

# FANTOM

## FR-10 ESC USERS MANUAL

Thank you for choosing the Fantom FR-10 ESC. This ESC is the result of countless hours of R&D, to bring you a pro-level racing ESC, second to none in performance and value! The heart of the FR-10 ESC is the high-performance 32-bit CPU and proprietary firmware, providing you with buttery smooth throttle response, unmatched power delivery, and all the adjustable parameters you've come to expect from a pro racing ESC!

Install it in your car today and see what we mean by **More Power to the People!**

### WARNING / CAUTION:

- Please carefully read this entire User Manual before using your ESC.
- Improper use and/or unauthorized modification to the ESC is extremely dangerous and can cause damage to the ESC and other connected devices, such as the motor, battery, servo, and transponder, which is not covered under warranty.
- Make sure the battery voltage does not exceed the rating shown in the specifications chart.
- Connecting the battery with reverse polarity will cause immediate damage to the ESC, which is not covered under warranty.
- Make sure all connection points are insulated, where possible, to avoid short circuits, which are not covered under warranty.
- Make sure the battery connectors are firmly secured into the battery. Loose battery connectors can cause your battery case to melt at the connection points, which are not covered under warranty.
- Use a minimum 50-watt soldering iron for all input and output connections.
- Before attempting any soldering, make sure that you are confident in your soldering abilities. Improper soldering can cause short circuits and poor performance, which is not covered under warranty. If you are unsure about soldering, please find someone with experience who can help you.
- Do not allow the ESC to exceed 105°C/221°F, which can cause permanent damage to the ESC and/or motor, which is not covered under warranty. We recommend leaving the "over-heat protection" set to the default setting of 221°F and using the included fan, for the best protection and performance.
- You must disconnect the battery after use. Even when the ESC is off, it will continue to slowly discharge the battery. Over-discharged LiPo batteries can be permanently damaged and are very dangerous. Over-discharged batteries can cause fire, explosion, bodily injury and property damage, which Fantom or any of Fantom's associates cannot be held responsible for. Damage to the ESC and/or battery, caused by an over-discharged battery is not covered under warranty.
- Do not rev the ESC to full throttle when your vehicle is lifted off the bench or overturned on the track, as this can cause rubber tires to shred or explode, which is very dangerous and can cause bodily injury and property damage, which Fantom or any of Fantom's associates cannot be held responsible for. This can also cause permanent damage to your motor, which is not covered under warranty.
- This ESC is not a toy. Adult supervision is required at all times.
- Fantom Racing owners, employees, affiliates, manufacturers, dealers and distributors cannot be held responsible for any damage and/or injury caused from the use and/or misuse of this product. The user accepts full responsibility for the use of this product. By using this product, the user agrees to all the information contained in this document. If you disagree with anything written in this document, please return this product to the source that you purchased it from. The product must be in brand new condition to be accepted for return.

**FEATURES:**

- All R&D done in the USA.
- Specifically designed for the highest level of stock and mod competition, with advanced firmware, for the ultimate power, response, and control.
- 32-bit high-performance CPU.
- 2,303 Strand, 11awg, Ultra Low Resistance Wire.
- CNC Machined Red/Black Aluminum Case w/ Integrated Heat Sink.
- High-Turbulence Heat Sink Design - Optimizes airflow for maximum cooling.
- Ultra-Low Resistance FET Board.
- 3 Integrated Max Power Capacitors.
- 25mm Fan w/ Aluminum Fan Cover.
- Heavy-Duty Solder Posts.
- On-Board Power Button with LED.
- Blinky Mode Software.
- Off-By-Radio Function.
- Ultra-smooth, Precision Throttle & Brake Frequency Adjustment.
- Ultra-Precision Throttle, Brake, and Punch Control.
- Fully programmable with the Fantom LCD Program Card by itself (sold separately), or you can Program the ESC or Update the ESC Firmware with the Fantom LCD Program Card combined with the advanced PC Interface (see instruction in the LCD Program Card User Manual).
- Multiple protection features include low voltage cut-off protection, over-heat protection, and throttle signal loss protection.
- Compatible with Sensored and Sensorless Brushless Motors.
- Data Analysis Capability includes RPM, Low Voltage and ESC Temperature.

