DUALSKY®

ADVANCED POWER SYSTEMS

User Guide

Ttronic V2.1

User Guide

TRACK & FIELD™

1. Introduction

In current market, the majority of brushless electronic speed controller (ESC) has adjusting single Timing function, by means of minor adjusting the Timing to change the characteristics of motor power output. But Dualsky engineers and drivers found that the single Timing can not meet the characteristics for Racing car competitions, as the motor speed change fast and the range of power output is too wide. Therefore, such Timing set is hard to take account of the requirements of motor power and efficiency at low, medium and high speed.

Dualsky Tronic emerges, as the times require, by setting ESC parameters at low, medium and high speed level of motor to achieve the best powerful performance adapted to track. This is the expectation of all the users !

2. Usage Warning

● Tronic V2.1 firmware is designed specifically for XC850TF ESC.
● All Track&Field electronic speed controller can upgrade Ttronic firmware, but please use it with caution.
● Non-XC850TF users the Tronic firmware will void your warranty.
● It is mainly designed for low speed STOCK motors:
  10.5T,13.5T,17.5T,21.5T.
● The Ttronic can also be used for MOD motor, but the MOD motor belongs to high speed motor, please set the Timing ADV to Zero.
● It is recommended to apply together with Dualsky Z5 motor, the motor Timing advance should be placed in the lowest position.
● The Ttronice technology is only applicable to sensor mode.
● Any slight changes on setting may change the motor's working temperature.

● The gear ratio is very important to the power output, please test the gear ratio start from higher.

3. Application

● XC850TF has been pre-installed Ttronic V2.1 firmware before leave factory.
● Change the D²RP preset competition setting by ESC button, please use the drivers mature settings.
● You also can use the USB LINK to connect with PC to set as many as 9 items.
● Non-XC850TF ESCs can use the USB LINK firmware updating function to upgrade the Ttronic firmware.

4. Working principle

The motor speed divided into three sections by Ttronic technology:

Start, Small curve	Big curve, short straight	long Staight road
Low	Medium	High >>>>>

● **Low-speed stage:**
  Description: ESC working at Zero Timing advance can optimize the start-up stage and acceleration feeling on small curves, it also had a greater impact on motor's temperature.
  Related projects: Start Mode, Start RPM.
● **Medium-speed stage:**
  Description: It depends on the power and efficiency of the mtoor in the big bends and small straights, it will affect accelerated strength. Setting around the Timing ADV is a kind of dynamic Timing compensation technology. The Start RPM will affect the low speed and medium speed at the same time.

Related projects: Timing ADV, Start RPM, End RPM.

● **High-speed stage:**

Description: When the motor drive to the big straight road at high speed, switch on the E-Booster(Turbo boost) function and further enhance the rotational speed to increase the car's speed.

Related projects: E-Booster, Boost RPM, Operating Speed, Return Speed, Full Throttle Only

E-Booster is a core technology in high speed stage. When the rotational speed raised to a certain extent, the correspondence rotational speed Tming ADV can not be able to play out the power and efficiency of the motor. The Booster intervention can further increase the Timing and enhance the power and efficiency of the motor.

The nature of Timing ADV and E-Booster is angle(degree). Timing ADV affect in medium speed level, E-Booster compensate for the high rotational speed level of power, both can be superimposed.

DDRP	Custom
Start Mode	6(*)
Timing Advance	6(*)
Start RPM	15,000 rpm(*)
End RPM	30,000 rpm(*)
E booster	25(*)
Boost RPM	35,000 rpm(*)
Operating Speed	300 ms ▼ 117 ms
Return speed	300 ms(*) ▼ 117 ms
Full Throttle Only	Yes(*)

Software Interface

Track&Field Ttronic illustration
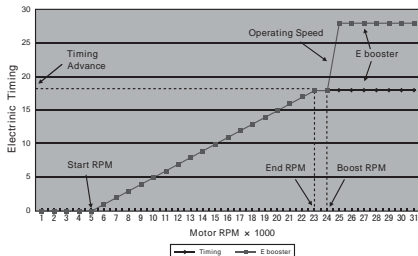
5. Setting mode description

1. Stat Mode. The ESC power output speed setting in the car starting stage, which has been divided into 9 modes. The higher the value, the more rapidly the power output will be. The greater the value, the fast the throttle response speed will be. The smaller the value, the more slowly the throttle response speed will be.

