



## Thank you for purchasing ZTW A-Series Brushless Electronic

### Speed Controller (ESC)

High power systems for RC model can be very dangerous and we strongly suggest that you read this manual carefully. ZTW Model have no control over the use, installation, application, or maintenance of these products, thus no liability shall be assumed nor accepted for any damages, losses of costs resulting from the use of this item. Any claims arising from the operating, failure or malfunctioning etc. will be denied. We assume no liability for personal injury, property damage or consequential damages resulting from our product or our workmanship. As far as is legally permitted, the obligation for compensation is limited to the invoice amount of the product in question.

The ZTW ESC's high power BEC has been specifically designed for extreme aerobatics and therefore has the capability to support the higher momentary peak demand loads to eliminate the possibility of unwanted shutdowns, and is also capable of supporting continuous simultaneous multiple servo operations typically found in CCFM equipped hardware 3D E-helicopters.

### Wires Connection:

The speed controller can be connected to the motor by soldering directly or with high quality connectors. Always use new connectors, which should be soldered carefully to the cables and insulated with heat shrink tube. The maximum length of the battery pack wires shall be within 6 inches.

- Solder controller to the motor wires,
- Solder appropriate connectors to the battery wires,
- Insulate all solder connectors with heat shrink tubes,
- Plug the "TR" connector into the receiver throttle channel,
- Controller Red and Black wires connects to battery pack Red and Black wires respectively.

Brushless Speed Controller



### Specification:

Type	Cont. Current(A)	Burst Current(A) 10 sec.	Battery cell NiCd/Lipo	Weight (g)	BEC Output	Size (mm) W*H*H	User Program
A-ZTW3A BEC	3A	5A	3-10 NiCd 1-3 Lipo	2.5	5V / 1A	13 x 17 x 4	yes
A-ZTW6A BEC	6A	8A	5-12 NiCd 2-3 Lipo	5	5V / 1A	13 x 21 x 4	yes
A-ZTW8A BEC	8A	10A	5-12 NiCd 1-24 Lipo	8	5V / 1A	21 x 22 x 4	yes
A-ZTW10A BEC	10A	12A	5-12 NiCd 1-24 Lipo	8	5V / 1A	21 x 22 x 4	yes
A-ZTW12A BEC	12A	16A	5-12 NiCd 1-24 Lipo	8	5V / 1A	21 x 22 x 4	yes
A-ZTW20A BEC	20A	30A	5-12 NiCd 1-24 Lipo	18	5V / 2A	23 x 33 x 6	yes
A-ZTW25A BEC	25A	35A	5-12 NiCd 1-24 Lipo	20	5V / 2A	23 x 33 x 6	yes
A-ZTW30A BEC	30A	40A	5-12 NiCd 1-24 Lipo	28	5V / 3A	23 x 43 x 6	yes
A-ZTW40A SBEC	40A	60A	5-18NiCd 1-26 Lipo	32	5.5V / 4A	23 x 52 x 7	yes
A-ZTW50A SBEC	50A	70A	5-18NiCd 1-26 Lipo	32	5.5V / 4A	23 x 52 x 7	yes
A-ZTW60A SBEC	60A	80A	5-18NiCd 1-26 Lipo	44	5.5V / 4A	23 x 52 x 14	yes
A-ZTW70A SBEC	70A	90A	5-18NiCd 1-26 Lipo	48	5.5V / 4A	23 x 52 x 14	yes
A-ZTW85A SBEC	85A	100A	5-18NiCd 1-26 Lipo	60	5.5V / 4A	34 x 52 x 14	yes
A-ZTW110A SBEC	110A	120A	5-18 NiCd 1-26 Lipo	86	5.5V / 4A	34 x 52 x 20	yes
A-ZTW120A OPTIO HV	100A	120A	18-38NiCd6-12Lipo	76		34 x 52 x 20	yes

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### Programming Mode Audible Tones