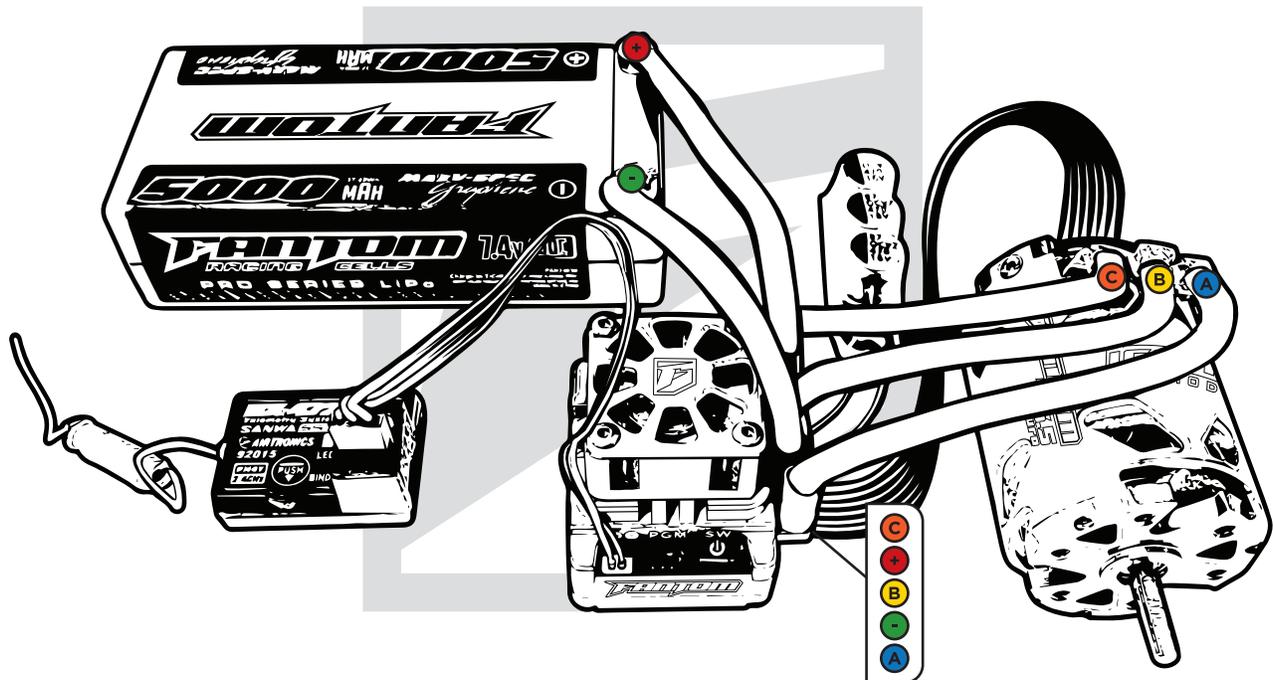
**SPECIFICATIONS:**

MODELS		FR-10 PRO 160A	FR-10 PRO STOCK 95A
Continuous Current		160A	95A
Battery Input	3.7V per cell LiPo	2-3 Cells	2 Cells
	1.2V per cell NiMH	4-6 Cells	4-6 Cells
BEC Output		Linear 6V / 7.4V Adjustable / 5A	Linear 6V / 7.4V Adjustable / 3A
Size (L x W x H) mm without fan		38 x 30.6 x 19.3	31.5 x 25.6 x 15.1
Weight (not including wiring and fan)		48g	45g
LCD Program Card		✓	✓
Recommended Applications		2S-3S 1/10th Scale	2S 1/10th Scale
Sensored		✓	✓
Sensorless		Compatible but not optimal	Compatible but not optimal
Motor Limit (2S LiPo - motor timing at 0°)		4.5 Turn or over	6.5 Turn or over

## INCLUDED IN BOX:

- FR-10 PRO ESC
- 25mm Fan
- Machined aluminum fan cover
- 2 x 165mm Input Wires - 11awg / 2,303 strand super-flex high performance wire (pre-soldered on ESC)
- 3 x 165mm Output Wires - 11awg / 2,303 strand super-flex high performance wire (pre-soldered on ESC)
- 3 Integrated Max Power Capacitors
- Shrink Tube w/ Fantom logo
- Red shrink tube for marking positive battery wire

## CONNECTION DIAGRAM:



## INSTALLATION:

1. Mount the ESC in your vehicle, using double-sided tape, in the location recommended in your vehicle's instruction manual. We recommend using 3M® brand double-sided tape.
2. Connect the speed control BEC connector (3 small black wires) into channel 2 of the receiver. Make sure to pay close attention to polarity. The BEC connector has two beveled edges, that should match most brand's receiver input plug.
3. Solder the power wire "A" to the motor "A" solder-tab.
4. Solder the power wire "B" to the motor "B" solder-tab.
5. Solder the power wire "C" to the motor "C" solder-tab.
6. Connect the hall sensor cable (sold separately) to the speed control (underneath the solder tabs) and to the motor's sensor cable port. Make sure to pay close attention to the orientation. Both sensor cable connectors have "ears" that must match the orientation of the notches in the sensor ports.

