



by Great Planes®

# RIMFIRE™

## RIMFIRE 35mm POWER SYSTEM

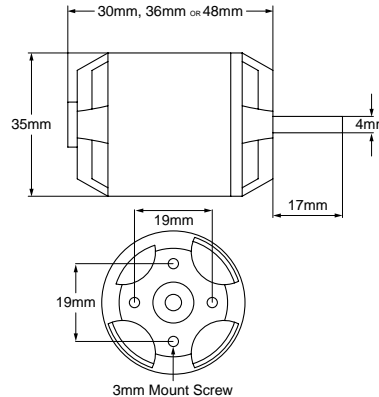


Congratulations, you have just purchased the RimFire 35mm power system components. All the components are sold separately to allow you to customize your power system to your airplane. The components needed to assemble your RimFire 35mm power system are: RimFire 35mm motors, propeller, propeller adapters and brushless speed controls. This instruction sheet explains how to determine what you will need and how to assemble each component.

## MOTORS

Model	Stock #
35-30-950	GPMG4590
35-30-1250	GPMG4595
35-30-1450	GPMG4600
35-36-1000	GPMG4615
35-36-1200	GPMG4620
35-36-1500	GPMG4625
35-48-700	GPMG4635
35-48-850	GPMG4640
35-48-1000	GPMG4645
35-48-1300	GPMG4650
35-48-1600	GPMG4655

The RimFire motors are labeled to provide the most information at a glance. For example: the 35-48-850kV is 35mm in diameter, 48mm long and has a kV (rpm-per-volt) of 850 rpm.



### Motor Output Shaft

**Diameter and Length:** 4x17mm [0.16"x0.68"]

**Weight (30mm):** 71g [2.5oz.]

**Weight (36mm):** 102g [3.6oz.]

**Weight (48mm):** 170g [6.0oz.]

## ELECTRONIC SPEED CONTROL (ESC)

An ESC is basically the device that controls your motor through your radio system. Never run any RimFire motors with a brushed ESC. It will not work and you may damage both the motor and the ESC. Always use a brushless ESC. ElectriFly offers Brushless ESCs that will work with the RimFire 35mm motors.



- ElectriFly **Silver Series 45 (SS-45) ESC (GPM1840)** for 45A maximum constant current draw.
- The **Silver Series 60 (SS-60) ESC (GPM1850)** for 60A maximum constant current draw.
- The **Silver Series 80 (SS-80) ESC (GPM1860)** for 80A maximum constant current draw.

These ESCs come with 4mm female bullet connectors that require an adapter (GPM3123) to plug into the 3.5mm male connectors installed on the RimFire 35mm motors. Also, these ESCs come with a Deans® Ultra Plug™ battery connector that matches the connectors that are found on most batteries that it will use.

## BRUSHLESS MEDIUM MOTOR MOUNT



1. Front Plate (1)
2. Back Plate (1)
3. 4-40x1/4" SHC Screw (8)
4. #4 Flat Washer (10)
5. Motor Bracket (1, not used on RimFires)
6. 4-40x1/2" SHC Screw (2)
7. 4-40 Lock Nut (2)

The ElectriFly Brushless Medium Motor Mount combines the ease of installation with the adjustability to fit most motor applications. The Medium Motor Mount is designed to fit the bolt pattern of the Great Planes .20-.48 and .40-.70 Nylon Engine Mount. This easily allows the conversion of a glow powered plane to electric powered.

## PROPELLERS



There is a wide selection of propellers available for electric use. The RimFire 35mm motors use high performance slow fly electric props. The larger the propeller used, the more current your motor will draw. The smaller the propeller, the less current the motor will draw.

Shown are a few of the recommended electric props. Due to the large range of propellers and the constant addition of new sizes, visit our web sites at [www.electrifly.com](http://www.electrifly.com) and [www.greatplanes.com](http://www.greatplanes.com) for the most up-to-date listing of electric type props.

