

SECTION
J
FAST
ELECTRIC

IMPBA OFFICIAL RULE BOOK

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FAST ELECTRIC

I - GENERAL

The Fast Electric section of IMPBA is to utilize electric motors and batteries to power model boats.

A. Motor, Controllers, Classes and Hulls

1. **Motors:** Any motor that uses battery supplied electrical current to create mechanical motion.
2. **Controllers:** Speed controls may be a switched resistive device, mechanically operated switch(s), electronic speed control or any combination of the above that is operated by remote control.
 - a. The use of any kind of voltage multiplier anywhere within the drive circuit is strictly prohibited.
3. **Class Definitions, voltage limits and restrictions**

Class	Voltage Limits	Allowed Motors(s)	
		Style/Type (Note 1)	Number of
N	3.7 to 8.46	Any	1
P	11.1 to 16.92	Any	1
Q	18.5 to 25.38	Any	Any (Note 1)
S	25.9 to 33.84	Any	Any (Note 1)
T	33.3 to 42.3	Any	Any (Note 1)

Note 1:

Some class(s) may limit number/type of motor.

Some class(s) may limit battery type.

	Hull Length Restrictions				
	Mono / Catamaran OB Tunnel	Rigger	1/8 Scale	Sport Hydro	Others
N	Up to 27"	to 60"	n/a	Up to 27"	per rules
P	Up to 34"	to 60"	n/a	>27 to 34"	per rules
Q	Up to 40"	to 60"	n/a	>34 to 40"	per rules
S	Up to 50"	to 60"	per rules	>40 to 50"	per rules
T	Up to 60"	to 60"	per rules	>48 to 60"	per rules

4. Hull Classification

Hulls must conform to current IMPBA maximum weight and length restriction per Section K - Technical Standards. A boat may be run in more than one class by changing batteries / motors to comply with the class requirements. At any event, a boat may run only as a Mono or a Hydro. Further clarification on hull types may be found under Technical Standards, Hull Classifications and within this section where applicable.

B. Battery Specifications

Batteries may be of any commercial manufacture that is available to the public.

These may include:

Lithium Polymer or Lithium Ion, etc. type cells. The battery/pack/cell is only recharged by the application of an electric current to the battery using a battery charger specifically designed for the type of cell being used. Any method of recharging or partially recharging a battery/pack/cell by any other means is not allowed. Liquid acid type battery, Fuel Cell or Radioactive batteries are not allowed. A voltmeter will be used to measure the total voltage applied to the input of the speed control(s), un-loaded, with a fully charged 'pack' will constitute technical conformance to a class voltage limit.

1. A 'pack' is defined as the cell(s) wired in series or parallel or any wiring combination that is used to provide electrical power to the speed control for the purpose of driving the electrical motor(s).
 - a. Only one pack may be used even if multiple speed controls are used.
 - b. The pack must be made up of only one type of cell chemistry.
 - c. In multiple speed control/motor installations the total pack voltage must be used as the supply input to each speed control. You are not allowed to tap off voltage or switch a packs' parallel/series configuration during operation.
2. Contestants are cautioned to keep their wiring as simple as possible to make it easy for a contest director/technical inspector to confirm class conformance. Inspectors may require that batteries and or other components be removed from the model to make a ruling.
3. All batteries will be removable from the model by use of some type of connector arrangement. It is prohibited to "hard-wire" in the batteries. Hard wiring installations is where electrical connections are physically cut apart or de-soldered to allow removal of the battery.
4. As with any high performance battery, due consideration should be given to the safe handling and charging of batteries. As a responsible user of high performance batteries you will adhere to any of the manufacture recommendations dealing with handling, storage and charging. Some recommendations for the safe handling, storage and charging of batteries are:
 - a. Charging of battery to be done on a non-flammable surface or in a fire containment vessel out of the boat.
 - b. Typical containment vessels may be, but not limited to, fire blanket/pouch, baking dish, firebrick, clay pot or sand.
 - c. The contestant will provide a fire suppressant such as dry sand or a properly rated fire extinguisher.