Programming Mode Audible Tones	ESC Functions
Throttle Calibration	
1. Within the first 4 Sec. *** ** *	Brake
2. Battery type	Brake On / Off
	NiCad
	Lipo
3. Low Voltage Cutoff Threshold	
	Low 2.8V/50%
	Medium 3.0V/60%
	High 3.2V/65%
4. Restore Factory Softw Defaults	Restore
5. Timing Setup	Automatic (7-30 deg)
	Low (7-22 deg)
	High (22-30 deg)
6. Soft Acceleration Start Ups	Very Soft
	Soft Acceleration
	Start Acceleration
7. Governor Mode	Soft off
	Half first range
	Half second range
8. Motor Rotation	Forward/ Reverse
9. Switching Frequency	8kHz
	16kHz
10. Low Voltage Cutoff Type	Reduce Power
	Hard Cut Off

### Using Your New ESC

Improper polarity or short circuit will damage the ESC therefore it is your responsibility to double check all plugs for proper polarity and first fit BEFORE connecting the battery pack.

### Alert Tones

The ZTW ESC is equipped with audible alert tones to indicate abnormal conditions at power up.

1. Continuous beeping tone (\*\*\*\*) - Indicates that throttle stick is not in the minimum position.
2. Single beeping tone followed by a one second pause (\* \* \* \*) - Indicates that the battery pack voltage exceeds the acceptable ranges. (The ESC automatically checks and verifies the battery voltage once the battery is connected).

### Built-in Intelligent ESC Safety Functions

1. **Over-heat protection:** When the temperature of ESC exceeds 110 deg C, the ESC will reduce the output power to allow it to cool.
2. **Lost Throttle signal protection:** The ESC will automatically cut power to the motor when it detects a loss of throttle signal for 2 seconds, then the motor will emit continuous beeping tone.

### POWERING UP THE ESC FOR THE FIRST TIME & SETTING THE AUTOMATIC THROTTLE CALIBRATION

The ZTW ESC features Automatic Throttle Calibration to attain the smoothest throttle response and resolution throughout the entire throttle range of your transmitter. This step is done once to allow the ESC to "learn and memorize" your Transmitter's throttle output signals and only repeated if you change your transmitter.

1. Switch your Transmitter ON and set the throttle stick to its maximum position.
2. Connect the battery pack to the ESC. Wait for about 2 seconds, the motor will beep for twice, then put the throttle in the minimum position, the motor will also beep, which indicates that your ESC has got the signal range of the throttle from your transmitter.

**The throttle is now calibrated and your ESC is ready for operation.**

### ENTERING THE PROGRAMMING MODE

1. Switch your Transmitter ON and set the throttle to its maximum position.
2. Connect the battery pack to the ESC. Wait for about 2 seconds, the motor will beep for twice, then put the throttle in the minimum position, the motor will also beep, which indicates that your ESC has got the signal range of the throttle from your transmitter.
3. Wait until you hear two short beeps (\*\* \*\* \*) confirming that the ESC has now entered the programming mode.
4. If the throttle stick is left in the maximum position beyond 5 seconds, the ESC will begin the sequence from one function and its associated setting options to another. (Please refer to the table below to cross reference the functions with the audible tones).
5. When the desired tone for the function and setting option is reached, move the throttle stick down to its minimum position. The ESC will emit two beeps (\*\* \*) confirming the new setting has been stored.
6. The ESC only allows the setting of one function at a time.