The value within 4-6 is suitable for Electric off-road vehicles.
The value within 6-8 is suitable for EP ON ROAD modified cars.
The value within 8-9 is suitable for EP ON ROAD STOCK cars.

Start Mode High
Start Mode Low
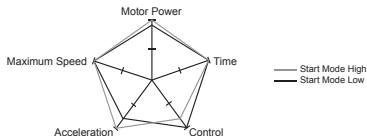
2. Timing ADV---In technology, it is defined as the offset(advance) of the power output when rotation of the motor commutation.
Unit: degree. Setting range: 0-64 degree. Step: 1 degree.
In Ttronic technology. The Timing ADV will be increased by the motor speed dynamically. The Timing degree will work and match the Start RPM and End RPM in the whole throttle range before the full throttle. When the motor speed reached the setting Start RPM, the Timing ADV degree will begin to operate and operate completed before the setting of End RPM. The biger of the Timing ADV value, the more fast the speed will be, the power consumption will also be increased.

Timing High
Timing Low
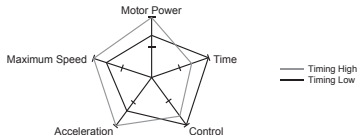
3. Start RPM---the motor RPM when the dynamic Timing ADV is begin to intervene.
Unit: RPM. Setting range: 500-20,000RPM. Step: 500RPM.
The greater the Start RPM value setting, the later the Timing advance intervention time will be. The smaller the Start RPM value setting, the earlier the Timing advance intervention time will be. When the motor reached the setting Start RPM, the ESC will be gradually increased Timing advance. The ESC works at zero Timing ADV before reached the Start RPM.

Start RPM High
Start RPM Low
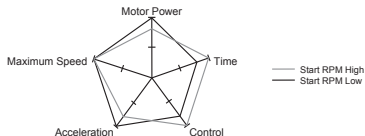
4. End RPM---the motor RPM when the dynamic Timing was increased completed.
Unit: RPM. Setting range: 5000-65,000RPM. Step: 1000RPM.
When the motor reached the speed, the ESC will allocate all the Timing ADV to motor.
The greater the End RPM value setting, the more slowly the Timing advance operate will be. The smaller the End RPM value setting, the faster the Timing advance operating will be. The Timing advance value will must be operated completed before the motor reached the End RPM value.

End RPM High
End RPM Low
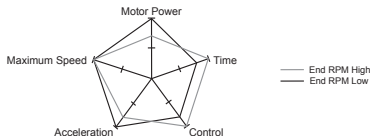
Mid-low speed setting skills
In the range between the same Start RPM to the End RPM, the greater the Timing value setting, the fast the car's acceleration, the power consumption will increase and the motor temperature will rise more. After setting the correct Timing value, you can adjust Start RPM and End RPM to adjust the frame control feeling.

Below are several actual test results
- Start RPM 5000, End RPM 20000; If adjust the Start RPM to 2000, End RPM to 20000。Although the Timing advance value has not changed, but the sensitivity of the throttle is higher by adjusting the Start RPM, as the Timing will intervene earlier. But due to the End RPM is too high the frame acceleration in the middle range still seems powerless.
- If adjust the Start RPM to 2000, End RPM to 15000. Due to the compression of the whole speed field/range, the Timing operating completed time is less, the middle frame acceleration will be improved and the motor temperature will be higher. Faster acceleration will bring greater current. Over current is easy to burn out motor. When adjusting car's acceleration, please pay attention to the motor's temperature at the same time.