**INSTALLATION (continued):**

7. Connect the power wire “+” to the “+” side of your battery connector (wired type battery), or to the “+” connector going to the “+” side of your battery (inboard bullet type battery). We highly recommend marking the “+” wire with the included short piece of red heat shrink tube, to help avoid mistakenly plugging the “+” connector into the “-” side of the battery, which will cause immediate damage to the ESC, which is not covered under warranty.

Connect the power wire “-” to the “-” side of your battery connector (wired type battery), or to the “-” connector going to the “-” side of your battery (inboard bullet type battery).

**Important Tips:**

1. Avoid soldering longer than 5 seconds per solder joint, when replacing the power wires on the ESC. Prolonged heat from the soldering iron can cause permanent damage to the circuit board, which is not covered under warranty.
2. The BEC wire is only used to connect the ESC to the radio receiver. To connect the ESC to the LCD Program Card, you must use the signal cable that is included with the LCD Program Card.
3. We recommend using the fan for the best protection and performance. Excess heat can cause permanent damage to the internal components and/or premature failure, which is not covered under warranty. Also, excess heat increases the electrical resistance of the ESC, which in turn lowers the performance capability.

**ESC SETUP:****STEP 1: Transmitter Settings**

Before setting up the ESC, please setup the following functions on your transmitter, if available.

<b>FUNCTION DESCRIPTION</b>	<b>NAME IN RADIO</b>	<b>SETTING REQUIREMENT</b>
Throttle Travel	High ATV, EPA	100%
Brake Travel	Low ATV, EPA, ATL	100%
Throttle Exponential	EXP, EXPO	Set at 0
Neutral Trim	Sub Trim	Center
Servo Reverse	Throttle Reverse	Any setting, keep unchanged after the set-up procedure

**STEP 2: Set Forward, Brake and Neutral endpoint data to the ESC**

1. Switch off the ESC and disconnect the ESC from the battery.
2. Remove the pinion gear from the motor, to keep the wheels from potentially spinning during calibration which can be very dangerous.
3. Switch the transmitter on and leave the throttle in the neutral position.
4. Connect the battery to the ESC. Press and hold the on/off button to turn on the ESC.  
First, the LED will light Red and Blue (purple), followed by Blue only.
5. Once the LED turns solid Blue, the “throttle range setting mode” has been entered and the neutral position has been set. Release the on/off button.

**STEP 2: Set Forward, Brake and Neutral endpoint data to the ESC (continued)**

6. Pull the trigger to the full throttle position. The Blue LED will blink 3 seconds and then turn solid Blue, and the motor will beep 1 time. The full throttle position has been set.
7. Push the trigger to the full brake position. The Red LED will blink 3 seconds and then turn solid Red, and the motor will beep 2 times. The full brake position has been set.
8. Release the trigger back to the neutral position. The Red and Blue (purple) LED will blink 1 second and then turn solid Red and Blue (purple), and the motor will beep 3 times. The “throttle range settings” have been completed.
9. Press and release the on/off button, to turn off the ESC. The ESC is ready for use, once it is turned on again.

**STEP 3: Check the ESC endpoints:**

The ESC's Forward, Brake, and Neutral endpoints can be checked based on the following LED status.

<b>FUNCTIONS</b>	<b>STATUS LED COLOR</b>
Neutral	Blinking BLUE - Blinky Mode / Solid BLUE - Modified Mode
Full Throttle	RED + BLUE (purple)
Full Brake	RED

**Important Tips:**

- If the above LED status corresponds to the ESC functions, then the setup procedure has been completed and the ESC is ready for use.
- If you make a mistake during the setup procedure, turn off the ESC and repeat all “STEP 2”.
- In setup mode, the ESC will store the Forward, Brake and Neutral position settings inside the built-in memory, even if it is disconnected from the battery.
- If the ESC won't enter the “throttle range setting mode”, try reversing the Throttle and Brake in your radio settings and then repeat all “STEP 2”.