**Therefore should you wish making changes to other function, disconnect the battery pack and wait 5 seconds to reconnect the battery and repeat the above steps.**

### ZTW A-Series ESC's Features:

- ◆ Extremely low internal resistance
- ◆ Super smooth and accurate throttle linearity
- ◆ Safety thermal over-load protection
- ◆ Auto throttle shut down in signal lose situation
- ◆ Supports high RPM motors
- ◆ Power arming protection (prevents the motor from accidentally running when switched ON)
- ◆ New Advanced programming software

### ZTW A-Series's ESC allows you to program all functions to fit your specific needs, which makes it very efficient and user friendly:

1. User programmable brake setting (we recommend using brake for only folding props applications)
2. User programmable battery type (Lipo or NiCd/NiMH)
3. User programmable low voltage cutoff setting
4. User programmable factory default setup restore
5. User programmable timing settings (to enhance ESC efficiency and smoothness)
6. User programmable soft acceleration start ups (for delicate gearbox and helicopter applications)
7. User programmable governor mode (for helicopter applications)
8. User programmable motor rotation (clockwise/counterclockwise)
9. User programmable switching frequency
10. User programmable low voltage cutoff type (power reduction or immediate shutdown)

### Settings:

#### 1. Brake: ON/OFF

- \* **ON** - Sets the propeller to the brake position when the throttle stick at the minimum position (Recommended for folding props).
- \* **OFF** - Sets the propeller to freewheel when the throttle stick is at the minimum position.

#### 2. Battery type: Lipo or NiCad/ NiMH

- \* **NiCad/ NiMH** - Sets Low Voltage protection threshold for NiCad/ NiMH cells.
- \* **Lipo** - Sets Low voltage protection threshold for Lipo cells and automatically detects the number of cells within the pack.

Note: Selecting the NiCad/ NiMH option for the battery type, triggers the ESC to automatically set the cutoff threshold to the factory default of 60%. The cutoff threshold can then be subsequently altered through the Low Voltage protection function, if required. The ESC will read the initial voltage of the NiCad/ NiMH pack once it is plugged in and the voltage read will then be used as a reference for the cutoff voltage threshold.

#### 3. Low Voltage Protection Threshold (Cutoff Threshold):

##### Low / Medium / High

- 1) For Lipo packs: number of cells is automatically calculated and requires no user input apart from defining the battery type. This ESC provides 3 setting options for the low voltage protection threshold; Low (2.8V) / Medium (3.0V) / High (3.2V). For example: the voltage cutoff options for an 11.1V / 3 cell Lipo pack would be 8.4V (Low) / 9.0V (Med) / 9.6V (High)
- 2) For Ni-xx packs: low / medium / high cutoff voltages are 50%/60%/65% of the initial voltage of the battery pack. For example: A fully charged 6 cell NiMH pack's voltage is 1.44V x 6 = 8.64V when "LOW" cutoff voltage is set, the cutoff voltage is: 8.64V x 50% = 4.3V and when "Medium" or "High" is set, the cutoff voltage is now 8.64V X 65% = 5.61V.

#### 4. Restore factory setup defaults:

**Restore** - Sets the ESC back to factory default settings;

Brake	OFF
Battery type Detect.	Lipo with Automatic Cell
Low voltage Cutoff threshold:	Medium (3.0V/60%)
Timing Setup.	Automatic
Soft Acceleration Start Up:	Soft Acceleration
Governor Mode :	RPM OFF
Frequency :	8kHz
Low Voltage Cutoff Type:	Reduce power

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### 5. Timing Setup : Automatic/ Low / High.

- \* **Automatic (7-30 deg)** - ESC automatically determines the optimum motor timing

- \* **Low (7-22 deg)** - Setting for most 2 pole motors.

- \* **High (22-30 deg)** - setting for motors with 6 or more poles.

In most cases, automatic timing works well for all types of motors. However for high efficiency we recommend the Low timing setting for 2 pole motors (general in-runners) and high timing for 6 poles and above (general out-runners). For higher speed, High timing can be set. Some motors require different timing setups therefore we suggest you to follow the manufacturer recommended setup or use the automatic timing setting if you are unsure.

Note: Run your motor on the ground first after making any changes to your motor timing!

