

Heli-Max™

PERFORMANCE PARTS

Rotor Head Speed Governor INSTRUCTIONS

Congratulations and thank you for purchasing the Heli-Max Rotor Head Speed Governor. The Governor is ideal for expert aerobatic pilots who demand a constant rotor head speed in order to maximize their helicopter's performance, and for novice pilots who wish to simplify pre-flight setup (actually, experts can realize the benefits of simplified setup too!) In other words, the Rotor Head Speed Governor is for everybody!

BASIC INFORMATION

One of the most important factors in determining the way a helicopter handles is the rotor head speed. Once you find a rotor head speed you like, it is desirable to maintain that rotor head speed at all times, during all maneuvers. However, there are many outside factors affecting rotor head speed such as flight speed, acceleration/deceleration, control inputs (rotor head loading), wind, etc. The rotor head is constantly acted upon by these and other forces which affect rotor head speed. Over-revving and overloading of the rotor head during maneuvers results in decreased performance. During the time that the rotor head has unloaded and rotor speed has increased, the machine will become jumpy or too responsive. During the time that the rotor head is overloaded and rotor head speed has decreased, the machine will become sluggish and less responsive. This never ending transition causes the pilot to wait for the helicopter before giving the next control input. This problem can be minimized with pitch and throttle curves, but it is not possible to totally eliminate it—until now. The Rotor Head Speed Governor operates the throttle servo to maintain a constant rotor head speed at all times. This decreases the amount of collective stick movements you must make, allowing you to concentrate more on the other controls!

It is possible to select two rotor head speeds with the Governor. Typically, a lower RPM is selected for hovering while a higher RPM is selected for aerobatics. This can be done in flight by adjusting a dial or flipping the rpm select switch on your transmitter.

OPERATION

The governor is connected between the throttle servo and the receiver (the same way a gyro is connected between the rudder servo and the receiver). Three magnets are mounted to the main gear in your helicopter. When spinning (at the same rpm as the rotor head), the magnets pass by a sensor connected to the CSU (constant speed unit—the little black box). The sensor reads the rpm of the main gear and sends a signal through the CSU to the throttle servo, which modulates the throttle servo as required. The governor will operate between 900 rpm to 2,200 rpm. The pilot determines rotor speed by settings he programs into the transmitter.

Please note that your governor will not:

- 1. Hold rotor head speed when your engine is not correctly set up (needle valve settings, exhaust system, etc.).
- 2. Reach the full 2,200 rpm if your engine does not have enough power.

DECIDE HOW YOU WILL TURN ON AND ADJUST THE GOVERNOR

Now you know what the Rotor Speed Governor can do, but how are you going to turn it on and adjust your rotor head rpm while you are flying? Following are three methods we suggest for using your governor.

Method A

Use a two position switch to switch between a lower rotor head speed (for hovering) and a higher rotor head speed (for aerobatics). This means that in addition to flipping the switch for your different pitch curves (Normal, Idle up 1, Idle up 2), you will also have to flip the rotor head speed switch to access your other rotor head rpm. For example, when you go from your normal pitch curve for hovering to your idle up 1 pitch curve for aerobatics, in addition to flipping your idle up 1 switch, you will also have to flip the governor switch to activate your higher rotor head speed. The way you adjust the RPM for each switch position (your two rpm ranges) is to change the ATV's for both ends of the switch. This means you can vary the rpm only on either side of your "middle" rpm which will be around 1,400 rpm (1478 rpm to be exact). In other words, the two rpm you can set are only above 1,400 rpm (when your switch is in one position) and below 1,400 rpm (when your switch is in the other position). You cannot have rotor head speeds of say, 1,600 rpm and 2,000 rpm because they are both on the same side of the ATV range.

Method B

Use an adjustable dial or slider to change your rotor head speed. This allows infinite adjustment of your rotor head speed (between 900 and 2,200 rpm) in any of your pitch curves, at any time. But, you will have to manually adjust the dial while you are flying. This might be a good method for starting out while you get the feel for how your governor operates. With this method, you can also turn the governor off at any time (instead of when your throttle stick drops below a preset point when you land, as in method A). For example, once you have established a hover and set your hover rpm with the dial, use the dial to increase your head speed when you go into your aerobatic pitch curve. Similarly, when you switch back into your hover pitch curve, adjust the dial to lower your head speed.