APCQ0945	.....9x4.5	Electric
APCQ4118	.....9x6	Electric
APCQ4120	.....10x5	Electric
APCQ4123	.....10x7	Electric
APCQ1055	.....11x5.5	Electric
APCQ4128	.....11x7	Electric
APCQ4129	.....11x8	Electric
APCQ4130	.....12x6	Electric
APCQ4136	.....12x10	Electric
APCQ3065	.....13x6.5	Electric
APCQ4022	.....18x10	Electric

## PROPELLER ADAPTERS

The RimFire 35mm motor comes with a prop adapter that mounts directly to the motor case. If the RimFire 35mm motor needs to be mounted so that the prop is mounted on the motor shaft, the motor requires a 4mm prop adapter collet type (GPMQ4965), or set screw type (GPMQ4936).



**GPMQ4936** 4mm Set Screw Type



**GPMQ4965** 4mm Collet Type

## BATTERIES: CHEMISTRY

The RimFire Motor/Silver Series ESC combination can use NiMH or LiPo batteries. Typically, NiMH batteries are heavier but much more affordable for the same capacity as LiPo batteries. If you want a very light, high-performance airplane, you might want to use LiPo batteries, but if weight is not a concern, then NiMH batteries might be for you.



If a battery is arranged in PARALLEL it might be labeled as (P). Arranging the batteries in parallel will give you more duration (more capacity).

All LiPo batteries have a rated discharge that must not be exceeded or the battery will be damaged. They may say 15C max. discharge rate or 20C max. discharge rate. This means that the discharge rate (current draw of the motor) must not be more than 15 or 20 (15C or 20C) times the capacity of the battery. The capacity is expressed in milliamp hours (2100mAh). It can also be expressed in amp hours (2.1 Ah).

A LiPo battery with a capacity of 2100mAh with a 20C discharge rate can be discharged at 42 amps, 2.1Ahx20C = 42 amps. If the power system draws more than 42 amps, the batteries

will have to be connected in parallel to increase the capacity. Two 2100mAh batteries in parallel have a capacity of 4200mAh or 4.2Ahx20C = 84 amp discharge rate.

ElectriFly offers a full line of NiMH and LiPo batteries. Airplanes that use the RimFire 35mm motors will typically use batteries with a capacity of 2000 to 3600mAh with the higher capacity batteries delivering more flying time but also being heavier. All of the batteries have connectors that fit the recommended ESCs.

Due to the constantly changing battery technology, check out the ElectriFly web site at [www.electrifly.com](http://www.electrifly.com) for the most up-to-date listing of the ElectriFly battery line.

## BATTERIES: NUMBER OF CELLS

Cells can be connected in series or in parallel. Usually batteries are labeled as 8-cell NiMH or 3-cell LiPo. This means the cells are connected in SERIES (S). Arranging batteries in series gives you more power (higher voltage).

- Each NiMH cell has 1.2V, so an 8-cell NiMH battery has 1.2x8 = 9.6V
- Each LiPo battery has 3.7V, so a 3-cell LiPo battery has 3.7x3 = 11.1V

If you need a higher voltage than what is available in the LiPo battery line, you will need to connect two battery packs together in series. If you need a battery voltage of 14.8V you can use the **Series Y-Connector (GPMM3143)** to connect two 7.4V batteries together.

<u>Stock #</u>	<u>Voltage</u>	<u>Capacity</u>	<u>Weight</u>	<u>Battery Type</u>	<u># of Cells</u>
GPMP0616	7.4V	2100mAh	4.3oz (121g)	LiPo	2
GPMP0617	11.1V	2100mAh	6.4oz (181g)	LiPo	3
GPMP0622	7.4V	3200mAh	6.3oz (179g)	LiPo	2
GPMP0623	11.1V	3200mAh	9.5oz (269g)	LiPo	3
GPMP0350	7.2V	2000mAh	8.5oz (240g)	NiMH	6
GPMP0351	8.4V	2000mAh	12.2oz (345g)	NiMH	7
GPMP0352	9.6V	2000mAh	13.7oz (390g)	NiMH	8
GPMP0353	12V	2000mAh	16.7oz (475g)	NiMH	10
GPMP0361	8.4V	3600mAh	17.5oz (497g)	NiMH	7
GPMP0362	9.6V	3600mAh	19.9oz (564g)	NiMH	8
GPMP0363	12V	3600mAh	24.8oz (702g)	NiMH	10
GPMP0364	14.4V	3600mAh	29.6oz (840g)	NiMH	12