C. Fast Electric Records

Records will be allowed for Mono, Hydro, Catamaran, Outboard Tunnel, Rigger, 1/8 Scale and Sport Hydro as per these rules. All 'Other' classes, as listed in the Specialty section of these rules may be eligible to set records if so indicated for a particular class.

D. Racing Rules

All IMPBA, Procedures, Rules of Competition, Contest & Racing Rules. All racing will run on standard IMPBA race courses unless otherwise specified for a class.

In addition to the IMPBA racing rules the following racing rules will also apply to fast electric.

1. During a race start, a boat cannot stop. Doing so will result in a one lap penalty. A boat will be considered as stopped when:
 - a. The boat falls off plane or step allowing the bow to settle into the water.
 - b. Turns upside down for any reason even if it is a self-righting boat.
 - c. A "barrel roll", "end over end flip" or "spin" is not a stopping infraction unless the boat fails to continue forward motion but may be grounds for a lane infraction.
2. Once the race has started, a boat that stops for any reason will be called as a stopped boat by the contest director and allowed a five count to continue racing. At the contest director's discretion, a stopped boat may immediately be called as a dead boat if warranted. A stopped boat that fails to continue racing after the five count will now be called as a dead boat. A boat that stops three or more times during a heat will be assessed as a dead boat for the heat. When a boat is called as a 'stopped boat' it is also considered to be a 'dead boat', which must be avoided by other boats on the water. When a stopped boat is capable of resuming the race it must give 'right of way' to other boats on the water as described in the Contest & Racing Rules.

3. At the end of a race as a boat finishes, one of two methods will be used. Either a cool down lap or park in the middle. The method used will be decided at the drivers meeting before any racing and used for all heats. At the International Regatta the cool down lap method will be used for all US1 classes.
 - a. For the cool down lap, as a boat finishes the race it will continue all the way around to course before coming into shore. Note that all heat race rules must be observed and right of way must be given to boats that are still racing.
 - b. For the park in middle, as a boat finishes the race it will pull into the course infield if it safe to do so, come to a stop and wait for permission to return to shore. As a boat finishes the race and cannot turn into the infield for any reason it will perform a cool down lap.
4. When a boat returns to shore under power it will do so by traveling as parallel to the front shoreline as possible to return to the launch area. A boat that returns to shore in a straight in or near straight in approach is creating a severe safety hazard that will result in a heat disqualification.

E. Safety Procedures and Precautions

All IMPBA safety procedures will be followed. Under no circumstance may any of the Racing Rules be altered that would affect the safety of an event.

All electric models must be handled as if the motor is running. Retrieve boat operators will be reminded that when picking up dead boats to keep themselves clear of the propeller(s) on the model and to keep the propeller(s) clear of any obstructions in the retrieve boat.

F. Protests

1. Protests will be handled according to Technical Standards, part IV-Protests.
2. At a sanctioned race, R.O.A.R. and or tabbed motors may be inspected but will not be opened. The inspection committee will inspect the motor as best as possible to derive a finding.
3. Template motors will be disassembled by the committee and inspected for conformance to the template design. (See Appendix A on Inspecting a Paradox motor.)

G. Race Starts - Oval

An official IMPBA clock, audiotape or stop watch (starting device) may be used to time the start of a race. The time to the start of a race will consist of two, 30-second consecutive time periods. The total "clock" time will be 60 seconds and will consist of Launching and Mill time. When an official IMPBA clock is used it may be placed on shore or in the water.

When an audio tape or stop watch is used as the starting device, time remaining to the start of race must be announced in 10 second increments from 60 to 20 seconds followed by 1 second increments for 19 to 1 second. At zero, any kind of announcement may be made to indicate the start of the race. Example: 50, 40, 30 (no more launch), 20, 19, 18, 17, 16, 15, 14, 13, 12, 11, 10, 9, 8, 7, 6, 5, 4, 3, 2, 1, race.

1. Launching Time - 60 to 30 seconds

This is the "launch window" time and will last for 30 seconds this is when all boats must start running on the water before this time expires. Failure for a boat to start running in this time period will result in a "Did not start". Milling will be by full course mill, observing all heat racing rules.