5. E-Booster (Turbo boost)---High-speed stage Timing.
Unit: Degree. Setting range: 0-64degreee. Step: 1 degree.
E-booster is operated in a one time, which is different from the Timing ADV incrementing process. Generally, the E-booster will be operated when car is running in higher speed, it can help the car get higher speed in longer straight.
**Note: Timing ADV plus E-Booster can not exceed 64 degree.**

E-Booster High
E-Booster Low
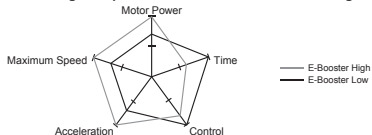
6. Boost RPM---E booster will be operated when reached the speed.
Unit: RPM. Setting range: 5000-65, 000PRM. Step: 1000RPM.
When the motor speed reached the setting Boost RPM speed, the E-booster will be turned on and superimposed with the Timing ADV. So that the frame can get higher speed in the straights. Using the RPM control the start time of E-booster, it can help the car get extra power compensation at the right time, and avoid the plays false operation in the fierce competition effectively.

Booster RPM High
Booster RPM Low
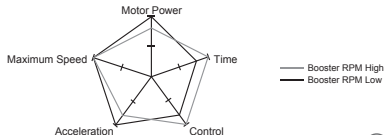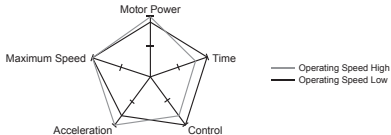
7. Operating Speed---E-Booster operating speed.
Unit: second/64 degree. Setting range: 0-2 seconds/64 degree.
Step: 0.1s (100ms)
Note: This option is the time of operating 64 degrees of E-booster. Therefore, the actual operating time must less than this value(actual time will display on Ttronic setting interface in computer).
Choose less operating time to get faster operating speed can help the car to obtain faster acceleration, but also will rise the motor's working temperature. For example: 300MS=0.3seconds can operate 64 degree high Timing. In order to facilitate users using the new version of the software, we specially increased the automatic calculation of column. The software will calculate the actual operating time according to the users selected high Timing and operating speed.
For example:

| E booster	64 degree	
Operating speed	300MS	actual operating speed 300MS
E booster	32 degree	
Operating speed	300MS	actual operating speed 150MS

Operating Speed High
Operating Speed Low

8. Return Speed---E-Booster return speed option.
Unit: Second/64degree. Setting range: 0-2second/degree.
Step: 0.1s (100ms).
Note: The mode is the time of return all the 64 degree E-booster, so the actual return time must less than this value. (the actual time will display on Ttronic setting interface in computer)
In order to prevent the braking effect cause by E-booster snap return, the new program has added this important option. The Working principle and Operating speed is essentially the same, but it is useful when return the high Timing. Adjust the return speed can be adapted to different frame and the track characteristics.

E booster	64 degree	
Return speed	300MS	actual return speed 300MS
E booster	32 degree	
Return speed	300MS	actual return speed 150MS

Return Speed High
Return Speed Low
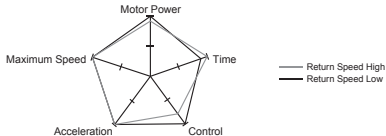
9. Full Throttle Only. This is a switch option. It can avoid the E-Booster was activated mistakenly in complicated curves.
Selecting YES, the High Timing enable condition is the remote throttle at full throttle position + reach High Timing (E-booster) Boost RPM. Selecting NO, the High Timing enable condition is reached High Timing (E-booster) Boost RPM. YES option is more suitable for most of players.

——	Full Throttle Only OFF
——	Full Throttle Only ON
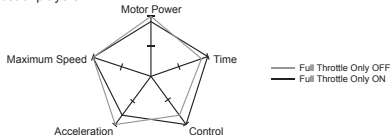
High speed setting skills
● In any case, the sum total of Low Timing and High Timing can not exceed 64 degree. In corresponding to slower motor (such as 13.5, 17.5), it can use more Timing (40-50 degree) with less E-booster (10-14 degree) to increase the acceleration in front part. In corresponding to faster motor(such as 4.5,5.5), it can use fewer Timing (0-15degree) with E-booster (15-25degree).
● In corresponding to slower motor, the Boost RPM can be the same as Timing End RPM, even smaller than Timing to achieve the Low and High Timing superposition using effect. (The setting of Boost RPM is smaller than Timing End RPM, it needs to pull high End RPM and shut down the full throttle option).
● In short straight track, use faster E-booster operating speed (around 80MS-120MS). The slower operating speed can come down the motor working temperature slightly. If choose a very big