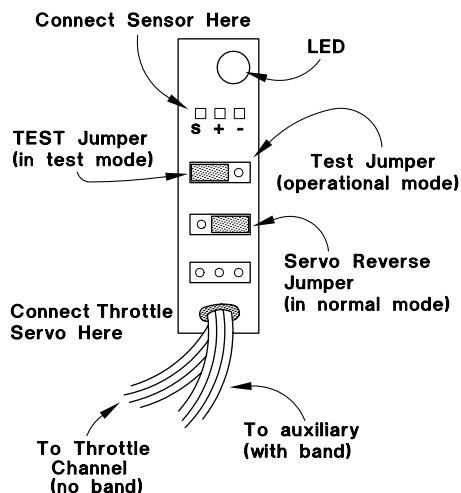
Method C

Use your pitch curve switch (Normal, Idle up 1, Idle up 2) to access your pitch curves and simultaneously activate corresponding rotor head rpm preset by the governor. This requires a computer radio with programmable mixing where you can alter the center point of the channel that determines your rotor head rpm (to preset the rpm for each of your conditions—Normal, Idle up 1, Idle up 2). Use the "offset" mixing type instead of linear mixing type.

Before you test and install your governor, if possible, you should test fly and set up your helicopter to perform the way you like.

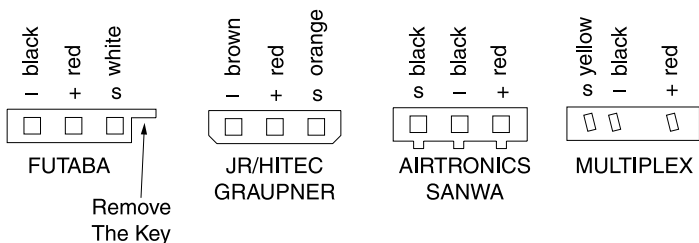
HOOKUP THE GOVERNOR

Do not mount the governor in your helicopter until instructed to do so. We recommend setting the governor up on the bench before you mount it in your helicopter. This will make it easier to perform the test procedures and give you a better understanding of how the governor works.



Your governor comes equipped with Futaba® brand “J” style connectors. If you own a Futaba radio system, proceed to step 1 below. If you own another brand of radio, you may have to modify the connectors on your governor. See the diagram below for proper polarities for major radio brand connectors. Usually, all that is required is to carefully remove the key on the connectors on the governor with a utility knife so they will fit into the slot on your receiver. If you’ve modified your connectors, **make certain** the wiring order on your governor connectors **and** the servo connectors is the same as the wiring order on the Futaba connector.

Study the diagram carefully. The positive (+) wire is the center, the negative (-) wire is on the side **opposite** of the key on the connector and signal (S) is on the side of the connector nearest the key. **WARNING!** Failure to match polarities on any connector may damage your gyro and will void your warranty.



1. Connect your throttle servo to the bottom output of the governor.

2. Determine whether you will use a dial to vary your rotor rpm or a two position switch to switch between a preset high and low rpm. Connect the lead with a band from the governor

to the channel on your receiver that is operated by the switch or dial you selected to control rotor rpm (usually Auxiliary 1). Some pilots with advanced computer radios may choose to use their programmable mixing and flight conditions to mix preset rotor rpm with their pitch curves (Idle up 1, Idle up 2). When different pitch curves are switched on (Idle up 1, Idle up 2), the preset rotor rpm will be selected without having to adjust an additional dial or switch.

3. Connect the lead from the governor without the band to the throttle servo output on your receiver.

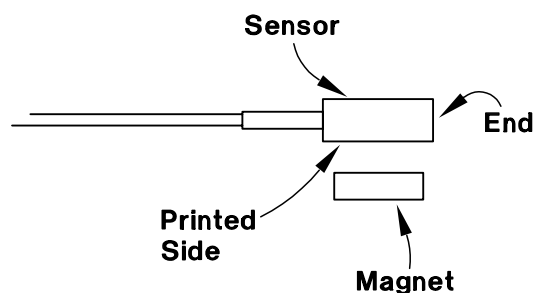
4. Connect the governor’s sensor lead to the top output of the governor.

SET UP AND TEST PROGRAM

Determine The Active Side Of The Magnets

1. Place the test jumper in the test mode on the governor (refer to the previous diagram).

2. Turn on your transmitter, then your receiver.



3. Place one of the magnets on your workbench. Pass the sensor over the magnet within a distance of 2mm or less. Note that the printed side of the sensor, not the end, reads the magnet.

A. If the LED on the governor glows, use a felt tip pen to mark the upward facing side of the magnet as “active” (mark an “A”).

B. If the LED on the governor does not glow, flip the magnet over and try again. When the LED glows mark that side of the magnet as active.

4. Determine and mark the active side of the remaining two magnets.

Now you’re ready to begin the setup and test program.

Set Up Your Transmitter

1. If your radio has a “hovering throttle trim” (an adjustable trim operated by a dial that is used to adjust throttle position at hover only), deactivate or inhibit the trim. This is not to be confused with your regular throttle trim.