2. Mill Time – 29 to 0 seconds

The last 30 seconds of time is the "mill time" where all boats are running on the water. Full course mill will continue observing all heat racing rules to the start of the race. Once clock time has counted down to zero, the race has officially started. As a boat crosses the Start/Finish line it is now eligible to receive points for the heat. Any boat that jumps over the Start/Finish before clock time has expired must complete one lap and recross the Start/Finish line for a legal start. The

starting device at zero will either: flash a strobe, sound a horn/whistle, switch to the five minutes of racing time, announce Race, a CD verbal start, or any combination of the above.

3. Optional Launch and Mill Time

As an option in FE only heats, the total "clock" time will remain 60 seconds, but may consist of 40 seconds of Launching time and 20 seconds of Mill time.

H. Approved Courses and Laps

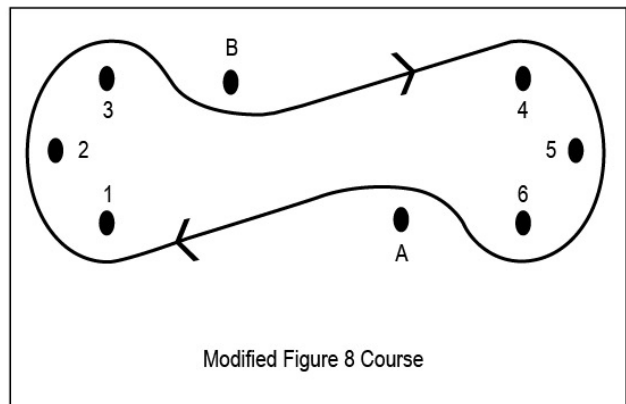
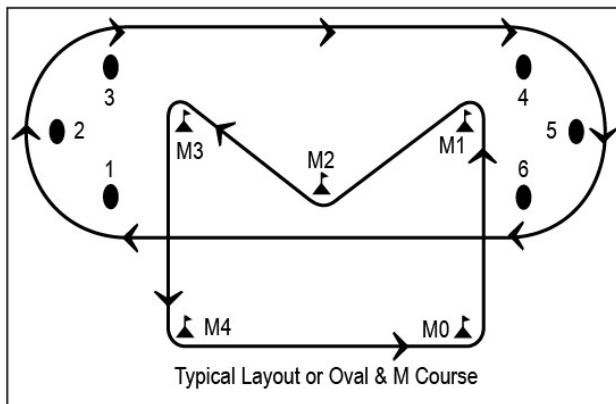
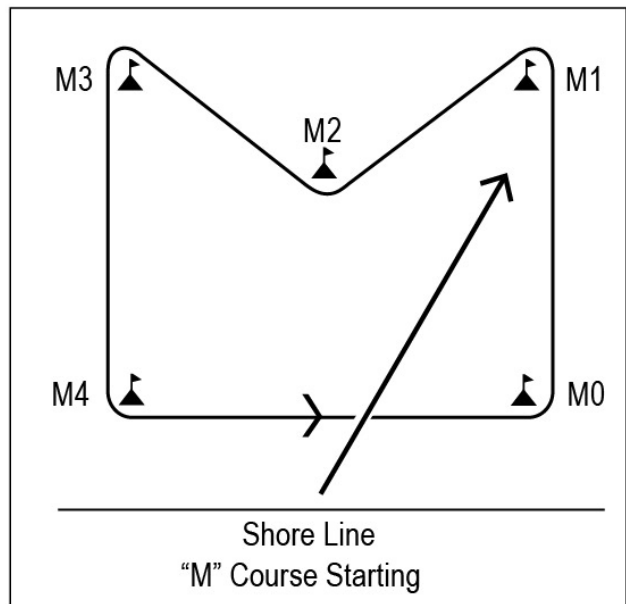
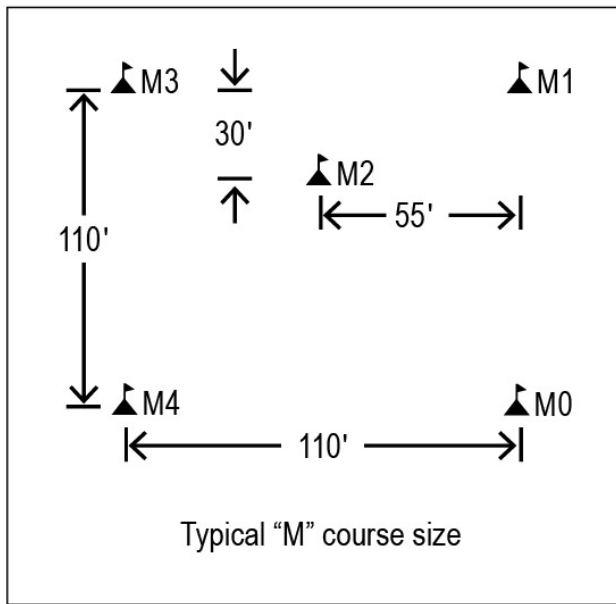
The 1/3-mile oval and 1/16 straightaway will be the normal race course for fast electric racing.

