



ESCAPE32 Configuration Settings

ESC development has been quite exciting in recent years. BLHeli32 was amazing, but being proprietary and having the company deciding not to continue, it went the way of the Dodo. Then AM32 came along, and with its open-source nature, it rapidly came to the forefront. Having numerous configuration options, it could be used for just about anything. But now we have another contender, and I expect it will soon be at the forefront: ESCAPE32. It has all the configuration options of AM32, plus several more. A notable feature is that it uses a Wi-Fi dongle to configure the firmware, like what is done with ELRS. Among other things, that means you can alter configurations at the field using your mobile phone. It can send telemetry to a CRSF UART, which means telemetry can not only go through a controller, but also to an ELRS receiver with a UART port. And as ELRS is rapidly heading towards being the RC operating system of choice, we are talking about having all the best!

We have recently produced a video comparing a couple of AM32 ESCs with an ESCAPE32 ESC. As you watch it, you will begin to see what I'm talking about. Here it is:

<https://youtu.be/h73-LmelHgU>

Now, in that video I said I would provide this document covering all the settings available in ESCAPE32. This is it!

Connecting to Wi-Fi for configuration

It's dead easy, but if you are unsure about it, have a look at the above videos.

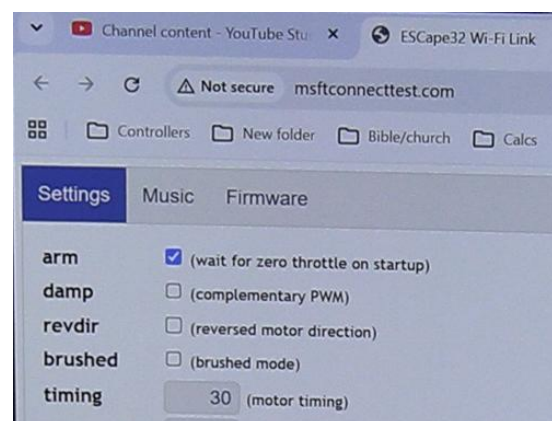
You will need a battery to power the ESC and a Wi-Fi dongle ("WiFi-Link ESC Configuration Tool"). I'm assuming your ESC will have a BEC (battery elimination circuit). Otherwise, you will need to cobble up a throttle connector with power supplied.



Have a mobile phone or computer with Wi-Fi capability at hand. Plug in the power to the ESC, then plug in the throttle cable to the dongle. Go to your Wi-Fi settings on the computing device where you select the Wi-Fi network and wait for the "Escape32_WiFi_Link" network to come up. Click on it, then click the "Connect" button.

A screen with all the settings will come up.

See the three tabs across the top. We will begin with "Settings," as that is the main one you will be working with it, and it will be the first you see.



Settings

Arm

Tick this box, as it is a good safety feature. It will require the throttle to be at zero before you can arm the system. And, without the system armed, the throttle will not work. Ticking the item is equivalent entering a "1" and unticked it is not enabled and the value for it is "0."

Damp

This is like Complementary PWM in AM32, only its name makes more sense. It is going to make the motor slow down when you cut the throttle. In fact, it's turning the motor into a little generator, restoring a tiny bit of power to the battery. But the biggest thing is that it will slow down the motor.

Most flyers will have this disabled to allow the prop to freely spin when the throttle is cut. Leave it unticked for this. But for two other situations you will want to have it ticked:

- For powered sailplanes you will want to stop the prop, either so it can fold, or simply to reduce drag. A spinning prop has more drag than a stationary one.
- If you are a pattern flyer, then you might like to use a combination of settings to give some braking action when descending nose down.

For either of these two situations you would start by ticking this, then down under drag brake and duty lock we will give you some more settings to add.

Rev Dir

Reverse the direction that the motor spins.

Brushed

Most of us will be using brushless DC motors, either inrunners or outrunners. If that's your situation, don't select this.

Timing

This is one thing that surprised me about ESCape32. With the unit that I tested, it doesn't have a choice for Automatic Timing. You need to select one value. 15 to 18 would be common for an outrunner. 20 to 26 for an EDF inrunner. 31 was the maximum that could be selected on the unit I tested.