E-booster (25-30degree), which can proper slow down a little operating speed. (100MS-150MS)
● The return speed of the E-booster will affect the frame whole control directly. Return speed is too fast will make the E-booster quickly disappeared, pull down the motor speed to produce a braking effect. It will affect driving smoothness of the car.
Using slower return speed after the high speed connected with the big curved track is recommended. (120MS-180MS)
Using faster return speed to help braking after high speed connected with U-turn curved track. (50MS-100MS)
Different brands of frame stationary internal gear ratio will affect the E-booster return speed application.
Based on 2.0 gear ratio, the smaller inner gear ratio (such as 1.7:1) for E-booster is disappear fast and produce less sensitive brake effect. The bigger is the internal gear ratio(2.35:1), the brake effect is more sensitive.

6. Drivers Setting

	D²RP Operation Mode	* Profile 1 MOD 4.5T	Profile 2 For 10.5T	Profile 3 For 13.5T	Profile 4 For 17.5T
1	**Start Mode**	6	9	9	9
Timing					
2	**Timing ADV**	0	35	40	50
3	**Start RPM**	N/A	5,000	3,000	500
4	**End RPM**	N/A	25,000	15,000	15,000

D²RP Operation Mode	* Profile 1 MOD 4.5T	Profile 2 For 10.5T	Profile 3 For 13.5T	Profile 4 For 17.5T
E booster				
1	**E booster**	25	20	24	14
2	**Boost RPM**	35,000	30,000	20,000	18,000
3	**Operating Speed**	300ms	300ms	300ms	100ms
4	**Return Speed**	300ms	300ms	300ms	100ms
5	**Full Throttle Only**	Y	Y	Y	Y

Recommended Gear Ratio	9.0	8.0	6.8	6.0
Measured Temperature	75C	85C	85C	90C

- The above settings are based on Z5 motors with 12.5mm rotor and minimum motor Timing (must).
- The default value power manifested as: Balanced, Smooth, Emphasized control.
- The default value is not the fastest speed setting.
- Suitable for 60m straight track.
- You still have to pay more attention to the power system temperature.
- We are not responsible for any system damage caused by using the above settings.
- The default value can be changed without notification.

Ttronic V2.1

Ttronic V2.1

™
TRACK
&FIELD

1. 介绍

　　市场上大多数的无刷电子调速器(ESC)都具备调节单一进角的功能。通过微调Timing来改变马达动力输出的特性。但是Dualsky的工程师和车手发现，单一的进角无法满足车模比赛的特点——马达转速变化大，动力输出范围宽。因此，这样的Timing设定很难兼顾马达在低、中、高速时对动力和效率的要求。

　　Dualsky Ttronic 应运而生。通过分别设定马达低、中、高三个转速域的ESC参数，以达到最适应赛道的动力表现。这是所有人所期望的！

2. 注意事项

● Ttronic V2.1固件专为XC850TF设计；
● 所有Track&Field电调均可更新Ttronic固件，但是请慎重使用；
● 非XC850TF使用Ttronic固件会导致保修失效；
● 主要为低转速的STOCK马达设计，也就是10.5T、13.5T、17.5T、21.5T；
● Ttronic也可用于MOD马达，但由于MOD马达属于高转速，建议Timing ADV应该设定为Zero；
● 建议配合Dualsky Z5马达使用，马达进角应放在最小位置；
● Ttronic技术仅适用于有感模式；
● 细微的设定改变，可能导致马达工作温度明显变化；
● 齿轮比对动力输出影响很大，测试应从较高的齿轮比开始。

3. 使用方法

● XC850TF出厂已预装T-tronic V2.1固件。
● 可以通过ESC按键改变aD²RP²预设的竞赛设定。使用车手的成熟设定。
● 也可以使用USB LINK 链接PC，设定多达9项的参数。
● 非XC850TF电вар), 可以使用USB LINK的固件更新功能来升级Ttronic固件。

4. 工作原理

Ttronic

起步，小弯道	大弯道，小直路	大直路
低	中	高 >>>>

- 描述：
  描述：ESC处于零进角工作，可以优化启动阶段和小弯道中的加速感觉，对马达温度也有较大影响。
  涉及项目：Start Mode，Start RPM。