The 1/4-mile oval and 1/5-mile oval may also be used but must be indicated on the sanction request and race flyer.

The number of laps run will depend on both class and course size. Use the following chart.

Class	1/3 mile	1/4 mile	1/5 mile
N, P, Q, S, T	6 laps	8 laps	10 laps

I. Course Layouts



II - FAST ELECTRIC CLASSES

A. Catamaran

Records and racing will fall into the N, P, Q, S, T classes.

1. Boat Specifications

Hull will conform to the catamaran definition covered under technical specifications.

B. Outboard Tunnel

Records and racing will fall into the N, P, Q, S, T classes.

1. Boat Specifications

- a. Hull will conform to the outboard tunnel definition covered under technical specifications.
- b. Outboard Hydro (outrigger) or Catamaran hulls are not allowed.
- c. Boat must be outboard powered with only one motor.
- d. Outboard tunnel classes shall not lock down motor nor use auxiliary steering.

C. Mono

Records and racing will fall into the N, P, Q, S, T classes

1. Boat Specifications

Hull will conform to the mono hull definition covered under technical standards.

D. Hydro

Records and racing will fall into N, P, Q, S, T classes

1. Boat Specifications

Hull will conform to the hydro definition covered under the technical standards.

E. Scale FE Unlimited Hydro

1. General

FE Scale Unlimited Hydro shall comply with the rules listed in area II - Scale Unlimited Rules (A thru G), of IMPBA Section H – Nitro Special Classes. The following exceptions listed in this section will replace and/or take precedence for FE Scale Unlimited Hydro competition.

2. Power and Boat Specifications

- a. The motor, controller, and batteries (power system) shall be concealed with a fake engine or cowling as per the prototype.
- b. Motor must be an inrunner type. Outrunners are prohibited.
- c. Battery voltage shall span the S/T voltage specification.
- d. Only one motor shall be used. Multiple motors are prohibited.
- e. Motor outside diameter shall not exceed 41.00mm. Measurement shall be taken without the cooling ring assembled or in an area the motor outside diameter is exposed.
- f. Motor length shall not exceed 108.00mm. Measurement shall be taken from the forward-facing mounting surface to the furthest point of the motor end bell. Motor leads and rotor shaft protrusions shall not be included.

F. Sport Hydro

1. General

Records and racing will fall into the N, P, Q, S, T classes.