## DETERMINE WHAT YOU NEED TO BUILD YOUR POWER SYSTEM

Now that you have a component for your power system, there are several different ways to select the rest of the components of your power system. In time, experience will help you to determine what works best for you, but an easy way to determine what you need now is the following.

**PROCEDURE #1:** If you know the size of the propeller you want to turn and the rpm, then look at the chart included in the packaging and:

- ❑ 1. Find the combination in the motor/prop chart that delivers the closest performance to what you want.
- ❑ 2. Note the recommended battery voltage.
- ❑ 3. Determine if you want to use LiPo or NiMH batteries based on the desired ready-to-fly airplane weight. Select the number of cells based on the recommended voltage shown on the chart.
- ❑ 4. Determine the battery capacity needed based on the current draw of your system and your desired flight time.
- ❑ 5. Determine the ESC you need based on the system current draw shown on the motor/prop chart. See the ESC section.

**PROCEDURE #2:** If you know the approximate weight of your airplane, including the motor and battery, and the performance you want from it, answer the questions below to determine the correct power system for your plane. You may need to make more than one calculation using different motors and battery combinations. See the battery section for some of the battery weights for the suggested batteries.

- ❑ 1. Perform the following calculation to determine the wattage required:
  - If you expect trainer-like performance then multiply **75 x Airplane Weight (lbs)**
  - If you expect aerobatic or high speed-like performance then multiply **100 x Airplane Weight (lbs)**
  - If you expect 3D or extreme performance multiply **150 x Airplane Weight (lbs)**
- ❑ 2. The number you get is the minimum wattage you will need for your plane to perform as you wish. Look at the chart and determine what combination gives you the performance you want based on wattage and maximum propeller size that will fit on the plane.
- ❑ 3. Note the recommended battery voltage.
- ❑ 4. Determine if you want to use LiPo or NiMH batteries based on the desired ready to fly airplane weight. Select the number of cells based on the recommended voltage shown in the chart.

- ❑ 5. Determine the battery capacity needed based on the current draw of your system and your desired flight time.
- ❑ 6. Determine the ESC you need based on the system current draw.

In addition to these two procedures, you can also visit the Great Planes ElectrIFly web site for descriptions of the power systems recommended for our line of electric and glow airplanes as well as more detailed explanation on the subject.

### UNDERSTANDING MOTORS

**kV (rpm/volt):** This is a number that gets thrown around quite a bit when talking electrics and it is important to know what it is. kV is the number of rpm a motor will spin per each volt applied (rpm/volt) under no load.

This means that basically a motor that has a kV of 1000 when connected to a 12V battery will try to spin at 12,000rpm (1000x12) under no load. Likewise a 3500kV motor will try to spin at 42,000rpm (3500x12) under no load.

When a propeller is attached to the motor, the motor will try to spin the prop at the rated kV. Depending on the diameter and pitch of the propeller (the larger the diameter or higher the pitch, the harder it is to spin), the motor's current draw can be increased or decreased. There are meters available from your hobby dealer that measure current and voltage.

Because every motor has a maximum current it can take based on its design and cooling ability, the maximum size of propeller that can be used with each motor can be determined. Too large of a propeller and the motor will spin at a much lower rpm than its rated kV, causing it to draw a lot of current and overheat. If the propeller/fan is too small, it will require little effort (current) to turn the prop at the rated kV.

Ideally the motor should be matched with a propeller that causes the motor to draw 80-100% of its rated maximum constant current. Once a power system is set up, it can be fine-tuned by adjusting the propeller size and measuring the amount of current the motor is drawing.