- 描述：决定马达在大直道和小直路上的动力和效率，影响加速度。设定围绕Timing ADV进行，这是一种动态进角补偿技术。Start RPM会同时影响低速和中速。
  涉及项目：Timing ADV，Start RPM，End RPM。

- 描述：当马达进入大直路，处于高转速工作时，开启E-Booster（超增压）功能，进一步提升转速，增加车速。
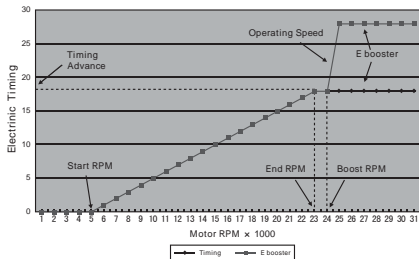 涉及项目：E-Booster，Boost RPM，Operating Speed，Return Speed，Full Throttle Only。

E-Booster 为高速阶段的核心技术。当转速提升到一定程度，对应中转速的Timing ADV已经发挥不出马达的功率和效率。此时E-Booster的介入可进一步增加进角，提升马达功率和效率。

Timing ADV和E-Booster的本质都是角度（degree），Timing ADVz作用在中转速区间，E-Booster补偿高转速区间的动力，两者可以叠加。

DDRP	Custom	
Start Mode	6(*)	
Timing Advance	0(*)	
Start RPM	15,000 rpm(*)	
End RPM	30,000 rpm(*)	
E booster	25(*)	
Boost RPM	35,000 rpm(*)	
Operating Speed	300 ms(*)	117 ms
Return speed	300 ms(*)	117 ms
Full Throttle Only	Yes(*)	

Track&Field Ttronic

Operating Speed
E booster

Timing Advance

Start RPM

End RPM   Boost RPM

Electric Timing (vertical axis): 0 5 10 15 20 25 30

Motor RPM × 1000 (horizontal axis): 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31

— Timing   ▪— E booster

5. 设定项描述

1. Start Mode 启动模式。车辆起步过程中，ESC动力输出的速度。设定分为9档。
   数值越高，动力输出越迅速。
   数值越大，油门响应速度越快；数值越小，油门响应速度越慢；
   数值4-6，适合电动越野；数值6-8，适合电房MOD马达；数值8-9，适合电房STOCK马达。

马达动力

最高车速   运行时间

加速性   操控性

—— Start Mode High
—— Start Mode Low
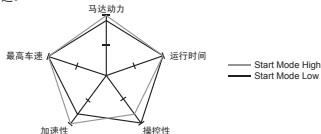
2. Timing ADV 进角。技术上的定义为：马达旋转换相时，动力输出的提前角度。单位为度，设定范围0~64度，步长为1度。Ttronic技术中，进角随马达转速动态增加。这里的进角度数是在全油门之前的整个油门行程中都会工作并与起始转速、截止转速相配合。当马达转速达到了设定的起始转速后就会开始进角的释放，并在设定的截止转速之前将设定的进角度数释放完毕。进角值设定的越大马达转速就越高，耗电量也会随之增加。

Timing High
Timing Low

马达动力
最高车速
运行时间
加速性
操控性
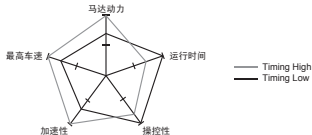
3. Start RPM 起始转速。动态进角（Timing ADV）开始介入的马达转速。单位RPM，设定范围500~20,000RPM，步长500RPM。
起始转速值设定的越大则进角介入的时间间越晚；起始转速设值定的越小前段进角介入的时间越早。当马达转速到设定的起始转速之后，电变才会逐步的增加前段进角。在起始转速达到之前，电变是以0进角的状态工作。

Start RPM High
Start RPM Low

马达动力
最高车速
运行时间
加速性
操控性
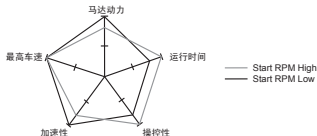
4. End RPM 终止转速。动态进角增加完成时的马达转速。单位RPM，设定范围5000~65,000RPM，步长1000RPM。当马达到达这个转速时，ESC将所有Timing ADV分配给了马达。截止转速值设的越大，前段进角就越缓慢的缓慢；截止转速设定的越小，前段进角释放的越快速：前段进角值一定会在马达到达截止转速值之前释放完毕。