2. Boat Specifications

- a. Boat must be inboard powered with only one motor.
- b. Hull must be a three (3)-point full-bodied hydroplane configuration and resemble a limited or unlimited hydroplane design of past or present. These hull types, Outrigger, modified outrigger, tunnel, or canard hulls are not allowed.
- c. Boat will be painted/colored in the spirit of racing and must include sponsor's name, logo, and/or a racing number affixed to hull. A local, national, or fictitious sponsor name is acceptable.
- d. Boat must have a driver and/or simulated enclosed cockpit.
- e. The three riding surfaces of the hull will be considered to be;
 - I. The propeller and will be referred as the rear riding surface.
 - II. The aft, lower most part of the two sponsons, which may or may not be equal distance from the bow of the boat. These two points will be referred to as the forward riding surfaces.
- f. The forward riding surfaces will be located within 50 and 60 percent forward of the transom for the overall hull length and measured at a 90 degree perpendicular to the hull centre line.
- g. Picklefork hulls shall not have open areas ahead of the forward riding surfaces totaling more than 25% of the total hull length. No other hull vent(s) are allowed.
- h. The width of the bottom of the transom must be 65% or more of the width between the forward riding surfaces. On a shovelnose hull that has a tapered transom bottom the 65% rule will apply to the hull bottom at a point three a one half inches forward of the transom.
- i. Only one strut and rudder is to be used. The maximum strut size is, 9/16 inch wide and 3 inches long. The strut maybe mounted under the hull or to the transom. The strut must be mounted in a fixed position when the boat is running on the water
- j. All running hardware must be of a suitable size and installed in a manner that does not add to, create another riding surface or add any lift to the hull. All running hardware and installations may not be aggressively oversized for the intended function.
- k. The stuffing tube will not be considered as a ride/lifting surface but must maintain a cylindrical shape throughout its length. Where the stuffing tube exits the hull a single triangular support as viewed from side will be allowed as long as its primary purpose is to house the stuffing tube and the dimensions don't unreasonably exceed that purpose.
- l. Transom cutouts, cutups or bottom extensions are not allowed.
- m. Rear shoes are not allowed.
- n. Air dams that extend to the rear may be a maximum 1/8 inches wide

G. Special Stock Classes:

These classes are only offered for SAW and /or Ovals time trials.

1. N “Stock”

a. General

This specialty class structure to include, Mono, Hydro, Sport Hydro, Catamaran and will be available for SAW and Oval record trials only.

b. Boat Specifications

- I. Boats will conform to N class length and voltage limits.
- II. Each respective hull type will conform to the definition of that hull design in the technical specifications.
- III. Boat must be powered by one motor and no paralleling of batteries will be permitted.

2. N “Super Stock”

a. General

This specialty class structure to include, Mono, Hydro, Sport Hydro, Catamaran and will be available for SAW and Oval records trials only.

b. Boat Specifications

- I. Boats will conform to N class length and voltage limits.
- II. Each respective hull type will conform to the definition of that hull design in the technical specifications.
- III. Boat must be powered by one motor and no paralleling of batteries will be permitted.

3. Motor Specifications

a. Motor type for records.

- I. “Stock”. Motor must be a R.O.A.R. approved ‘template’ rebuildable 27t 05, 540 tabbed, 550 Johnson type. Motor may use optional torque ring and/or water cooling. (See Appendix A: “How to Tech a Paradox”)
- II. Motors may also be R.O.A.R. approved Brushless “Stock” or 17.5 turn motors. (See Appendix B: Technical Specifications, and Appendix C: Approved Motor List)
- III. “Super Stock”. Motor must be a R.O.A.R. approved ‘template’ rebuildable 19t 05, Motor may use optional torque ring and/or water cooling. (See Appendix A)
- IV. Motors may also be R.O.A.R. approved Brushless “Super Stock” or 13.5 turn motors (See Appendix B and Appendix C)

III. FAST ELECTRIC INTERNATIONAL REGATTA

A. US-1 Eligible Classes

The following 21 classes may enter the 1/16 mile SAW, 1/3 mile Oval, and multi-boat heat racing events at a US-1 format FE International Regatta to be eligible for the US-1 International Champion and Excellence of Performance Trophies per Section E-Procedures:

1. N, P, Q, S, T, Mono, Hydro, Catamaran, and Outboard Tunnel; S/T 1/8 Scale.

APPENDIX A: How to Tech a Paradox *(Re-printed in part or whole with permission from Trinity.)*

The name PARADOX and CHAMELEON are names of motors used by Trinity, Co. This does not necessarily mean that you have to race these motors by this manufacturer. The PARADOX and CHAMELEON are the first of their type of rebuildable stock “template” motors. These names are used as templates in describing this type of motor and does not limit the choices of this “template” motor. For IMPBA this is practically the same as “ROAR” motors but, easier to tech.

