



by Great Planes®

RIMFIRE™

RIMFIRE 28mm POWER SYSTEM

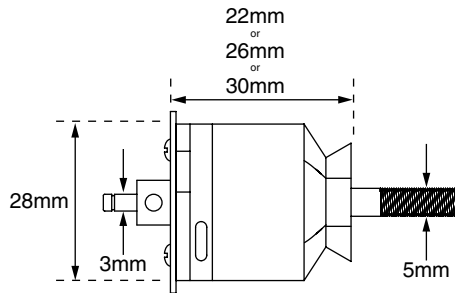


Congratulations, you have just purchased the RimFire 28mm power system components. All the components are sold separately to allow you to customize your power system to your airplane. The components needed to assemble your RimFire 28mm power system are: RimFire 28mm motors, propeller, propeller adapters and brushless speed controls. This instruction sheet explains how to determine what you will need and how to assemble each component.

MOTORS

Model	Stock #
28-22-1380	GPMG4505
28-26-1000	GPMG4525
28-26-1300	GPMG4530
28-26-1600	GPMG4535
28-30-750	GPMG4555
28-30-950	GPMG4560
28-30-1250	GPMG4565
28-30-1450	GPMG4570

The RimFire motors are labeled to provide the most information at a glance. For example: the 28-30-750kV is 28mm in diameter, 30mm long and has a kV (rpm-per-volt) of 750 rpm.



- Weight (22mm):** 28.5g
- Weight (26mm):** 40.3g
- Weight (30mm):** 52.8g

Weight includes: Motor w/collar.

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 28mm motors.



ElectriFly Silver Series 12 (SS-12) ESC (GPMM1810)
for 12A maximum constant current draw.



ElectriFly Silver Series 25 (SS-25) ESC (GPMM1820)
for 25A maximum constant current draw.

The SS-12 comes with 2mm female bullet connectors that plug directly into the 2mm male bullet connectors installed on the RimFire 28mm motors, so no soldering is required. The SS-25 comes with 3.5mm female bullet connectors and requires an adapter (GPMM3122). The SS-12 comes with a Deans® Micro battery connector that matches the connectors that are found on most batteries that it will use. The SS-25 comes with a Deans Ultra Plug® battery connector and may require an adapter for some of the batteries.

BATTERIES: CHEMISTRY

The Ammo 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.



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 $1.2 \times 8 = 9.6V$
- Each LiPo battery has 3.7V, so a 3-cell LiPo battery has $3.7 \times 3 = 11.1V$

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 (GPMM3147)** for use with Deans Micro plug or **(GPMM3143)** for use with the Deans Ultra Plug, to connect two

7.4V batteries together. **Note:** The 350mAh and 640mAh LiPo batteries listed below both use Deans Micro Plugs. The 910mAh, 1250mAh and 1500mAh LiPo batteries listed below use the Deans Ultra Plugs.

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).

ElectriFly offers a full line of NiMH and LiPo batteries. Airplanes that use the RimFire 28mm motors will typically use batteries with a capacity of 300 to 1500mAh, with the higher capacity batteries delivering more flying time but also being heavier. Most of the batteries have connectors that fit the recommended ESC.

Due to the constantly changing battery technology, check out the ElectriFly web site at www.electrifly.com for the most up-to-date listing of the ElectriFly battery line.

PROPELLER ADAPTERS

The RimFire 28mm motor comes with a bolt-on prop adapter and a prop saver with sleeves to fit a variety of prop hub sizes. If the RimFire 28mm motor needs to be mounted behind the firewall, the motor requires a 3mm prop adapter collet type (GPMQ4959), or set screw type (GPMQ4930).



GPMQ4930 3mm Set Screw Type



GPMQ4959 3mm Collet Type

PROPELLERS



There is a wide selection of propellers available for electric use. The RimFire 28mm 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 and www.greatplanes.com for the most up-to-date listing of electric type props.

- GPMQ6655 10x3.5S PowerFlow
- GPMQ6660 10x4.5S PowerFlow
- GPMQ6695 11x4.5S PowerFlow
- APCQ4960 7x4SF Slo-Flyer
- APCQ5000 8x3.8SF Slo-Flyer
- APCQ5005 9x3.8 Slo-Flyer
- APCQ5010 9x4.7SF Slo-Flyer
- APCQ5015 10x4.7SF Slo-Flyer
- APCQ5016 10x3.8SF Slo-Flyer
- APCQ5020 11x4.7SF Slo-Flyer
- APCQ5026 12x6SF Slo-Flyer
- APCQ5027 12x3.8SF Slo-Flyer

Stock #	Voltage	Capacity	Weight	Battery Type	# of Cells	Connector Adapter
GPMP0594	7.4V	300mAh	0.8oz (24g)	LiPo	2	
GPMP0595	11.1V	300mAh	1.1oz (32g)	LiPo	3	
GPMP0600	7.4V	640mAh	1.4oz (40g)	LiPo	2	
GPMP0601	11.1V	640mAh	2.0oz (58g)	LiPo	3	
GPMP0604	7.4V	910mAh	2.1oz (60g)	LiPo	2	GPMM3127
GPMP0605	11.1V	910mAh	3.1oz (87g)	LiPo	3	GPMM3127
GPMP0608	7.4V	1250mAh	2.5oz (70g)	LiPo	2	GPMM3127
GPMP0609	11.1V	1250mAh	3.8oz (106g)	LiPo	3	GPMM3127
GPMP0612	7.4V	1500mAh	3.0oz (85g)	LiPo	2	GPMM3127
GPMP0613	11.1V	1500mAh	4.4oz (125g)	LiPo	3	GPMM3127
GPMP0067	9.6V	350mAh	2.3oz (65g)	NiMH	8	GPMM3135
GPMP0105	8.4V	650mAh	3.4oz (95g)	NiMH	7	GPMM3135
GPMP0072	9.6V	650mAh	4.4oz (125g)	NiMH	8	GPMM3135

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 ElectricFly 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. It can be mounted directly to the front of the firewall using the RimFire steel mounting plate included with the motor, or to the back of the firewall using a prop adapter to mount the prop.