End RPM High
End RPM Low

马达动力
最高车速
运行时间
加速性
操控性
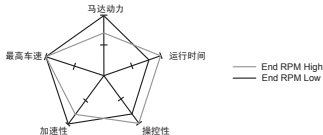
在相同的起始转速至截止转速区域之间设定的前段进角值越大，车子的加速度就越快，同时耗电量也会增加，马达温度也会上升的更多。在设定合适的进角值之后可以通过调节起始转速与截止转速来调整马达的操控手感。

- 起始转速5000，截止转速20000：如果调整至起始转速2000，截止转速20000。虽然前段进角值并没有改变，但是通过调节起始转速后油门的敏感度更高，因为进角会更早的介入。但是由于截止转速过高的关系车架的中段加速度依旧显得无力。
- 如果调整至起始转速15000，截止转速2000。由于压缩了整个转速域，进角释放完毕的时间更少。车架的中段加速度会得到改善，同时马达温度也会变得更高。如果进角度会带来更大的电流，电流过大容易烧毁马达。在调节车辆加速度的同时要注意马达的温度。

5. E-Booster加速器（超增加）。高速阶段进角的大小。单位：度，设定值范围0~64度，步长为1度。不同于Timing ADV的递增过程，E-booster是一次性释放出来。后段进角一般来说只会设定在车架比较高速时才释放，可以帮助车架在较长的直路获得更高的车速。注意：Timing ADV和E-Booster两者之和不能超过64度。

E-Booster High
E-Booster Low

马达动力
最高车速
运行时间
加速性
操控性
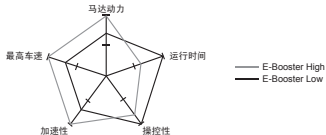
6. Boost RPM 开启转速。到达该转速，E booster被释放出来。单位：RPM. 设定范围5000~65,000RPM，步长1000RPM。当马达转速达到了Boost RPM所设定的转速后，后段进角才会开启并与前段进角进行叠加，使车架在直路上获得更高的车速。使用ibooster来控制后段进角的开启时机，更精准的控制车辆在合适的时机获得额外的动力补偿。并且可以有效的避免选手在激烈的比赛中产生误操作。


— Booster RPM High
— Booster RPM Low
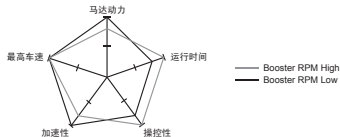
7. Operating Speed 开启速度。E-Booster释放的速度。单位：秒/64度，设定范围0~2秒/64度，步长0.1s(100ms)。注意，此项目为释放全部64度E-booster的时间。所以，实际释放时间要小于这个值（实际时间Ttronic电脑设定界面上会显示）。
选择更少的释放时间能够获得更快的释放速度，就能让车辆获得更快的加速度，同时也会提升马达的工作温度。例如：300MS=0.3秒释放完64度的后段进角。
为了方便玩家使用新版本的软件特地增加了右边的自动计算栏，软件会根据玩家之前所选的后段进角及释放速度自动计算出实际的释放时间。
例如：

| E booster | 64度 | |
Operating speed	300MS	实际释放速度300MS
E booster	32度	
Operating speed	300MS	实际释放速度150MS

— Operating Speed High
— Operating Speed Low
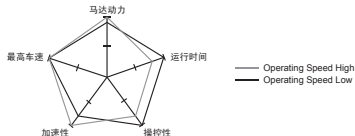
8. Return Speed 关闭速度。E-Booster关闭速度选项。单位：秒/64度，设定范围0~2秒/秒，步长0.1S(100ms)。注意，此项目为关闭全部64度E-booster的时间。所以，实际关闭时间要小于这个值（实际时间Ttronic电脑设定界面上会显示）。为了防止后段进角瞬间关闭时造成的刹车效应，新版程序增加了这个至关重要选项。工作原理和Operating Speed 基本相同只是在后段进角关闭的时候才起到作用，自由调节后段进角关闭的速度可以适应不同车架及赛道特性。