2. Turn your ATV’s at both ends of your throttle servo to 100% (when instructed to do so, you will have to adjust your throttle linkage mechanically because the ATV’s must be set at 100% for your governor to operate correctly).

Set Up And Test The Governor

Refer to the flow chart to help you through the steps of setting up your governor. The steps in the flow chart correspond to the steps in the following instructions.

❑ 1. If you haven't already done so, turn off your Tx and Rx. Now, turn on your Tx, then the Rx.

In the flow chart, whenever you see the term "Reset your governor," it means you should turn off your receiver, return to step 1 and follow the flow chart until you return to the step that instructed you to reset your governor.

❑ 2A. If you are using an adjustable dial on your transmitter to adjust the rotor rpm, turn the dial to the position where the rpm will be minimum (counter clockwise).

❑ 2B. If you are using a two position switch to select between a high and a low rpm, flip the switch to the position that will be used for the lower of the two rpm.

❑ 3. Pass the sensor over one of the magnets three times. The LED on the governor will glow each time. If the LED does not glow, you have your magnet upside down. Flip the magnet over, reset your radio, and return to step 1.

❑ 4. Pass the sensor over the magnet a 4th time. The throttle servo should move the carburetor to "idle" position. If the throttle servo moves to full throttle, reverse the direction of your servo using the reverse jumper on the governor. Turn your Rx switch off, move the reverse jumper to the servo reverse position, then reset the governor by turning it back on and passing the sensor over the magnet 4 times. On the 4th time the throttle servo should move to idle.

❑ 5. Pass the sensor over the magnet a 5th time. The throttle servo will move the carburetor to full throttle.

❑ 6. Pass the sensor over the magnet a 6th time. The throttle servo will move the carburetor to engine off.

❑ 7. Repeating steps 1 through 6 as many times as necessary, adjust your throttle linkage (do not use your ATV's) so your carburetor is fully open and fully closed when the governor moves the throttle servo after passing the sensor over the magnet the 5th and 6th time.

You must adjust your linkage mechanically because the throttle servo receives its signal from the governor, not your transmitter. This is a fail safe feature. Do not use your ATV's to adjust the throttle lever settings.

❑ 8A. If you are using a dial to adjust the rpm, turn the dial to its maximum position.

❑ 8B. If you are using a switch to select a high and low rpm, flip the switch to the position that will provide the higher of the two rpm.

❑ 9. Pass the sensor over the magnet a 7th time. If the LED glows, reverse the channel in your transmitter that operates the dial or switch you are using to adjust the rpm, then reset the governor. When you get to step 9 and the LED flashes, go to the next step.

❑ 10A. If you are using a dial to adjust the rpm, turn the dial to its minimum position.

❑ 10B. If you are using a switch to switch between high and low rpm, flip the switch to the position that will provide the low rpm. The LED will glow.

❑ 11. Turn the dial or your rpm select switch to the high rpm setting. The LED will go out. At this point the governor is activated and will maintain constant rotor rpm.

❑ 12. Turn the dial or your rpm select switch to the low rpm setting. The LED will glow. Now the governor is deactivated.

❑ 13A. If you are using a dial, slowly increase the dial until the LED goes out. At the point when the LED goes out, the governor is activated. From this point on, rotor rpm will increase as you turn up the dial.

❑ 13B. Decrease the ATV on the side of the rpm select switch that controls the lower of the two rpm positions until the LED goes out. Note the ATV percentage. At this point the governor is active and is set at the lowest possible rpm you can use (900 rpm).

❑ 14A. Slowly decrease the dial until the LED glows. The governor is now inactive.

❑ 14B. Slowly increase the same ATV you adjusted in step 13B until the LED glows. The governor is now inactive. When it's time to fly your helicopter and set the hovering rpm, set your helicopter on the ground and adjust the ATV until you reach the rpm you desire.

❑ 15. Move your throttle stick to full throttle. Pass the sensor over the magnet an 8th time. The LED should flash.

❑ 16. Move the throttle stick to idle. The LED will glow. Now the governor is inactive.

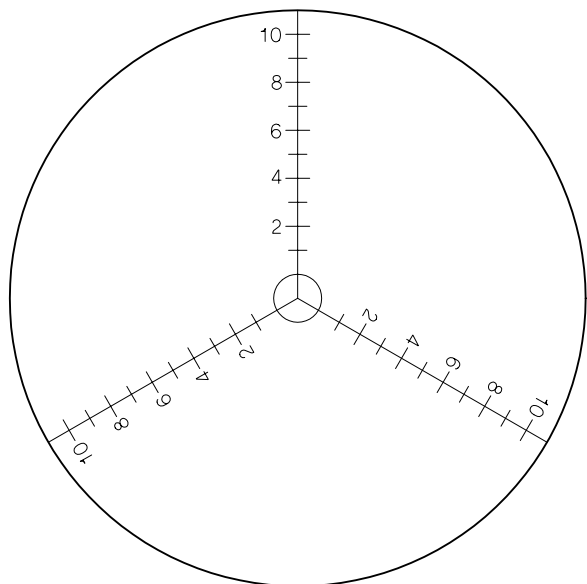
❑ 17. Move the throttle stick back to full throttle. While you do this, note the position of the throttle stick when the LED goes off. This is the point at which the governor "turns on" and cannot be adjusted.

