



BALLISTIC BRUSHLESS MOTOR INSTRUCTIONS

55-3600-1 Rev. D

PRECAUTIONS

NEVER FREE-REV THE MOTOR Free-running your brushless motor in a no-load condition can result in rotor failure and ESC transistor damage & will void the product's warranty!

Never free-rev your system to "see how it runs" or you may not get to drive it again!

- **WATER & ELECTRONICS DON'T MIX** Never allow water, moisture, or other foreign materials to get inside motor, or on PCBs.
- **NOVAK MOTORS & ESCs FOR BEST RESULTS** Use Novak sensored motors with Novak Brushless ESCs for best performance & protection. Only use motors with the proper number of turns to match ESC's rating.

Use of this brushless motor with non-Novak ESCs and ESCs that advance motor timing can result in excessive current draw & severe motor damage that will NOT be covered by the product's warranty!

- **DO NOT use Ballistic 550 4.5T-5.5T motors above a 3S Li-Po pack.**
- **DO NOT use 3.5-7.5T motors with Havoc 2S, Havoc 3S or Mongoose ESCs.**
- **INSULATE EXPOSED WIRES** Use heat shrink tubing to prevent shorts.
- **NO SOLVENTS** Do NOT expose the motor to any type of solvents.
- **SET GEAR MESH PROPERLY** Too tight of a gear mesh can result in motor pinion shaft breakage--be sure to adjust mesh properly.

ACCESSORIES

- 5351 Brushless Shielded Sensor Harness--4"--Double-ended motor sensor harness.
- 5352 Brushless Shielded Sensor Harness--6"--Double-ended motor sensor harness.
- 5353 Brushless Shielded Sensor Harness--9"--Double-ended motor sensor harness.
- 5413 Heat Sink Motor Sleeve--Black--Replaces Novak 540 motor sleeve.
- 5414 Heat Sink Motor Sleeve--Purple--Replaces Novak 540 motor sleeve.
- 5415 Heat Sink Motor Sleeve--Blue--Replaces Novak 540 motor sleeve.
- 5416 540 Novak Brushless Motor Cooling Kit--Black--Heat sink sleeve & 25mm fan.
- 5417 540 Novak Brushless Motor Cooling Kit--Purple--Heat sink sleeve & 25mm fan.
- 5418 540 Novak Brushless Motor Cooling Kit--Blue--Heat sink sleeve & 25mm fan.
- 55420 540-Size Novak Brushless Motor Sleeve--Black--Novak replacement sleeve.
- 55421 540-Size Novak Brushless Motor Sleeve--Blue--Novak replacement sleeve.
- 55422 540-Size Novak Brushless Motor Sleeve--Gold--Novak replacement sleeve.
- 55423 540-Size Novak Brushless Motor Sleeve--Purple--Novak replacement sleeve.
- 55424 540-Size Novak Brushless Motor Sleeve--Orange--Novak replacement sleeve.
- 55425 550-Size Novak Brushless Motor Sleeve--Black--Novak replacement sleeve.
- 5508 14GA Brushless Wire Set--2 pieces each of 9" silicone blue, yellow, orange, black & red.
- 5509 16GA Brushless Wire Set--2 pieces each of 9" silicone blue, yellow, orange, black & red.
- 5512 12GA Super-Flex Wire--Black, Red, & Blue--3 ft each color, silicone.
- 5514 14GA Super-Flex Wire--Black, Red, & Blue--3 ft each color, silicone.
- 5647 Black Cooling Fan--25x25x10mm--All purpose cooling fan with 2-pin JST connector.
- 5648 Clear Cooling Fan--30x30x6mm--GTB replacement fan with 2-pin JST connector.
- 5731 3.5mm Power Connectors--5 pair--Gold plated low-loss connectors for 1.2-14G wire.
- 5741 4mm Power Connectors--5 pair--Gold plated low-loss high-amp 1.2-14G connectors.
- 5832 Lead-Free 3% Silver Racing Solder--15g--Low-resistance, high-conductivity solder.
- 5903 Ballistic Motor Insulator Pack--Replacement paper dist, fiberglass cover & silicone grommet
- 5909 Sintered 13mm Tuning Rotor--High-power sintered neodymium tuning rotor.
- 5936 Ceramic Ball Bearing ABEC-5--Replacement oversized, front ceramic bearing
- 5938 Steel Ball Bearings ABEC-5--Replacement oversized, front steel bearing kit
- 5932 Ballistic Motor Hardware Kit--Replacement motor screws & shim washers.
- 5933 Ballistic 550 Motor Hardware Kit--Replacement motor screws & shim washers.
- 5940 Ballistic Front End Bell & Bearing--Black anodized/Ribbed/Factory-installed bearing.
- 5941 Sintered 12.3mm Ballistic Rotor--Replacement Ballistic sintered neodymium rotor.
- 5942 Ballistic Timing/Sensor Assembly--Replacement timing & sensor section of motor.
- 5943 Ballistic Bearing Cap & Back Bearing--Replacement bearing cap/Factory-installed steel bearing.
- 5944 Ballistic Back End Bell--Replacement back end bell of motor. Black anodized/Ribbed.
- 5945 Ballistic Crawler Timing/Sensor Assembly--Replacement timing & sensor section of crawler motor.
- 5946 Ballistic Bearing Cap/Back Bearing--Replacement bearing cap/Factory-installed ceramic bearing.
- 5947 Ballistic 550 Front End Bell & Bearing--Black anodized/Ribbed/Factory-installed bearing.
- 5948 Ballistic 550 Rotor--Replacement 12.3mm high-power sintered neodymium rotor.
- 5949 Ballistic 550 Tuning Rotor--14mm high-power sintered neodymium tuning rotor.
- 5950 Crawler Sintered Tuning Rotor--14mm high-power sintered neodymium tuning rotor.
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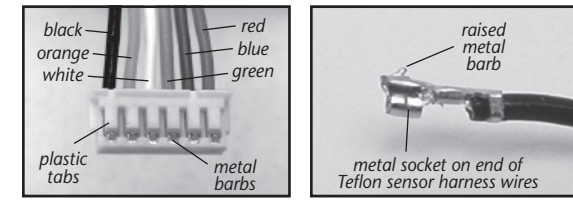
MOTOR MAINTENANCE