E booster	64度	
Return speed	300MS	实际关闭速度300MS
E booster	32度	
Return speed	300MS	实际关闭速度150MS

— Return Speed High
— Return Speed Low
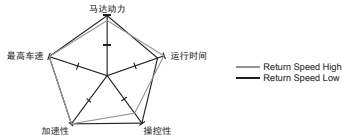
9. Full Throttle Only全油门选项。这是一个开关选项。这将可避免在复杂弯道中E-Booster被错误激活。选择YES时，后段进角的开启条件是遥控器油门处于全油门位置+达到后段进角(E-booster)开启转速；选择NO时，后段进角的开启条件是达到后段进角(E-booster)开启转速，YES的选项更适合大部分玩家。

— Full Throttle Only OFF
— Full Throttle Only ON
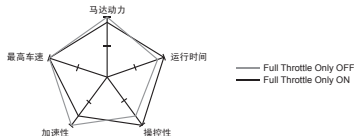
- 任何情况下前段进角与后段进角相加后进角总数不要超过64度。在对应较慢的马达上时（例如13.5...17.5）可以使用较多的前段进角（40-50度），配合较少的后段进角（10-14度）来达到增加前段加速度的目的；在对应较快的马达时（例如 4.5...5.5）可以使用较少的前段进角（0-15度），配合（15-25度）的后段进角。
- 在对应较慢马达时后段进角的开启转速可以和前段进角的截止转速相同，甚至小于前段进角的截止转速。以达到前后进角叠加增加的效果。（后段进角开启转速小于前段进角截止转速的设定需要拉高截止转速并关闭全油门选项）
- 在直路比较短的赛道上，需要使用较快的后段进角释放速度（80MS-120MS左右），较慢的释放速度可以略微降低一些马达工作温度。如果选择了非常大的后段进角（25-30度）可以适当放慢一些释放速度（100MS-150MS）。
- 后段进角的关闭速度直接影响到车架的整体操控性。过快的关闭速度会使后段进角过快消失，拖低马达转速，产生刹车效应，影响车辆行驶的稳定性。高速后接圆弯的赛道建议使用较快的关闭速度（120MS-180MS）。高速�转头弯的赛道可以使用较快的关闭速度来帮助刹车（50MS-100MS）。不同品牌车架之间不同的固定内齿轮比也会影响到后段进角关闭速度的使用效果。以内齿比2.0为基准，越小的内齿轮比（如1.7:1）对于后段进角过快消失而产生的刹车效应越不敏感，内齿轮比越大（2.35:1）刹车效应越严重。

6. 车手的设定

D²RP 运行模式 Dualsky Digital Racing Profiles	* Profile 1 MOD 4.5T	Profile 2 For 10.5T	Profile 3 For 13.5T	Profile 4 For 17.5T
1	Start Mode 启动模式	6	9	9	9
Timing 进角选项					
2	Timing ADV 进角	0	35	40	50
3	**Start RPM** 起始转速	N/A	5,000	3,000	500
4	**End RPM** 终止转速	N/A	25,000	15,000	15,000

D²RP 运行模式 Dualsky Digital Racing Profiles	* Profile 1 MOD 4.5T	Profile 2 For 10.5T	Profile 3 For 13.5T	Profile 4 For 17.5T
E booster 加速器选项					
1	E booster 加速器	25	20	24	14
2	Boost RPM 开启转速	35,000	30,000	20,000	18,000
3	Operating Speed 开启速度	300ms	300ms	300ms	100ms
4	Return Speed 关闭速度	300ms	300ms	300ms	100ms
5	Full Throttle Only 只针对全油门	Y	Y	Y	Y

建议齿比	9.0	8.0	6.8	6.0
实测温度	75C	85C	85C	90C

- 此设定基于Z5马达，转子采用12.5mm，马达进角为最小（必须）；
- 预设值的动力表现为：均衡，顺畅，强调操控性；
- 预设值不是车速最快的设定；
- 适合具有60m直路的赛道；
- 仍然要密切关注主动力系统温度；
- 不对任何采用此设定导致的系统损坏负责；
- 预设值改变，恕不通知。