❑ 18. Now that the governor is set up, activate your other pitch curves (Idle up 1, Idle up 2). Lower the throttle stick. Make sure the LED remains off so the governor will not turn off when you lower the throttle stick while performing aerobatics (or hovering inverted).

❑ 19. If the LED remains off, your governor is set up correctly and you are finished. If the LED glows when you lower the throttle stick while you are in your aerobatic pitch curves (Idle up 1, Idle up 2), raise your throttle curves so the LED remains off. Now you are finished setting up the governor.

Mount The Magnets And Sensor

1. Determine where you will mount the magnets and sensor. The magnets must be mounted where they will turn the same rpm as the main rotor. We recommend you mount them to the main gear.



2. Use the template included to accurately mark your main gear where each magnet will be positioned. Make sure you count the same number of gradations along each 120° line so the magnets are aligned. This is important for the sensor to read them correctly and for balance!

3. Mount the magnets in or on the main gear (with the active side facing the sensor). They must pass within 2mm of the sensor. You may mount the magnets to the surface of the gear with silicone cement, epoxy or CA. For the most security, we recommend drilling a 3/16" diameter shallow cavity or a hole all the way through the gear to hold the magnets.

4. Mount the sensor. If possible, mount it directly to the frame of the helicopter, or fashion a mount from thin plastic or aluminum. Mount the sensor mount to the frame of your helicopter where the sensor will be within 2mm or less of the magnets when they pass.

5. Make certain the sensor and none of the cords can interfere or become entangled in the mechanics of the helicopter.

TEST FLYING

Start your engine with the throttle stick at idle and your rpm dial or switch on the low rpm setting. The governor will not be activated until the throttle stick reaches the required position (noted in step 17 under Set Up And Test The Governor) and you advance the rpm dial (or adjust the ATV if you are using a two position switch).

When you are ready to lift off, advance the throttle to begin the rotor head turning, then turn on the governor by adjusting the dial (or adjusting the ATV) until the desired rotor rpm is reached. There will be a slight delay when you change the rpm.

Important: Be certain the jumpers are secure on the governor unit. If the servo reverse jumper becomes disconnected, the governor will switch off.

Initially, your helicopter will feel different. But, after you get the feel for the new setup you will wonder how you did without it!

You can get the maximum from your rotor speed governor (and your helicopter) if you experiment with different rotor rpm. This way, you can match your helicopter to your engine. Once you have mastered the setup of your rotor speed governor, your flying sessions will become more relaxed. Gone will be the days of programming rotor blade pitch and throttle curves! This leaves you to the most important task at hand—flying!

TECHNICAL DATA

Power supply:	3-9 Volt DC
Consumption:	7mA
Size:	2.2 x 1.4 x 0.4" (56 x 37 x 10.5mm)
Weight:	0.14 oz (4g)
Operational range:	approx. 900 rpm to approx. 2,200 rpm with included three magnets (approx. 650 rpm to approx. 1530 rpm with four magnets)

ONE YEAR WARRANTY STATEMENT *USA and Canada Only

Heli-Max warrants this product from defects in materials and workmanship for a period of one year from the date of purchase. During that period, Heli-Max will, at its option, repair or replace without service charge any product deemed defective due to those causes. You will be required to provide proof of purchase (invoice or receipt). This warranty does not cover damage caused by abuse, misuse, alteration or accident. If there is damage stemming from these causes within the stated warranty period, Heli-Max will, at its option, repair or replace it for a service charge not greater than 50% of its then current retail list price. Be sure to include your daytime telephone number in case we need to contact you about your repair. This warranty gives you specific rights. You may have other rights, which vary from state to state.

For service on your Heli-Max product, warranty or non-warranty, send it post paid and insured to:

HOBBY SERVICES
1610 Interstate Drive
Champaign, IL 61822

Attn: Service Department

Phone: (217) 398-0007 9:00 A.M. - 5:00 P.M. Central Time M-F
E-Mail: hobbyservices@hobbico.com

We can also be reached on the internet at:

www.hobbies.net/helimax

*For warranty and service information if purchased outside the USA or Canada, see the additional warranty information (if applicable) or ask your retailer for more information.

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