- **CHECK ALL MOTOR SCREWS** for loosening at regular intervals, just like other hardware on your vehicle. *Note: The 3 main socket head screws that hold the motor together may require tightening after a few runs of the motor.* Also check the 3 flat head screws securing the end cap on the back of the motor.
- **CHECK MOTOR BEARING WEAR** after extensive use. The motor's closed design will keep most dirt & debris out, but some will get in and eventually cause wear. If the shaft does not spin freely, you may need bearing replacement (*replacement bearing accessory kits are available from Novak*). A small drop of light oil on the bearings periodically can help extend bearing life--however, too much oil will attract dirt and will cause problems, so apply sparingly.
- **CLEAN INSIDE MOTOR** periodically by removing front end bell, removing the rotor, and blowing out the inside of the motor with compressed air. *Be sure not to lose any small shim washers that may be on the ends of the rotor shaft & keep them in the correct location.*

SENSOR HARNESS WIRING

Should any of the 26G Teflon wires pull out of the motor's sensor harness connector, re-insert them in the connector's appropriate slot as shown below. There is a small plastic tab that grabs a small raised barb on the back of the metal socket crimped onto the Teflon wire's end. Check the plastic tab to make sure it has not deformed excessively before inserting the socket into the plastic connector housing with the barb toward the plastic tabs.

Note: Remove or loosen the bearing cap to remove or insert a sensor harness.



SERVICE PROCEDURES

Consider changing out motor parts yourself. **All of the Ballistic's main components are available as service items**--Refer to "Accessories" section or check out our website. In most cases, replacing motor parts is less expensive than sending in your motor for service.

After reviewing instructions, tech section and how-to video section of website, if you feel your motor requires service (*motor may appear to have failed when other problems exist*), obtain the most current product service options & pricing by one of the following methods:

WEBSITE: Print a copy of the product **SERVICE FORM** from the SERVICE section of the Novak website. Fill out the needed information & return it with the Novak product.

PHONE/FAX/E-MAIL: Contact our customer service department by phone, fax, or e-mail, and we will supply you with current service options.

WARRANTY SERVICE: You **MUST CLAIM WARRANTY** on product **SERVICE FORM** & include a valid, itemized cash register receipt with the purchase date on it, or an invoice from previous service work. *If warranty provisions have been voided, there will be service charges.*

ADDITIONAL NOTES:

- Dealers/distributors are not authorized to replace products thought to be defective.
- If a hobby dealer returns your product for service, submit a completed product **SERVICE FORM** to dealer & make sure it's included with items.