In the center of the header card, you will find the mounting hole template for mounting the RimFire 28mm motor to the front of or the back of the firewall.

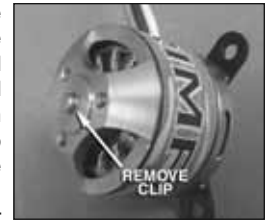
CONFIGURING THE MOTOR

A propeller can be installed onto the RimFire using the included bolt-on prop adapter, prop saver adapter, or a collet-type prop adapter (not included).

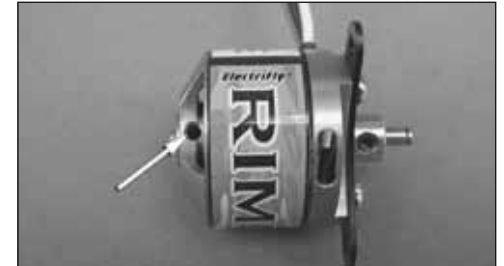


If you are installing the motor onto the front of the firewall (common installation), the propeller can be installed onto the bolt-on prop adapter or the prop saver adapter. If you choose to use the bolt-on prop adapter, secure it to the front of the motor using the included three 2.5x5mm socket head cap screws and thread locking compound. A prop washer and prop nut are included to tighten the propeller onto the bolt-on prop adapter.

If you choose to use the prop saver adapter, the motor shaft will need to be shifted forward inside the motor. Begin by removing the c-clip from the front of the motor shaft. A fine, flathead screwdriver or



small needle nose pliers are useful in doing this. Tip: *Crawling around on your hands and knees looking for a lost c-clip is no fun. Wrap a sandwich bag around the motor before attempting to remove c-clips. If the c-clip flies off the shaft, it will be contained by the bag. Also, be sure to wear safety glasses when removing the clips!*



Remove the set screw that locks the motor shaft to the front endbell.



Loosen the set screw in the brass collar and slide it off the back of the motor shaft.



Remove the c-clip and washers from the motor shaft behind the rear endbell.



Press the motor shaft forward inside the motor. Reinstall the washers and c-clip onto the groove at the back of the motor shaft. Rotate the shaft inside the motor so that the hole for the set screw in the front endbell aligns with

the flat spot on the shaft. Reinstall the set screw into the front endbell and tighten it against the shaft with thread locking compound.



The included prop saver adapter can be installed with either end facing forward. One end has a diameter

of 5mm and the other end has a diameter of 6mm. For other prop hub sizes, 7mm and 7.85mm adapter sleeves are also included to fit over the 5mm diameter prop saver end. Orient the prop saver adapter in the direction that best suits your propeller and install it onto the front of the motor shaft and tighten the screws against the flat spots on the shaft.

MOUNTING PLATE INSTALLATION



Although the mounting plate comes preinstalled on the RimFire, the three 3x4mm machine screws should be retightened with threadlocking compound. If you plan to install the motor behind the firewall, remove the mounting plate from the motor.

FRONT OF FIREWALL MOUNTING METHOD



Use the template from the header card to locate and drill the mounting holes and the relief holes for the

mounting plate screws. Attach the RimFire mounting plate to the firewall using three #4x3/8" [3x6mm] sheet metal screws (not included), or a type/size specified by the airplane manual.

BEHIND FIREWALL MOUNTING METHOD



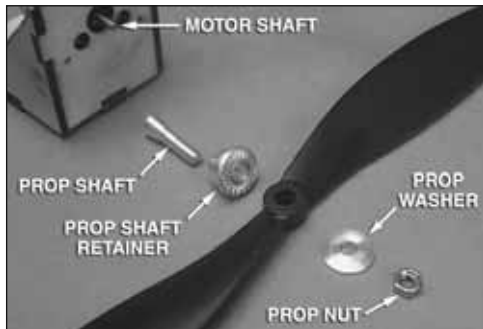
Use the template from the header card to locate and drill the holes for the mounting screws. Attach the RimFire mounting plate to the firewall using three 3mm machine screws (not included).

PROP SAVER PROP ADAPTER INSTALLATION



Install the cowl if the plane comes with one. Install the prop on the prop saver and secure it with a rubber O-ring looped over both of the machine screws. Check the O-ring for wear before each flight. If the O-ring shows any cracks, replace immediately.

COLLET TYPE PROP ADAPTER INSTALLATION



Slide the 3mm prop shaft over the motor shaft. 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 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 motor shaft.

SET SCREW TYPE PROP ADAPTER INSTALLATION



Slide the 3mm prop adapter over the motor shaft. Tighten both of the set screws against the shaft. Install the prop, prop washer and then the prop nut. Tighten the prop nut against the prop. Carefully pull on the prop to make sure it is securely attached to the motor shaft.

INSTALL THE BRUSHLESS ESC

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

- SS-12 (**GPMM1810**) 12 amp continuous current for motors drawing 12 amps or less.
- SS-25 (**GPMM1820**) 25 amps continuous current for motors drawing 25 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 exceed 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
www.electrifly.com

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