

VULCAN MOTOR INSTRUCTIONS

55-3640-1 Rev.3

4/2014

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!

- **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 sensor-based 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!

- **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

- 5332 Brushless Motor Connector Wire Set--14GA wire with 3.5mm bullet connectors.
- 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.
- 5508 14GA Brushless Wire Set--2 pc each of 9" silicone blue, yellow, orange, black, & red.
- 5509 16GA Brushless Wire Set--2 pc 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.
- 5649 Black Cooling Fan--25x25x10mm--Cooling fan with 2mm Mini power plug installed.
- 5731 3.5mm Power Connectors/5 pair--Gold plated low-loss connectors for 12-14G wire.
- 5741 4mm Power Connectors/5 pair--Gold plated low-loss high-amp 12-14G connectors.
- 5831 Lead-Free 3% Silver Racing Solder/6gr--Low-resistance, high-conductivity solder.
- 5832 Lead-Free 3% Silver Racing Solder/15gr--Low-resistance, high-conductivity solder.
- 5836 Heavy Duty Lead-Free 3% Silver Racing Solder/25gr--Thicker 1.5mm solder.
- 5850 Heat Shrink Tubing/6pc--6" long heat shrink tubing in six sizes: 1/16" - 3/8".
- 5851 Heat Shrink Tubing/24pc--6" long heat shrink tubing in six sizes: 1/16" - 3/8".

- 55903 Motor Insulator Pack--Replacement paper disk, fiberglass cover, & silicone grommet.
- 5909 Sintered 13mm Tuning Rotor--High-power 540 neodymium tuning rotor.
- 5927 Vulcan Vented Motor Can/Bearing--Black anodized/factory-installed bearing.
- 55928 Back End Bell/Vented--Replacement vented back end bell of motor. Black/Ribbed.
- 55929 Bearing Cap/Back Bearing--Vulcan bearing cap with exposed, factory-installed bearing.
- 55932 Motor Hardware Kit/540--Replacement motor screws & shim washers.
- 5941 Sintered 12.3mm Rotor--Replacement Vulcan/Ballistic 540 sintered neodymium rotor.
- 55942 Timing/Sensor Assembly--Replacement 540/550 timing & sensor section of motor.
- 55943 Bearing Cap/Back Bearing--Bearing cap with non-exposed, factory-installed bearing.
- 55944 Back End Bell/Closed--Back end bell of motor without cooling vents. Black/Ribbed.
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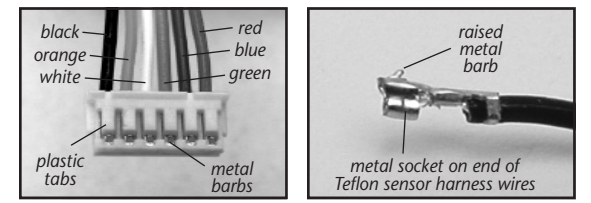
MOTOR MAINTENANCE

- **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 bearing cap on the back end of the motor.
- **CHECK MOTOR BEARINGS** periodically. *The motor bearing shields will keep the majority of dirt & debris out, but some will get in and cause wear.* Wipe off the bearings regularly and check if motor shaft spins freely. If shaft does not spin freely, you may need bearing replacement (*replacement bearing accessory kits are available from Novak*). If needed, apply a small drop of light oil to the bearings periodically to help extend bearing life--(*Too much oil will attract dirt & will cause problems, so apply sparingly*).
- **CLEAN INSIDE MOTOR** periodically by removing front end can, 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

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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/E-MAIL: Contact our customer service department by phone 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 receipt with the purchase date on it, or an invoice from previous service work. *If warranty provisions have been voided, there will be a service fee.*

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- Dealers/distributors are not authorized to replace products thought to be defective.
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PRODUCT WARRANTY

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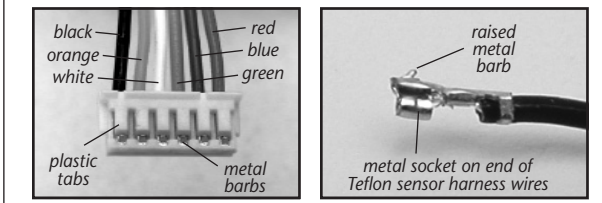
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INSTALLATION INSTRUCTIONS