If your motor makes a loud screeching sound, lower the timing value. Otherwise, you can bump it up a couple of degrees at a time and see if you get smoother running and higher RPM. As you do so, check to see if either the ESC or motor is overheating. That can happen with higher timing values.

Sine Range

This is for sinusoidal start up, as used with ground vehicles. When their motors first start to turn, they have to develop a certain amount of torque to move the vehicle. That resistance makes it difficult for the ESC to find the location of the rotor in the motor to know which coils to send signals to. So, with this option it simply starts sending a rotating set of pulses that the rotor will follow. Once it gets going, then the back EMF signals coming back to the ESC from the

magnets passing over motor coils can be detected by the ESC, which then tells it where it is, allowing it to send the normal 'three phase' electrical pulses for operation.

This range is what percent of throttle that this mode will go up to, starting from zero. Once it gets up to that throttle level, then it will switch over to normal operation. 20 to 25% is common.

For an airplane, quad copter, helicopter or EDF jet this is not needed. Any pulse sent by the EDF to the motor will cause it to jump, and it immediately knows then the position of the rotor, and off it goes! Furthermore, if you are in the air with a prop or fan that freely rotates at zero throttle, the ESC again will know the rotor position from the back EMF, and it will respond to the throttle instantly.

Sine Power

A brushless DC motor can generate a huge amount of torque at low RPM. Not only can it break things, but it will draw all the current that it can to do that, even if it is more than it, the ESC or the battery can handle. That means instant electrical component toast or something busted. So, setting something reasonable here can save a lot if you are using sinusoidal startup. The default is 8%. For something like a rock crawler, it could go up to 12%. Keep it low and only raise it if the vehicle is stuttering.

Keep in mind that with sinusoidal start up, the ESC has no idea of where the rotor is, so it's sending a rotating set of pulses at an RPM that corresponds to the throttle position. If it is not providing enough power for the motor to keep up with that RPM, then it's falling behind while still getting bumped with the pulses that are trying to make it go, but not quite succeeding. That is why it is stuttering.

Increasing the power beyond the point where the motor has no problem keeping up under load with the rotating pulses will only cause it and the ESC to get hot. You don't want that. So, increase it to the point where it still operates smoothly with the motor under load at low RPM, and don't go much higher.

Freq Min and Max

Your ESC will dynamically change the frequency as appropriate due to RPM, load and whatever else is going on. These two figures are the range that it will operate in. 24 to 48 would be common for an outrunner. An EDF inrunner would need something higher, perhaps 48 to 96. Higher frequencies allow the motor to run smoother and more efficient, but they also create more heat in the ESC. The peak RPM of the motor will have a lot to do with the high end of the range. Double the RPM basically means that the PWM frequency needs to be doubled.

Duty Spup

Duty spin-up power. Whenever you see "Duty," it has something to do with the application of power. Spin-up has to do with what's happening in the first second or so from when the throttle is applied. This is a critical time for frying things, as we have mentioned, so we need to go easy. 5 to 10% is common for an outrunner. 10 to 15% for an inrunner.

Duty Ramp

This softens the throttle punch at low RPMs. For planes, just set it at 0, which has it disabled. That gives you very quick throttle response, and just spinning a prop isn't a problem. What this setting is for is to keep land vehicles from having excessive wheel spin when you hit the throttle.

It's measured in kERPM. 'k' is for 1,000. ERPM is electronic RPM. It is equal to the actual RPM of the motor times the number of pole pairs. So, a 14 pole outrunner has 7 pole pairs. If it is running at 10,000 RPM, that's 70,000 ERPM or 70 kERPM.