1. Armature

- a. Shaft** - Check the end of the motor shaft. This is the easiest way to spot check if someone is legal or not. The shaft of the Paradox was designed longer than normal and the extra length lets it stick out of the endbell about an 1/8-inch. This along with the special taper on the end makes the armature easy to identify even while it is in the boat. If the guy next to you has a Paradox without this shaft its time for some teching. The shaft length is 2.775 inches, (70.5mm).
- b. ID Tag** - Another way to check the armature is to look through the holes in the can. The arm has an ID tag epoxied between two of the poles that says EPIC 27. This tag identifies the armature as the one that belongs in an EPIC can and that it has 27 turns of wire. We also used the Midnight 2 Z Speed armature blank that is shaped like no other RC armature in the world. (Chameleon uses 19 turn ID Tag)
- c. Wire** - Rewinding a Paradox stock motor is really not an issue as the armatures are never available in any form other than as they come in the motor. The way the commutator tabs are compression welded will not allow them to be opened without bending them and scratching the commutator. Even if you do get them up and you were to rewind the arm, the tabs do not have enough strength when bent back to make a good electrical contact with the wire. You would have to solder or weld the tabs to get the motor to run at all and this will be visible. The big holes in the endbell will let you sneak a peak at the tabs. The wire diameter is 0.0265 inches or 0.67mm

2. Motor Can

- a. Bushings** - Worried about ball bearings? Well, with the Paradox checking is easy without taking the motor apart. We made the shaft hole in the can and endbell extra big so that the bushings are visible. Not only are the holes big enough to see the bushings you can also see that we use the Midnight 2 Recessed Bushings.
- b. Timing** - Because of the flat can design of the Paradox the endbell cannot be rotated in the can. To make sure there is no filing and turning of the endbell we also put a key on it that locks it to the can. Still not sure the timing of the endbell has not been changed? Simply check the 0 degree mark on the bottom of the can, this lines up with a -24 degree mark on the endbell. When both are aligned, the motor is set at 24 degrees.

3. Total Disassembly

- a.** If you checked all of the above but still think something is not legal, just open up the motor. It only takes a minute, and the beauty of it is that it can just as easily be put back together. Unlike sealed stocks that are illegal after opening, if your Paradox is legal you simply put it back together and run it again.
- b.** Opening the Paradox is quick and easy. An internal locking ring holds the endbell secure in the can. The endbell is held to the ring with 2 screws which when removed allow the endbell to be removed from the motor. Capacitor tabs are supplied under these screws so capacitors do not have to be soldered to the can, which would make teching harder.
- c.** Once the armature is out of the motor, it can be inspected closer. The simplest way to check it is to simply compare it to another legal Paradox armature. Since they are all machine wound, they all look the same. The commutator is nice and clean around the tabs with no scratches in the silver colored part at the bottom.
- d.** The wire gauge is easy to measure if there is any doubt. The wire may be measured with a dial caliper where it goes up to the commutator. It should measure 0.0265 inches or 0.67mm diameter. Of course the motor has 27 turns if you ever need to de-wind one. We feel that this really will never be necessary because of the ID tag and the ability to compare the armature easily with a legal sample. If someone is cheating, it will be very visible to the naked eye.

APPENDIX B: Technical Specifications for Brushless Stock & Super Stock Motors

All motors must have original manufacture's logo or name molded into the end bell. R.O.A.R. Stock and Super Stock motors must have a distinguishing feature or mark not easily removed/alterd on the stator stack designating the wind number.

"05" Size Dimensions

Can:

Overall maximum diameter is 36.02mm measured at whatever point yields the maximum dimension, excluding solder tabs, screw heads or lead wires. Maximum length is 53.00mm measured from the mounting face of the motor to the furthest most point of the end bell, not including solder tabs, lead wires or original manufacture's logo or name. Motor mounting holes must be on 1.00-inch (25.40mm) centers.