Please note that the kV of a motor does not change with voltage, but if a higher voltage is applied to the motor, it will try to spin the same propeller at a higher rpm. This will cause the motor to draw more current and possibly exceed the maximum rated current of the motor. So, if a battery with lower voltage is replaced with one with a higher voltage, it is recommended that a smaller propeller be used to keep the current in check. If a higher voltage battery is replaced

by a lower voltage battery, the size of the propeller can be increased to keep the motor at its rated current.

Another possibility to fine tune the power system's performance is to use another motor with higher kV to increase the current or a lower kV to lower the current.

## ASSEMBLE YOUR POWER SYSTEM

Once the required RimFire motor has been determined, it needs to be installed on the plane. To determine the best mounting system, the distance from the firewall to the front of the prop adapter first needs to be determined.



It can be mounted directly to the firewall using the RimFire aluminum mounting plate (included with the motor), or an ElectrIFly Medium Motor Mount (**GPMG1255**). Both mounting systems are direct replacements for the Great Planes .40-.70 nylon engine mount.



Check the airplane instruction manual for the correct distance. These pictures show the distances from the firewall to the front of the prop adapter using the different mounting systems.

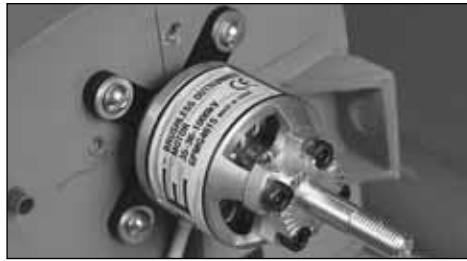
On the header card, you will find the mounting hole pattern template for the Brushless Medium Motor Mount and RimFire mounting plate. If you are replacing a glow engine with an electric motor system, remove the nylon engine mount and replace it with the Medium Motor Mount or RimFire mounting plate, using the same bolts to attach it to the firewall. If the firewall has not been drilled for an engine mount and blind nuts, use the mounting template on the header card to locate the mounting holes. Drill the four mounting holes and install 6-32 blind nuts from the back of the firewall.

### MOUNTING PLATE INSTALLATION

If attaching the motor to the firewall using the adjustable motor mount, skip to the *Adjustable Motor Mount Installation*.



Attach the RimFire aluminum mounting plate to the motor using four 3x8mm flat head machine screws. Apply a drop of Great Planes **Threadlocker (GPMR6060)** to the screws before installing them.



Attach the RimFire mounting plate to the firewall using four 6-32 machine screws and four #6 flat washers. Apply a drop of Great Planes Threadlocker to the screws before installing them. Mount the aluminum prop adapter to the motor case using four 3x7mm SHC screws. Use a drop of Threadlocker to the threads of each bolt.

### ADJUSTABLE MOTOR MOUNT INSTALLATION



Attach the Backplate of the motor mount to the firewall using four 6-32 machine screws and four #6 flat washers.



Mount the RimFire motor to the motor mount front plate (front or back) using four 3mm machine screws.

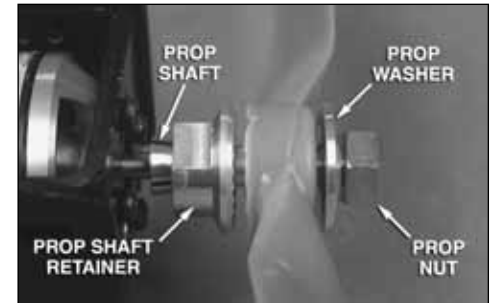
Install the collet or set screw prop adapter on the motor shaft or the aluminum prop adapter on the motor case. The RimFire 35mm motors use the 4mm prop adapter (**GPMQ4965 Collet Type** or **GPMQ4936 Set Screw Type**).

### ALUMINUM PROP ADAPTER INCLUDED WITH MOTOR



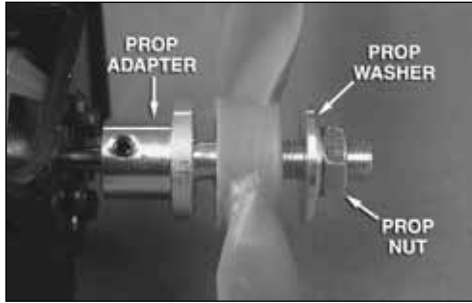
Mount the aluminum prop adapter to the motor case using four 3x7mm SHC screws. Use a drop of **Threadlocker (GPMR6060)** to the threads of each bolt to prevent them from coming loose.

