpose of which is to capture and re-deploy energy that would otherwise be dissipated as heat. The ERS system increases the overall efficiency of the power unit, allowing the MP4-30 to consume less fuel than an equivalent car that's not equipped with an ERS.

One of the MGU's is directly linked to the engine's crankshaft. This MGU acts as a generator when the car is braking, recovering Kinetic energy that would otherwise be dissipated as heat from the brakes. It's called the MGU-K (for kinetic). The MGU-K also deploys electrical energy to propel the car; in this mode, the MGU-K acts as a motor.

The other MGU is directly linked to the shaft of the engine's turbo. The turbo harvests Heat from the engine's exhaust via a turbine, and deploys that power to increase the amount of air supplied to the engine intake via a compressor. The MGU that's attached to the turbo shaft on the MP4-30 is called an MGU-H (for heat). The turbine on the MP4-30 is very efficient and, when the engine is operating at moderate-to-high revs, produces more power than the compressor needs to supply the engine with sufficient intake air. This allows the MGU-H to act as a generator, harvesting the excess power from the turbine, which may either be deployed through the MGU-K to propel the car or directed to the electrical energy store (a battery pack we refer to as the ERS battery). When the driver is off-throttle, the turbo will slow down, and will take time to speed back up when the driver applies the throttle at corner exit. This causes a delay in the supply of intake air and, consequently, engine power, that's known as turbo lag. On the MP4-30, the MGU-H may act as a motor when the driver is off-throttle, maintaining turbo speed to eliminate turbo lag.

The governing body of Formula 1, the Federation Internationale de L'Automobile (FIA), mandates limits on power and energy flow among the three primary ERS components. The FIA also sets strict limits on the total fuel with which a car may start races (mid-race re-fueling is not permitted), and the maximum fuel flow to the engine as a function of engine speed. The MP4-30 has advanced control software designed to manage the overall operation of the ERS in order to ensure maximum performance and compliance with the FIA regulations. A number of *adjustment parameters* are available to the driver to tune system performance to suit particular circumstances. All of these settings are available in the Garage. Most are also available in-car via the F8 black box.

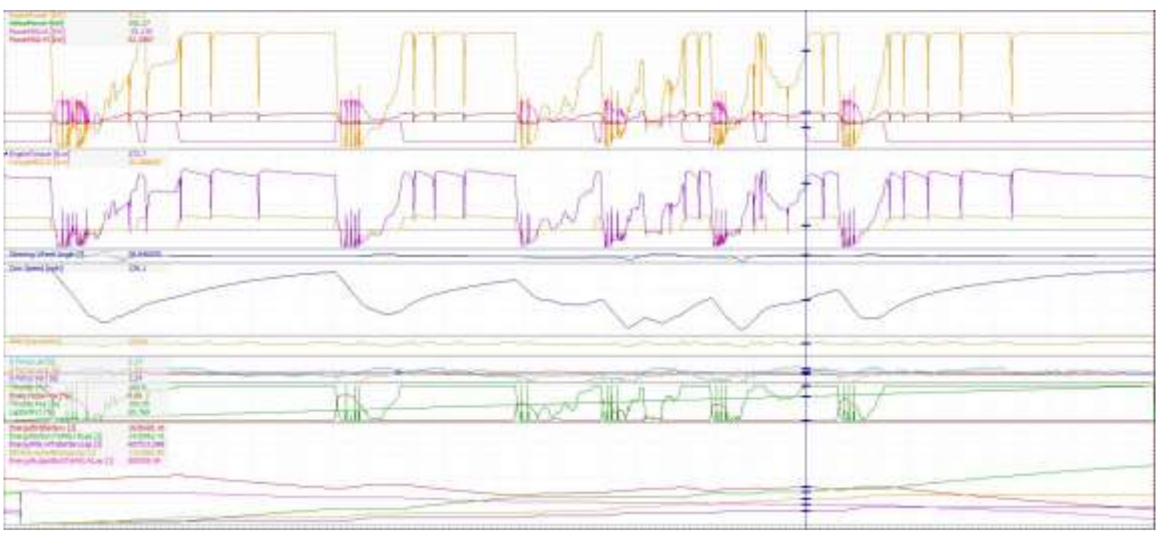
MGU-K re-gen gain sets how aggressively the MGU-K applies regenerative braking, which plateaus at an FIA-mandated limit of 120 kW. This parameter may be mapped to control keys using the *Engine Braking* settings in the Options menu. Lower regeneration can make braking more stable. Higher regeneration harvests more energy. The driver should target the greatest regeneration level at which braking is stable.