PRODUCT WARRANTY

Novak Brushless motors are guaranteed to be free from defects in materials or workmanship for a period of 120 days from the original date of purchase (*verified by dated, itemized sales receipt*). Warranty does not cover incorrect installation, components worn by use, cross-connection of battery/motor power wires, overheating solder tabs, damage resulting from thermal overload or operation above 175°F, use of excessive timing or overheating, splices or damage to the sensor harness, damage from disassembling motor, tampering with internal electronics, allowing water, moisture, or any other foreign material to enter motor or get onto the PCB board, short-circuiting of motor by allowing exposed wiring or solder tabs to cross-connect or ESC applying simultaneous power to more than one phase at a time from switching to Brush Mode, free-revving motor, or any damage caused by a crash, flooding, or natural disaster. In no case shall our liability exceed the product's original cost. We reserve the right to modify warranty provisions without notice. Because Novak Electronics, Inc. has no control over the connection & use of motor or other related electronics, no liability may be assumed nor will be accepted for damage resulting from the use of this product. Every motor is thoroughly tested and cycled before leaving our facility and is, therefore, considered operational. This product is not a toy, and is not intended for use by children under 14 years of age without the strict supervision of an adult. Use of this product in an uncontrolled manner may result in physical damage or injuries. Take extra care when operating any remote control vehicle. *By the act of connecting/operating speed control, the user accepts all resulting liability.*

e-mail: cs@teammovak.com • (949) 833-8873 • FAX (949) 833-1631
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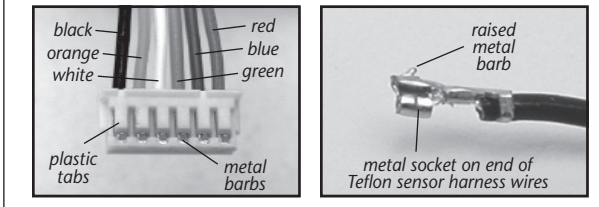
MOTOR MAINTENANCE

- **CHECK ALL MOTOR SCREWS** for loosening at regular intervals, just like other hardware on your vehicle. *Note: The 3 main socket head screws that hold the motor together may require tightening after a few runs of the motor.* Also check the 3 flat head screws securing the end cap on the back of the motor.
- **CHECK MOTOR BEARING WEAR** after extensive use. The motor's closed design will keep most dirt & debris out, but some will get in and eventually cause wear. If the shaft does not spin freely, you may need bearing replacement (*replacement bearing accessory kits are available from Novak*). A small drop of light oil on the bearings periodically can help extend bearing life--however, too much oil will attract dirt and will cause problems, so apply sparingly.
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SENSOR HARNESS WIRING

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PHONE/FAX/E-MAIL: Contact our customer service department by phone, fax, or e-mail, and we will supply you with current service options.

WARRANTY SERVICE: You **MUST CLAIM WARRANTY** on product **SERVICE FORM** & include a valid, itemized cash register receipt with the purchase date on it, or an invoice from previous service work. *If warranty provisions have been voided, there will be service charges.*

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e-mail: cs@teammovak.com • (949) 833-8873 • FAX (949) 833-1631
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INSTALLATION INSTRUCTIONS

1. NO MOTOR CAPACITORS & SCHOTTKY NEEDED

Novak brushless motors do not need motor capacitors or external Schottky diodes--**Schottky diode usage will damage ESC.**

2. CHECK MOTOR SCREW LENGTH & INSTALL MOTOR

- Insert the motor mounting screws that came with your vehicle through the motor mounting plate. **540-size motors need no more than 1/8" of screw extending past the vehicle's mounting plate (2-4mm)**--Too little can strip the motor's threads, too much will cause internal motor damage & will void warranty.
- Attach motor to vehicle's motor mount using one of the sets of threaded mounting holes--**select a mounting position that keeps the solder tabs clear of conductive surfaces like aluminum or graphite.**

3. INSTALL PINION GEAR (see GEAR SELECTION)

Install pinion on motor and test fit in vehicle to align pinion and spur gears. Tighten pinion's set screw on the flat of motor shaft.