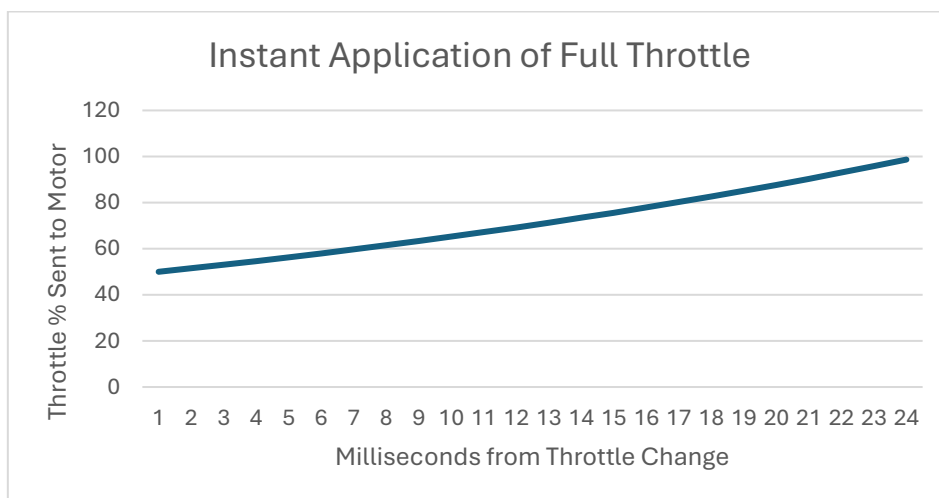
The value of kERPM that you set here is the point where the motor has ramped up to full power. So, let's say that your EDF jet is having some problems stuttering during initial application of power, or it is desyncing. In a situation like that you might want to put in a small duty ramp perhaps 5 kERM. Typically having an inrunner, it might have two pole pairs, so that means that from zero throttle up to when the motor is spinning at 2,500 RPM it's gradually increasing the power being applied. By the time it reaches 2,500 RPM it is using full power.

For rock crawlers, a value of 15 to 20 would be common. For heavy models that need a bit more "oomph" to get going, use a lower value.

Duty Rate

How quick a throttle response is need when the throttle position is changed, or when a point is hit where a duty cycle changes. Higher values give a more aggressive, quick response. Lower values smooth things out. It is measured in units of 0.1% per millisecond. Note that this is different than with AM32. A value of 30 to 35 would be common for planes, with 3D models being at the higher end. EDF jets would need a value of 25 to 30.

So, with a value of 30, if you were flying at 50% throttle and instantly slapped the stick to full throttle, this is how the ESC would interpret the throttle signal:



So, in 0.024 seconds it would be at full throttle. That's not much of a delay!

If you try this and your motor stutters, reduce the value.

Note that Duty Rate is sometimes referred to as Slew Rate.

Duty Drag, Duty Lock

Duty Drag is for slowing down when the throttle is cut. This is normally at zero for a plane. 30 to 40% is common for ground vehicles. Higher for heavy ones.

Duty Drag is what to do, duty lock is whether to do it passively or actively. Duty Lock is unticked for it to be passive – no power is used to slow it down or hold it stopped. But the Duty Drag setting will govern how much of the soft, passive resistance to add via the motor and ESC

circuitry – not by sending power pulses but by directing what happens with the electricity generated by the spinning motor. Of course, to do that you need to have Damp enabled, up near the top of the list.

When Duty Lock is ticked, then it will actively, and abruptly, apply power to stop the motor and actively hold it in the stopped position. If it is under load, like a land vehicle parked on a slope or an airplane gliding through the air with the prop trying to turn, then it is going to draw electricity from the battery and generate heat. If that continues for a length of time, both of those could be a problem.

That brings us to two exceptions to the ‘normal’ Duty Drag setting of ‘0.’

- For a powered sailplane, set duty drag at ‘100’ and Duty Lock unticked.
- For a F3A or similar pattern plane, also have Duty Lock unticked, but then start by setting Duty Drag at ‘10.’ In a test flight, note how much the increase in airspeed is reduced in a steep dive. In a series of tests, increase it by 2 each time and select the setting that optimises braking in that situation. Using your Wi-Fi dongle at the field with a mobile phone or tablet will allow you to do that effectively.

The setting on Duty Drag will adjust how much braking force is used whether or not Duty Lock is activated. Naturally, that braking force will be much greater with Duty Lock activated.

Throt Mode

Throttle Mode. Generally, forward only unless you need to be able to reverse your motor. The next option, forward and reverse (1), would be used on aircraft with reverse thrust. The next two options include braking and are for land vehicles.