MGU-K deployment generally determines how much power is available to propel the car. If MGU-K deployment is greater than MGU-H harvesting, power will be drawn from the ERS battery, and the ERS battery charge level will decrease. The driver must manage power draw from the ERS battery by setting the MGU-K deployment level. *MGU-K deploy mode* toggles between two different approaches to setting MGU-K deployment level: fixed and adaptive. This parameter may be mapped to control keys using the *MGU-K Deploy Mode* settings in the Options menu. In fixed mode, the system will deploy the MGU-K at a power level set by *MGU-K deploy fixed*. This parameter may be mapped to control keys using the *MGU-K Fixed Deploy Mode* settings in the Options menu. In adaptive mode, the system will deploy the MGU-K at an appropriate level to hit an ERS battery charge percentage set by *MGU-K deploy adaptive*. This parameter may be mapped to control keys using the *MGU-K Adaptive Deploy* settings in the Options menu. If MGU-K deployment suddenly drops from near maximum power to no power, the rain light flashes to warn following drivers that the car's acceleration will decrease significantly.

The driver must manage fuel use carefully during races. A fuel display appears on the steering wheel every time the driver crosses start-finish during the race. Fuel used on the previous lap, a target fuel used per lap, and the projected amount of fuel with which the driver will finish the race are displayed. A driver may save fuel by adopting different driving techniques (early lifts at the ends of straights and smooth throttle application are generally considered to be the most effective ways to do this) or by changing engine mode. *Fuel consumption* sets the engine mode. This parameter may be mapped to control keys using the *Fuel Mixture* settings in the Options menu.

An overtake function is available to increase propulsive power for short periods. Overtake is only enabled when the driver activates the *Push To Pass* control key, which must be held down for the entire duration of engagement. Be aware that overtake use depletes the ERS battery, so must be carefully managed during races.

Finally, throttle pedal shaping allows the driver to select the type of engine performance as he/she rolls into the throttle pedal coming off a corner. Setting 1 maps the throttle-to-torque relationship just like a typical engine that uses a butterfly throttle plate. Setting 4 uses a linear throttle-to-torque output relationship. The two settings in between blend the butterfly model and the direct linear torque model together. This setting is completely dependent on driver preference. At race tracks with low grip and slow speeds, where exit performance is critical for fast lap times, you may want to use the more conventional butterfly shape throttle curve in order to control the power application. Conversely, drivers might want the brute force torque from the linear torque pedal for faster tracks, where feathering the throttle off the corner is less important. Note that FIA rules prohibit changing throttle mapping while the car is on track, and so this function may only be set while the car is in the garage.



Differential

The iRacing MP4-30 also gives iRacing members the ability to *design differential* settings. Members will have the ability to choose differential locking settings for different segments of the corner. As with current grand prix race cars, this area has a major influence on the performance of the racecar. More *entry preload*, *entry* and *middle* differential locking will increase understeer or decrease oversteer on entry and through the middle of corners. On *exit* more locking will increase oversteer or reduce understeer. For entry to middle sections of a corner, this setting mainly controls vehicle balance: however on exit not only does it affect balance, it also alters the amount of acceleration thrust generated by both wheels. A compromise will need to be found which will allow the most amount of locking to power straight out of a corner without overwhelming the rear tires and generating too much oversteer during corner exit. The driver will also have the ability to make micro adjustments to the differential settings in the garage or via dials in-car (PL and ENT) while driving, which will slightly increase or decrease understeer and oversteer performance of the diff. In-car controls may be mapped to external keys/buttons with the *Diff Preload* and *Diff Entry* in-car adjustments in the Options menu.

Tires

A quick note about the optimum tire settings for the MP4-30 on road circuits: Peak lateral grip should be in 17-22 psi hot range for both front and rear tires. Optimal longitudinal drive and braking grip will likely be in the lower end of the peak lateral range or possibly a little less. Peak grip will be maintained in and around 210-230 F in average temperature, with some temperature spread from inside to outside of the tire being reasonable. Best camber angles to use are anywhere from -2.5 to -3.5 degrees in the front and -0.5 to -1.5 degrees in the rear. For directional stability it makes sense to run with some amount of toe-out (negative toe-in) at the front of the car and toe-in (positive toe-in) at the back of the car.