4. ADJUST MOTOR FOR PROPER GEAR MESH

- Adjust the motor position for proper amount of free play. **You NEED to have a small amount of play between the pinion gear and the spur gear (about the thickness of piece of paper)--check the free play at several positions around the spur gear to ensure a proper mesh (just in case the gears are out of round).**

MAKE SURE THE PINION/SPUR GEAR MESH IS NOT TOO TIGHT!

If gear mesh is too tight, motor shaft breakage can occur.

- Tighten motor mounting screws--Avoid using excessive force, as the threaded holes in motor could become stripped.
- ### 5. SOLDER MOTOR POWER WIRES (skip this step if motor is wired to ESC)
- Determine the best routing in vehicle for the motor's silicone power wires--**avoid any moving parts & suspension.**
 - **Prepare ends of power wires** by stripping 1/8-1/4" of insulation from end of wire. Tin wire ends with solder.
 - **Lay tinned end of the wire flat on the solder tab and solder wires to proper tabs of the motor (refer to phase markings below solder tabs).** Apply heat with soldering iron to the power wire and solder tab--begin adding solder to tip of iron and to wire--**Add just enough solder to form a clean & continuous joint from the solder tab up onto the wire.**

WARNING: Be sure no wire strands have strayed to an adjacent solder tab--this will cause short-circuiting, damage electronics, & void product's warranty.

IMPORTANT NOTE: DO NOT OVERHEAT SOLDER TABS

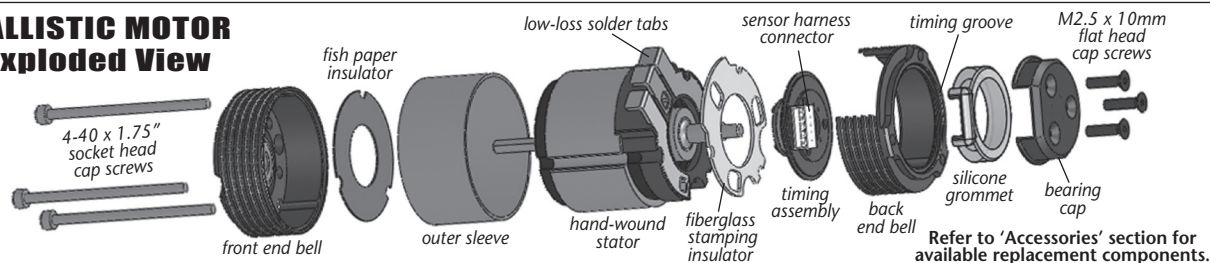
Prolonged or excessive heating of the solder tabs will cause damage & void the product's warranty.

6. CONNECT MOTOR SENSOR HARNESS

- Determine the best routing in vehicle for the motor's sensor harness--**securing sensor harness to the motor power wires with a tie-wrap can provide a good location & also act as a strain relief.**
- Connect one end of the harness to the ESC & the other end to the motor's sensor harness connector located under the back bearing cap. Be sure the plug on the end of the harness inserts all the way into the sensor harness connector--**the plug & connector are keyed and will only go together one direction.**

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BALLISTIC MOTOR Exploded View



TIMING WARNING (Important)

Due to the nature of timing advance speed controls, motor tolerances & settings, vehicle performance, and track conditions, it has become virtually impossible to provide installation and operation recommendations that will allow you to use these speed controls and motors at their highest performance levels without the potential for unwanted damage.

You must, use extreme caution when setting up these electronics and carefully test your application to avoid overloading and overheating either the speed control or the motor. These are racing electronics used in racing conditions, and therefore damage as the result of excessive overheating will not be covered under the product's factory warranty.

GEAR SELECTION (Important)

Motor operating temperature is the ONLY way to properly set the maximum vehicle gearing

The motor should be 160-175°F MAX at end of run!
Temperatures above 175°F will weaken the magnet & may melt the coils! This voids warranty & can damage ESC!
Change the gearing to avoid overheating.

Because of the potential danger of overheating, ESC/motor damage & failure, **you must start with VERY small pinion sizes** and check ESC & motor temperatures at multiple times throughout a run. This is the only way to ensure that you are not causing excessive heating.

If ESC & motor temperatures remain low & stable, you can slowly increase the pinion size while again monitoring the temperatures to determine the safe gearing for your vehicle, motor, and climate/track conditions. Because these variables can change or be modified, **you MUST continually monitor ESC & motor temperatures** to protect your electronics from damage.

If you do not change gearing after switching to brushless, you will be over geared and will have slow acceleration & excessive temperatures!