Throt Set

Throttle Set. This is idle speed. So, given that you don’t want your motor running whenever you power up your plane, leave this as ‘0.’

Throt ztc

Throttle coasting. Activate this if you have a helicopter to enable auto rotation in an emergency landing. Otherwise, leave it unticked. You may not have this in your menu if your firmware is earlier than version 15.

Throt Cal

Throttle Calibration. This should be ticked to enable calibrating your transmitter throttle stick using the traditional method of turning your transmitter on with the stick all the way up, then after hearing some beeps, pulling it all the way down, and finally turning it off after hearing the completion beeps.

Analog Min

Analog Minimum. Set at 100 or ignore. It’s only used when the Input Mode is Analog. That is generally not the case. See the next item.

Input mode

0: servo/Oneshot125/DSHOT

1: analog

- 2: serial
- 3: iBUS (FlySky)
- 4: SBUS/SBUS2 (FrSky/Futaba)
- 5: CRSF (TBS/ELRS)
- 6: EXBUS (Jeti)
- 7: HoTT (Graupner)

If you are using a normal pwm servo output from the ESC to go to the receiver or controller, then select '0' – servo. Otherwise, select the one that applies.

Input Child

If you are using a serial mode, then you need to specify which channel is being used for the throttle here.

Tele Mode

Telemetry Mode.

- 0: KISS
- 1: KISS auto
- 2: iBUS (FlySky)
- 3: S.Port (FrSky)
- 4: CRSF (TBS/ELRS)
- 5: MSB (Multiplex)
- 6: HoTT (Graupner)

Tele phid

Telemetry physical ID. The address or slot offset used to identify telemetry data without clashing with controller systems.

- 0 – off
- 1 to 2 - iBUS/MSB
- 1 to 4 - SBUS2
- 1 to 8 – CRSF
- 1 to 28 - S.Port

Prot Stall

Stall Protection. If the motor is struggling to keep turning at low RPMs, this will give it a power boost. Good for rock crawlers. A bad idea for airplanes whose props can dig into the ground or get caught in a tree – not to mention your fingers! Leave it unticked.

Prot Sens

Protection Sensor. Source for the temperature sensor.

- 0 – ESC
- 1 – motor
- 2 – both the motor and the ESC

Naturally, the motor needs to have a temperature sensor if you want to select it.

Prot Volt

Voltage Protection value. Minimum voltage per cell that you want the ESC to avoid by reducing power. Set at '0' to disable. Otherwise, multiply the desired value by 10, and put in that figure.

Prot Cells

The number of cells in the battery providing power to the ESC.

Prot Current

The maximum current that you want the ESC to avoid by reducing power.

Note that all these protection features, when enabled, incorporate the following:

- Sag filter. The voltage is allowed to drop briefly when there is a sudden burst of power.
- Progressive power limiting. As you approach the protection limit, the ESC will gradually reduce the maximum throttle ceiling available.

Music

Provide coding in the RTTTL format. Songs are available online, or you can follow the ESCape32 instructions to create your own. Those are given under the Music tab, which, when you paste content into there and save it, will get placed into this spot in settings.

BEC

BEC voltage provided on the ESC output tab for the battery elimination circuit, where enabled.

- 0 – 5.5v
- 1 – 6.5v
- 2 – 7.4v
- 3 – 8.4v

LED

Activating this enables the LED status lights. The external tab can power LEDs which operate at 3.3 to 5 volts. The status is as follows:

- R: solid - temperature/voltage/current protection
- G: blinking slow/fast - forward/reverse, inversed/normal blinking - sine startup/trap mode
- B: blinking once/twice - passive/active drag brake

Additional tabs

At the top you also have a music and firmware tab. We've already mentioned the music one. Naturally, under the firmware tab you have the option of updating your ESCape32 firmware.

Ongoing updates

Continual development is going on in a system like this. From time to time we will be updating this content. Already we are seeing that there are supposed to be some options that are not showing on our ESCs. So, we will be looking into that and will seek to keep you informed. You can receive those updates by subscribing to our blog here on our web page, RCJim.com.