### COLLET TYPE PROP ADAPTER INSTALLATION



Slide the prop shaft over the output shaft of the gear drive or motor. Next slide the prop shaft retainer over the prop shaft. Note that the hole through the retainer is tapered. Make sure that the side with the larger diameter hole is installed first. Install the spinner backplate (if used, **not included**), the prop, prop washer and then the prop nut. Tighten the prop nut against the prop. This will cause the tapered hole in the prop shaft retainer to squeeze the prop shaft around the output shaft. Carefully pull on the prop to make sure it is securely attached to the output shaft of the gear drive.

## SET SCREW TYPE PROP ADAPTER INSTALLATION



Slide the prop adapter over the output shaft of the gear drive or motor. Apply a drop of Great Planes **Threadlocker (GPMR6060)** to the set screws and install them in the prop adapter, tightening them against the motor shaft.



Position the motor/front plate assembly between the backplate. Measure the distance from the firewall to the front of the prop adapter. Attach the front plate of the motor mount to the back plate using the eight 4-40x1/4" SHC screws and eight #4 flat washers, spaced out as far as possible. A drop of Threadlocker on the threads of the screws will prevent the screws from coming loose.

**Note:** Once the motor is mounted in position, the prop adapter can be removed to allow the cowl to be mounted. This adapter is easily installed with the cowl already installed.

## INSTALL THE BRUSHLESS ESC

Because these motors have a wide range of current draws, a variety of ElectricFly Silver Series Brushless ESCs are recommended.

- SS-45 (**GPM1840**) 45 amp continuous current for motors drawing 45 amps or less.
- SS-60 (**GPM1850**) 60 amps continuous current for motors drawing 60 amps or less.
- SS-80 (**GPM1860**) 80 amps continuous current for motors drawing 80 amps or less.

See the chart on the header card for the current draw of some of the motor/prop combinations that have been tested. Always make sure that the ESC is positioned so that it gets some cooling air flowing over it.

Use the instructions included with the ESC to correctly connect the ESC.

## RIMFIRE MOTOR MAINTENANCE

RimFire brushless motors require virtually no maintenance. There are no brushes to wear out and replace. The precision bearings have a very long service life and should last a very long time. The internal parts of the motor should not require any cleaning. The only thing that needs to be checked is to make sure all the screws and set screws remain tight.

## IMPORTANT PRECAUTIONS

- Once the battery is connected to the ESC, stay clear of the motor and prop.
- DO NOT apply an input voltage that exceeds the maximum specification of each motor.
- DO NOT apply currents to the motor that exceeds the maximum specifications of each motor.
- DO NOT allow the input connectors to accidentally touch each other while power is applied to the motor. Make sure all input connections are insulated electrically.
- DO NOT allow water or moisture to enter the motor, as it can cause permanent damage to the motor and possibly short out the attached ESC.
- DO NOT cut the coated wires from the motor. If you must remove the bullet connectors, unsolder them.
- Allow the motor to cool after each flight.
- The motor shaft of the motor will rotate at very high rpm. DO NOT attempt to touch the shaft while it is rotating. If setting up the motor/ESC on the workbench, make sure the motor is securely attached and that nothing is attached to the motor shaft BEFORE applying power.
- Never attempt to use a damaged motor (having mechanical or electrical defects).
- ElectricFly carries a complete line of Ammo (in-runner style) and RimFire (out-runner style) brushless motors, gear drives, motor mounts, prop adapters and speed controls. For a complete list of these products, check out our web site at:

[www.greatplanes.com](http://www.greatplanes.com)  
[www.electrifly.com](http://www.electrifly.com)

or visit your nearest hobby shop that carries the full line of Great Planes and ElectricFly products.