### 6. Soft Acceleration Start ups: Very Soft / Soft Acceleration/ Start Acceleration

- \* **Very Soft** - Provides initial slow 1.5 sec ramp-up from start to full rpm intended to protect delicate gears from stripping under instant load. This setting is recommended for either fixed wing models equipped with gearboxes and / or helicopters.

- \* **Soft Acceleration** - Provides initial slow 1 sec ramp-up from start to full rpm. This setting is recommended for either fixed wing models equipped with gearboxes and or helicopters.

- \* **Start Acceleration** - Provides quick acceleration start ups with a linear throttle response. This is recommended for fixed wing models fitted with direct drive setups.

### 7. Active RPM Control (Heli Governor mode)

#### \* RPM Control OFF

- \* **First range:** There will be a 5-second delay from start to full rpm, but if the throttle is cutoff after starting, then the next start will be as normal start.

- \* **Second range:** There will be a 15-second delay from start to full rpm, but if the throttle is cutoff after starting, then the next start will be as normal start.

Note: Once the Governor Mode is enabled, the ESC's Brake and Low Voltage Cutoff Type settings will automatically be reset to No Brake and Reduce Power respectively regardless of what settings they were previously set.

### 8. Motor Rotation: Forward/ Reverse

In most cases motor rotation is usually reversed by swapping two motor wires. However, in cases where the motor cables have been directly soldered the ESC cables, motor rotation can be reversed by changing the value of setting on the ESC.

### 9. Switching Frequency : 8kHz/16kHz

- \* **8kHz** - Sets ESC switching frequency for 2 pole motors, e.g., in-runners.

- \* **16kHz** - Sets ESC switching frequency for motors with more than 2 poles, e.g., out-runners.

Although 16kHz is more efficient with our Thrust motors, the setup default is 8kHz due to the higher RF noises caused at 16kHz.

### 10. Low Voltage Cutoff Type : Reduce Power / Hard cutoff

- \* **Reduce Power** - ESC reduces motor power when the pre-set Low Voltage Protection Threshold value is reached. (recommended)
- \* **Hard Cutoff** - ESC instantly cuts motor power when the pre-set Low Voltage Protection Threshold value is reached.

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Trouble	Possible Reason	Action
Motor doesn't work after powering up the ESC. An alert tone with continuous beeping tones (****) is emitted.	The throttle stick is not in the minimum position at power up.	Move the throttle stick to the minimum position.
Motor doesn't work after powering up the ESC. ESC emits two audible tones followed by short beeps (** ** ** ** )	Reversed throttle channel caused the ESC to enter the programming mode.	Enter the servo reverse menu on your transmitter and reverse the throttle channel. Note: For Futaba radios set the throttle channel to Reverse.
Motor runs in reverse rotation	Wrong cables polarity between the ESC and the motor.	Swap any two of the three cable connections between the ESC and the Motor or access the Motor Rotation function via the ESC programming mode and change the pre-set parameters.
Motor stops running in flight.	Lost throttle signal	Check proper operation of the radio equipment. Check the placement of the ESC and the Receiver and check the route of the receiver's aerial and ESC cables to ensure there is adequate separation to prevent RF interference. Install a ferrite ring on the ESC's throttle cable.
	Battery Pack voltage has reached the Low Voltage Protection threshold.	Land the model immediately and replace the battery pack.
	Possible bad cable connection	Check and verify the integrity of the cable connections.
Motor restarts abnormally ESC Overheats	Possible RF Interference at the flying field.	The normal operation of the ESC may be susceptible to surrounding RF interference. Restart the ESC to resume normal operation on the ground to verify recurrence. If the problem persists, test the operation of the ESC at a different flying field.
	Inadequate Ventilation	Relocate the ESC to allow better ventilation.
	Servos drawing too much current and over loading the ESC.	Use servos that are adequately sized for the ESC. The maximum BEC current drawn should be within the BEC limits.
	Over sized motor or prop	Reduce Prop size or resize the motor



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