**READY FOR USE**

Your ESC is now ready to use with the default settings. To get the maximum performance out of your ESC, we recommend experimenting with the user accessible parameters. To access the customizable parameters requires the Fantom LCD Program Card (sold separately). You can purchase the LCD Program Card from the dealer you purchased your ESC from, or from our website. Once you have the LCD Program Card, you can follow the basic instructions, included with the LCD Program Card, in the Quick Guide, or download full detailed instructions at: [www.fantomracing.com/downloads](http://www.fantomracing.com/downloads)

**Important Tips:**

1. ALWAYS turn your radio on, before turning on your ESC.
2. ALWAYS turn your ESC off, before turning off your radio.

**LED INDICATION**

<b>FUNCTION</b>	<b>LED</b>	<b>LED STATUS</b>
Battery Low Voltage Warning	Red LED	Blinking (in modified mode only)
ESC Over-Heat Warning	Red + Blue (purple) LED	Blinking (in modified mode only)
Stock (Blinky) Mode	Blue LED	Blinking (throttle in neutral position)
Modified Mode	Blue LED	On Solid (throttle in neutral position)

- ***RED LED blinking during operation:*** When the ESC is in "Modified" mode, this indicates that the battery has reached the default Low Voltage cut-off, or the Low Voltage cut-off setting that you customized with the LCD Program Card (see LCD Program Card manual). Once this function is activated, power to the motor will stop. When the ESC is in "Stock" mode, this LED function is disabled, but power will still stop to the motor, if the battery reaches the low voltage cut-off that you have set.
- ***BLUE+RED LED blinking during operation:*** When the ESC is in "Modified" mode, this indicates that the ESC has reached the default Over-heat temperature, or the Over-heat temperature setting that you customized with the LCD Program Card (see LCD Program Card manual). Once this function is activated, the ESC will reduce power to the motor by 50%. When the ESC is in "Stock" mode, this LED function is disabled, but power will still be reduced to the motor, if the ESC reaches the over-heat temperature that you have set.
- ***BLUE LED blinking in neutral position:*** This indicates that the ESC is in Stock Mode (Blinky / Zero Timing). Turbo and boost cannot be accessed in this mode.
- ***BLUE LED on solid in neutral position:*** This indicates that the ESC is in Modified Mode. Turbo and boost can be accessed and adjusted in this mode.

**ESC FIRMWARE FLOW CHART** (Fantom LCD Program Card required to edit – see LCD Program Card Manual)

SECTION	PROGRAMMABLE ITEM		PROGRAMMABLE VALUE																
Application	Running Mode		Forward / Brake			Forward / Brake / Reverse				Forward / Reverse									
	Low Voltage Cut-off		Disable			Auto(3.3V/Cell)				Custom 3.0v to 11.1v (0.1v increments)									
	ESC Over-heat		203°F / 95°C		221°F / 105°C			266°F / 130°C		Disable									
	Motor Rotation		Normal					Reverse											
	Race Mode		Modified					Stock (Blinky)											
	Dead Band		4%-15% (1% increments)																
	BEC Output		6.0V					7.4V											
Throttle	IP- Limiter		1-30 (1 step increments)																
	Throttle Rate		1-30 (1 step increments)																
	Drive Frequency		1K, 2K, 4K, 8K, 16K																
	RPM Lock		1%-100% (1% increments)																
	Throttle Curve		Linear					Custom (must use PC Interface)											
Brake	Initial Brake		1%-20% (1% increments)																
	Drag Brake		0%-100% (1% increments)																
	Brake Force		0%	12.5%	25%	37.5%	50%	62.5%	75%	87.5%	100%								
	I-Brake Response		1-20 (1 step increments)																
	Brake Rate		1-20 (1 step increments)																
	Brake Frequency		1K, 2K, 4K, 8K, 16K																
	Brake Curve		Linear					Custom (must use PC Interface)											
	Off By Radio		Yes					No											
Timing	Boost	Boost Timing		0-64° (1° increments)															
		Boost Trigger Level		1-50 (1 step increments)															
		Boost Trigger Rate		1-10 (1 step increments)															
	Turbo	Turbo Timing		0-64° (1° increments)															
		Activation Method		Full Throttle			RPM				Full Throttle + RPM								
		Turbo Delay		Instant	0.05s	0.1s	0.15s	0.2s	0.25s	0.3s	0.35s	0.4s	0.45s	0.5s	0.6s	0.7s	0.8s	0.9s	1.0s
		Turbo Timing Start RPM		8,000 RPM to 50,000 RPM (1,000 RPM increments)															
		Turbo On Rate		1-10 (1 step increments)															
		Turbo Off Rate		Instant					1-10 (1 step increments)										