Because of the broad power band of brushless, you can go 1-2 teeth higher pinion than the above recommendations for more top speed, but remember any higher will produce excessive ESC & motor heating.

Ballistic Crawler Brushless Motors

When properly geared for use with gear reduction transmissions found in rock crawling vehicles, your brushless crawler motor and ESC should not get very hot--if you notice excessive temperatures, check motor & drive train for free operation or adjust gearing to lower temperature. Additionally, refer to your vehicle's instruction manual for gearing recommendations.

See our website for additional gearing information or if your motor is not listed above.

MOTOR TIMING ADJUSTMENT

The Ballistic motor's timing is adjustable by simply loosening the three M2.5 flat head screws on the back bearing cap, rotating the bearing cap to desired setting, and re-tighten the screws.

The motor's factory timing is marked with a timing label located on the side of the back bearing cap and lines up with a groove milled into the top of the back end bell. Novak motors are factory timed to the most efficient setting for their given wind.

Advancing the timing will increase the motor's RPM range & reduce its torque, but will also make it less efficient and it will pull more current, resulting in higher ESC & motor operating temperatures.

Adjusting the timing beyond the 45° mark on the timing label will result in dangerously high current draw and heating that can lead to ESC & motor failure, and will void the product's warranty.

Retarding the timing will reduce the motor's RPM range & increase torque--this usually also reduces current draw and lower operating temperatures. For each timing mark (on label) reduced, increase pinion gear size by one tooth to accommodate lower RPM range.

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Novak brushless motors do not need motor capacitors or external Schottky diodes--**Schottky diode usage will damage ESC.**

2. CHECK MOTOR SCREW LENGTH & INSTALL MOTOR

- Insert the motor mounting screws that came with your vehicle through the motor mounting plate. **540-size motors need no more than 1/8" of screw extending past the vehicle's mounting plate (2-4mm)**--Too little can strip the motor's threads, too much will cause internal motor damage & will void warranty.
- Attach motor to vehicle's motor mount using one of the sets of threaded mounting holes--**select a mounting position that keeps the solder tabs clear of conductive surfaces like aluminum or graphite.**

3. INSTALL PINION GEAR (see GEAR SELECTION)

Install pinion on motor and test fit in vehicle to align pinion and spur gears. Tighten pinion's set screw on the flat of motor shaft.

4. ADJUST MOTOR FOR PROPER GEAR MESH

- Adjust the motor position for proper amount of free play. **You NEED to have a small amount of play between the pinion gear and the spur gear (about the thickness of piece of paper)--check the free play at several positions around the spur gear to ensure a proper mesh (just in case the gears are out of round).**

MAKE SURE THE PINION/SPUR GEAR MESH IS NOT TOO TIGHT!

If gear mesh is too tight, motor shaft breakage can occur.

- Tighten motor mounting screws--Avoid using excessive force, as the threaded holes in motor could become stripped.
- ### 5. SOLDER MOTOR POWER WIRES (skip this step if motor is wired to ESC)
- Determine the best routing in vehicle for the motor's silicone power wires--**avoid any moving parts & suspension.**
 - **Prepare ends of power wires** by stripping 1/8-1/4" of insulation from end of wire. Tin wire ends with solder.
 - **Lay tinned end of the wire flat on the solder tab and solder wires to proper tabs of the motor (refer to phase markings below solder tabs).** Apply heat with soldering iron to the power wire and solder tab--begin adding solder to tip of iron and to wire--**Add just enough solder to form a clean & continuous joint from the solder tab up onto the wire.**

WARNING: Be sure no wire strands have strayed to an adjacent solder tab--this will cause short-circuiting, damage electronics, & void product's warranty.

IMPORTANT NOTE: DO NOT OVERHEAT SOLDER TABS

Prolonged or excessive heating of the solder tabs will cause damage & void the product's warranty.

6. CONNECT MOTOR SENSOR HARNESS

- Determine the best routing in vehicle for the motor's sensor harness--**securing sensor harness to the motor power wires with a tie-wrap can provide a good location & also act as a strain relief.**
- Connect one end of the harness to the ESC & the other end to the motor's sensor harness connector located under the back bearing cap. Be sure the plug on the end of the harness inserts all the way into the sensor harness connector--**the plug & connector are keyed and will only go together one direction.**

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BALLISTIC MOTOR Exploded View