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

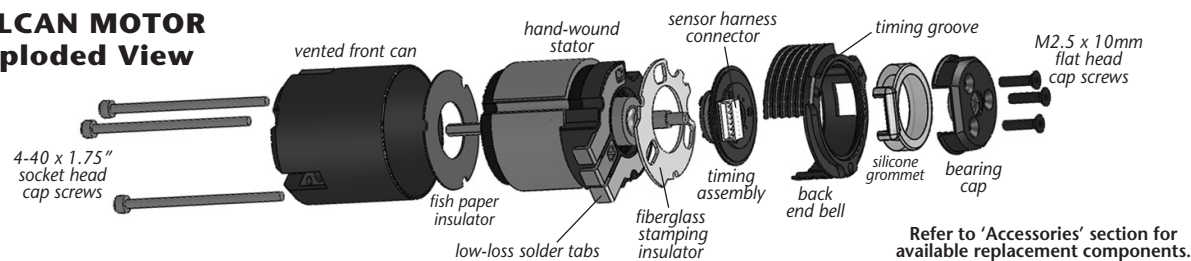
Prolonged or excessive heating of the solder tabs will cause damage & void the product's warranty.

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.**

www.teamnovak.com

VULCAN MOTOR Exploded View



OVERHEATING -- WARNING!

Due to the nature of racing, 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 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 for shorter high speed runs, but continued usage will produce excessive ESC & motor heating.

Brushless Motors in Rock Crawling Applications

Brushless crawler motors and ESCs should not get very hot with typical gear reduction rock crawling transmissions--if you notice excessive temperatures, check motor & drive train for free operation or adjust gearing to lower temperature. Refer to vehicle's manual for proper gearing.

See our website for additional gearing information

MOTOR TIMING ADJUSTMENT

The Vulcan's timing is adjusted by loosening the bearing cap's three M2.5 flat head screws, rotating cap to desired setting, & re-tightening screws--**DON'T OVER-TIGHTEN.** 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.

ZERO DEGREE CRAWLER TIMING

Align sensor harness with solder tabs.

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

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

Adjusting timing beyond the 45° mark on timing label will result in dangerously high current draw & excessive heating that can lead to ESC & motor failure. MELTED STATORS ARE NOT COVERED BY THE WARRANTY!



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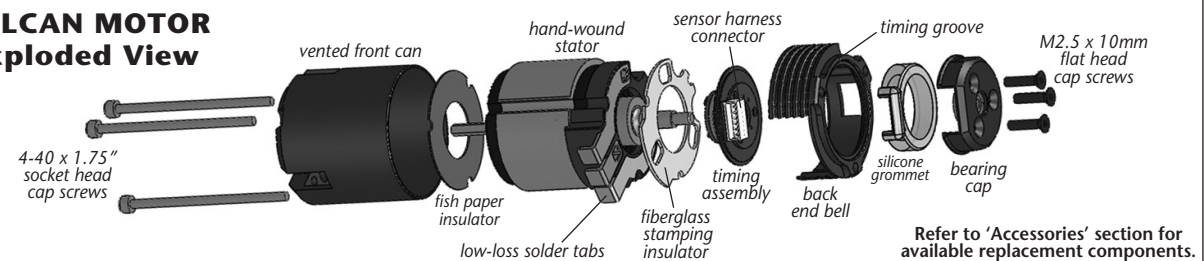
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Motor operating temperature is the ONLY way to properly set the maximum vehicle gearing

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 for shorter high speed runs, but continued usage will produce excessive ESC & motor heating.

Brushless Motors in Rock Crawling Applications

Brushless crawler motors and ESCs should not get very hot with typical gear reduction rock crawling transmissions--if you notice excessive temperatures, check motor & drive train for free operation or adjust gearing to lower temperature. Refer to vehicle's manual for proper gearing.

See our website for additional gearing information

MOTOR TIMING ADJUSTMENT

The Vulcan's timing is adjusted by loosening the bearing cap's three M2.5 flat head screws, rotating cap to desired setting, & re-tightening screws--**DON'T OVER-TIGHTEN.** 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.

ZERO DEGREE CRAWLER TIMING

Align sensor harness with solder tabs.

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

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

Adjusting timing beyond the 45° mark on timing label will result in dangerously high current draw & excessive heating that can lead to ESC & motor failure. MELTED STATORS ARE NOT COVERED BY THE WARRANTY!