**TROUBLESHOOTING**

SYMPTOM	POTENTIAL CAUSES	ACTIONS TO TRY
No motor and/or no servo functions	Wiring problem	Check wire and all connections
	Wrong polarity when the BEC wire was connected to the receiver	Correct the polarity when connecting the BEC wire to the receiver
	Transmitter, Receiver or Battery defective	Replace the components one by one
	Speed control defective	Send to Fantom for repair
No motor function, but servo is working	Wiring problem	Check wire and all connections
	Sensor cable defective and/or missing	Replace sensor cable
	Motor defective	Replace motor
	Speed control defective	Send to Fantom for repair
Motor stutters while accelerating	Sensor cable defective and/or missing	Replace sensor cable
	Motor or sensor board defective	Replace sensor board and/or motor
	Power Capacitor failure	Replace the Power Capacitor
	Radio Interference	Change the ESC and/or Receiver location
	Speed control defective	Send to Fantom for repair
Motor runs at constant slow speed and never stops	Transmitter settings changed after setup	Repeat ESC set up procedures
	Humidity / water in ESC	Dry the ESC
Radio Interference	Transmitter batteries low	Replace / Charge transmitter batteries
	Bad battery connection	Check wire and all connections
	Receiver, transmitter, or servo defective	Replace the components one by one
	Wrong polarity when the BEC wire was connected to the receiver	Wrong polarity when the BEC wire was connected to the receiver

**FANTOM FR-10 WARRANTY / REPAIR**
**Product Warranty – 2 Year Limited/Pro-rated Warranty**

Fantom ESC's are manufactured to the highest quality standards. Due to the intended use of this product, this product is guaranteed against workmanship and manufacturing defects only. This warranty is in effect for a period of 2 years from the original date of purchase. **The purchase date must be verified by an itemized cash register sales receipt. No hand-written receipts will be accepted. If your ESC has been serviced before, a copy of the Fantom warranty/repair invoice must be included with your ESC, or the warranty start date will revert to your original purchase date. NO EXCEPTIONS.** Warranty coverage is at our discretion upon reviewing the product.

## IMPORTANT INFORMATION

- No Fantom dealers, distributors, or resellers of any kind, are authorized to repair and/or replace any Fantom products. ALL warranty claims and/or repairs must be handled directly with Fantom.
- Fantom will not reimburse any expenses incurred to return any Fantom product, whether for warranty claim or repair.
- Fantom is NOT responsible for any lost or stolen items once they are in the possession of the shipping company. Fantom is not responsible for items delivered to the wrong address. Fantom will not be responsible for replacing any lost, stolen, or incorrect delivery of any item.
- Before sending your ESC in for warranty review, please review the troubleshooting chart and make sure that you have tried all the actions listed. Also, please double check that all the installation and setup procedures have been done correctly. Upon review of your returned ESC, if we find that no problems exist with the ESC, a \$10 diagnosis fee plus the return shipping cost will be charged.
- The receiver wire is required for diagnosis. If your ESC is returned with a clipped receiver wire, a \$15 service fee will be charged for the replacement, even if your ESC is otherwise covered under warranty.
- This warranty is non-transferable.
- Fantom's liability shall never exceed the product's original cost.
- Because Fantom has no control over the use of this product the purchaser accepts all responsibility and cannot hold Fantom responsible for any damages and/or injury incurred by improper use or improper judgment in using this product.