Stack/Stator:

For Stock and Super Stock brushless motors: The stator construction must be continuous laminations having the same overall shape, one after the other without anything in between. The laminations must be of one homogeneous material without cut-outs, holes or hollow sections other than the slots for the round copper coil wires and three slots for the screws used to hold the entire can together. The overall stator length parallel to the motor shaft shall be a maximum 21.0mm. The thickness of the laminations shall be 0.35mm +/- 0.05mm.

A go-nogo gauge 14.500mm + 0.000/-0.005mm diameter shall pass into the stator, clearing the stator plus its windings and the collection ring at the end of the stator.

Winding:

R.O.A.R. Stock Motor: Only three slot "Y" wound stators are permitted. No Delta wound or slotless stators are allowed. Only circular (round) pure copper magnet wire permitted. The three slot stator must be wound with 17.5 turns of 2 strands of a maximum diameter of 20AWG or .813mm per slot

R.O.A.R. Super Stock Motor: Only three slot "Y" wound stators are permitted. No Delta wound or slot less stators are allowed. Only circular (round) pure copper magnet wire permitted. The three slot stator must be wound with 13.5 turns of 2 strands of a maximum diameter of 21AWG or .724mm per slot.

Rotor:

R.O.A.R. Stock and Super Stock Motors: External shaft diameter must be 0.125 inches (3.175mm). Only one-piece two-pole Neodymium sintered, or ferrite (Ceramic) magnetic rotors are permitted. The magnet length shall be 25.00mm +/- 1.00mm not including nonmagnetic balancing material. The magnet outside diameter shall be a maximum of 12.51mm, no tolerance, for the entire length of the magnet. The shaft outside diameter shall be 7.25mm +/- 0.150mm for the entire length of the magnet. This dimension must be measurable without destroying the rotor.

Motor Cooling:

Water cooling of motors is permitted. Cooling coil or jacket must be made from a non-ferrous material and must not in any way interfere with technical inspection.

Motor Technical inspections:

All 'tabbed' motors will be subject to technical inspection. Motors will be inspected by the IMPBA technical chairman or a person so designated by the IMPBA technical chairman and approved by the IMPBA board to perform this task. If necessary a 'tabbed' motor that is sent for inspection will be performed by means of a destructive tear down. Under no circumstances will the owner of the motor be reimbursed for the cost of the motor. A 'tabbed' motor must be sent for inspection before any record may be set. As an option to the technical inspection process above, a contest director may purchase a new, in the package motor for the contestant at any local hobby shop and provide (at cost) to the contestant. Such a motor will be impounded at the end of each run and may only be used at that event.

APPENDIX C: R.O.A.R. Approved Stock & Super Stock Brushless Motors

Stock Associated LRP Vector X11 Stockspec 17.5T
Stock Hacker Brushless USA Hacker E40 - 17.5T
Stock Losi Losi Xcelorin 17.5 LOSAB9406
Stock Novak Novak 3417SS 17.5 Pro
Stock Orion Orion Vortex 2008 Stock 17.5
Stock Schumacher USA Speed Passion SPF175 Ultra Sportsman Stock
Stock Tekin Tekin Reline 17.5T Type-S P/N 2251
Stock Trinity Trinity TRI 10210 17.5T (red timing plate)
Super Stock Hacker Brushless USA Hacker E40 - 13.5T
Super Stock Losi Losi Xcelorin 13.5 LOSAB9405
Super Stock LRP LRP Vector X11 Stockspec 13.5T
Super Stock Novak Novak 3413SS 13.5 Pro
Super Stock Orion Orion Vortex 2008 Stock 13.5 P/N ORI28141 - Rotor without fan
Super Stock Schumacher USA Speed Passion SPF135 Ultra Sportsman Stock
Super Stock Tekin Tekin Redline 13.5 Type S P/N TT2252
Super Stock Trinity Trinity TRI 10210 13.5T (blue timing plate)