Warranty is void if any of the following condition(s) are found, or evidence of the following is determined, but not limited to:

- No sales receipt is provided
- Misuse, abuse, or normal wear
- Receiver wire damaged
- Physical damage to the case
- Physical damage to the electronic components, i.e. MOSFET board, PCB control board, fan, etc.
- Humidity/Water inside the ESC
- Evidence of over-heating
- Solder on the MOSFET and/or PCB control board (except on solder pads)
- Evidence that the ESC was connected to the battery with reverse polarity
- Damage by a crash or any natural disaster
- Use in an application that it is not rated for (see specifications chart)
- Detached capacitor
- Exceeding the specified limitations (see specifications chart)
- Shorted connections
- Incorrect wiring
- If modifications have been made
- If attempts to repair have been made, other than by Fantom

**IMPORTANT INFORMATION (continued)**

If we determine that your ESC meets our warranty conditions, here's how the warranty works:

- The first 180 days, your ESC will be covered 100%. It will be repaired or replaced, and shipped back to you at no cost to you.
- 181 to 270 days, the pro-rated cost is \$75.00, plus return shipping. Your ESC will be repaired or replaced with a refurbished unit, for \$75.00, plus the cost of Priority Mail shipping, to your location, with insurance.
- 271 to 365 days, the pro-rated cost is \$105.00, plus return shipping. Your ESC will be repaired or replaced with a refurbished unit, for \$105.00, plus the cost of Priority Mail shipping, to your location, with insurance.
- 366 days to 2 years, the pro-rated cost is \$150.00, plus return shipping. Your ESC will be repaired or replaced with a refurbished unit, for \$150.00, plus the cost of Priority Mail shipping, to your location, with insurance

For warranty claims, ship your ESC to:

**FANTOM RACING**

15170 Dickson Rd,  
White Pigeon, MI 49099

Include the following:

1. Original cash register sales receipt, or Fantom warranty/repair invoice from a previous service.
2. Your name, return address, daytime phone number, and email address.
3. A brief note explaining the problem you are experiencing.
4. Credit card number, expiration date, CVV code, and billing address, if you are claiming warranty after 180 days from the date of purchase or previous service. If you prefer PayPal, include your PayPal address.
5. Your ESC well protected inside the box.

If we receive your ESC without all the information requested above, we will not contact you to retrieve the information, and we will not replace/repair your ESC until all the information is provided. Unclaimed products after 60 days will be considered abandoned.

## Product Repair

If we determine that your ESC does not meet our warranty conditions, here's how our repair service works:

- Once we receive your returned ESC, we will determine what needs to be repaired. If we determine that the cost to repair it will exceed the cost of a refurbished ESC, we can offer you a refurbished ESC at the cost of \$170, plus return shipping and insurance. Refurbished ESC's have been rebuilt to factory specs, and include new wires, new power capacitor, latest firmware, and a 180-day warranty. They do not come with a 2-year pro-rated warranty as a new ESC does.
- If we determine that your ESC can be repaired, here are the repair costs.
  - Replace Case - \$50
  - Replace Receiver Wire - \$15
  - Replace Battery / Motor Wires - \$32
  - Replace MOS Board - \$67 (includes new wires)
  - Replace Control Board - \$55

Once we determine the condition of your ESC, we will contact you to give you your options. No repair or replacement will be done without your prior authorization. Repair or replacement costs do not include return shipping or insurance.

For repair service, ship your ESC to:



**FANTOM RACING**

15170 Dickson Rd,  
White Pigeon, MI 49099

Include the following:

1. Your name, return address, daytime phone number, and email address.
2. A brief note explaining the problem you are experiencing.
3. Credit card number, expiration date, CVV code, and billing address. If you prefer PayPal, include your PayPal address.
4. Your ESC well protected inside the box.

If we receive your ESC without all the information requested above, we will not contact you to retrieve the information, and we will not repair or replace your ESC until all the information is provided. Unclaimed products after 60 days will be considered abandoned.

Fantom Racing reserves the right to change the provisions of this warranty at any time without prior notification. The information provided on our website is based on our experience and is only our opinion. Because there are so many variables, your experience may differ from ours. By no means is any information given as a guarantee to a product's performance, and the purchaser assumes all risk and liabilities.

If we are unable to service a defective product, that is no longer available, your product will be repaired or replaced with a product that equals or exceeds your original item, with all applicable charges applied.

Due to ongoing development, prices, products, availability, and specifications are subject to change without notification.

**DISCLAIMER:**

By using this product, you agree with and acknowledge that you have read and understand all the instructions and warnings contained in this document and that you agree to take full responsibility and assume all risks associated with the use and/or misuse of this product and related products. You also agree that Fantom Racing owners, employees, affiliates, manufacturers, dealers, distributors, and resellers cannot be held responsible for any damage and/or injury caused from the use and/or misuse of this product. If you disagree with anything written in this document, please return this product. The product must be in brand new condition to be accepted for return.

**CONTACT INFO:**

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Phone: 269.483.0200

[www.fantomracing.com](http://www.fantomracing.com)