Futaba

RATE GYRO

GY520

760/1520μs System

AVCS Active Angular Velocity Control System

INSTRUCTION MANUAL

YAW-AXIS STABILIZER FOR MODEL HELICOPTER
(RATE GYRO)

1M23N21902

CE

TABLE OF CONTENTS

Technical updates and additional programming examples can be found at:

www.futaba-rc.com/faq

WARNING!

Failure to follow these safety precautions may result in severe injury to yourself and others.

- Read through the entire manual before operating this product.

- ***The GY520 requires 5-10 seconds to initialize when the power is turned on. Do not move the helicopter and do not move the tail rotor stick during this initialization or the gyro may not initialize properly. Once the initialization process is complete, the tail rotor servo will move to the left extent and then to the right extent. This will occur twice. The indicator light will change to solid blue for AVCS Mode or solid red for Normal Mode.***

BEFORE EACH FLIGHT:

- Always check the transmitter and receiver battery voltage to ensure they have enough remaining capacity to complete the flight.
- Verify that the gyro is operating correctly.
- Verify that the gyro compensates in the correct direction before flight. If the compensation direction is incorrect the model will pirouette uncontrollably, at a very high rate.
- Verify that the gyro is operating in the desired mode.
- Verify that the gyro mounting pads are in good condition.
- Verify that the gyro wires are not contacting the frame of the helicopter.

- The servo type parameter within the GY520 must match the type of servo you are using. Incorrect setting may damage the GY520 or the servo, possibly resulting in a loss of control during flight.

- Only use the GY520 with a 2.4GHz system such as the Futaba FASST™ system, or a PCM system. **Use with a FM system is strongly discouraged since interference can cause serious operational problems. In addition to this the latest high performance tail rotor servos generate electrical noise which may also cause interference to an FM receiver.**

- Always ensure that there is some slack in the gyro cables to help maximize performance. Always use the supplied gyro mounting pads to attach the gyro to the helicopter mechanics. Do not use a strap that encompasses the GY520. This may affect the overall performance of the gyro.

- Always allow the gyro to adjust to the surrounding environmental temperature before flight. A large temperature change during use will cause drift and other operational issues.

- The GY520 uses a conductive resin case to prevent electromagnetic interference. Do not allow anything to touch the gyro case as it may cause a short circuit.

- If you are switching between Normal Mode and AVCS Mode in flight, please keep in mind that you must have the gyro re-learn the center position after making a trim change within the transmitter. To memorize the new center position simply flip the gain switch on the transmitter three times between Normal Mode and AVCS Mode within one second. The tail rotor servo will center indicating that the new center position has been memorized.

- When the GY520 is used in Normal Mode, tail rotor compensation or revolution mixing must be used within the transmitter.

- When operating the gyro in AVCS Mode, all tail rotor compensation and revolution mixing must be disabled and any tail rotor offsets for flight modes must be disabled.

- When the GY520 is operated in AVCS mode the tail rotor servo will not center when the stick is released. This is normal operation for AVCS mode. The servo may also move to the extent while the model is being carried out to the flight line. Before take off, you must center the tail rotor servo by moving the tail rotor stick full left, then full right, back to full left and then allow the stick to center within one second. You can also visually center the tail rotor pitch slider by using the tail rotor stick.

- Do not drop the GY520 onto a hard surface or subject the GY520 to a strong shock as this may damage the sensor. Always use the supplied mounting pads or the Futaba replacement mounting pads available from your local hobby dealer.

- Always exit programming mode before attempting to fly the model.

- Do not use any type of priority mixing or gain reduction mixing on the GY520.

If any difficulties are encountered while setting up or operating your GY520, please consult the instruction manual first. For further assistance you may also refer to your hobby dealer, or contact the Futaba Service Center at the web site, fax or telephone number listed below:

www.futaba-rc.com or www.hobbyservices.com
Fax (217)-398-7721, Tel (217) 398-0007

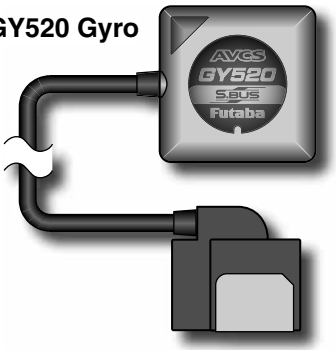
If you are unable to resolve the issue, pack the system in its original container with a note enclosed and a thorough, accurate description of the difficulty. Include the following in your note:

- Symptoms (including when the problem occurred)
- System (Transmitter, Receiver, Servos and model numbers)
- Model (Model name)
- Model numbers and quantity
- Your Name, Address and Telephone number

Send the respective items to the authorized Futaba Service Center Address below:

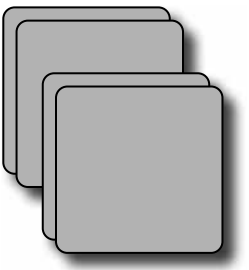
Futaba Service Center
3002 N Apollo Drive Suite 1
Champaign, IL 61822

GY520 Gyro

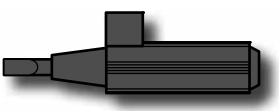


Mounting Pads

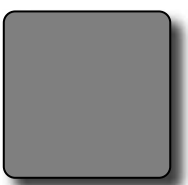
2mm Thick (two)
3mm Thick (two)



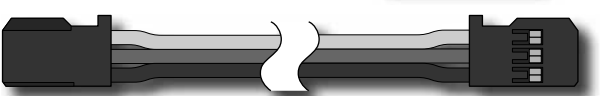
Adjustment Screwdriver



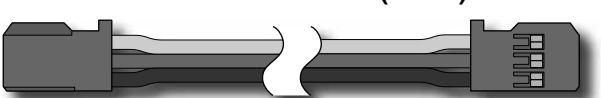
Damping and Shield Plate



Extensions



Tail Rotor Extension (Black)



Gain Extension (Red)

Width: 0.79in [20mm]
Length: 0.79in [20mm]
Height: 0.39in [10mm]
Weight: 0.243oz [6.9g]

Maximum* Operating Voltage: 3.8V to 6.0V DC (Gyro only)
Current Drain: 40mA (Gyro only)
Selectable Servo Frame Rate: 70Hz, 280Hz and 560Hz
Center Pulse Width: 1520µS (70Hz & 280Hz Frame Rate)
760µS (560Hz Frame Rate)
Flight Mode: User selectable F3C or 3D
Operating Temperature: 14ºF to 113ºF
Control System: Advanced PID control
Sensor: MEMS vibrating structure gyro
Angular Velocity Range: ±800 Degrees Per Second

*The maximum operating voltage listed only applies to the GY520. Always verify that your receiver, servos, tail rotor servo, governor, switch and any other electronic components used in your installation are capable of operating at the voltage you plan to use.

250 – 450 Sized Electric

Futaba S9257 EP Heli Digital (280Hz/1520µS): **FUTM0667**

.30 – .91 Size Helicopters

Futaba S9254 Digital Servo Heli (280Hz/1520µS): **FUTM0224**
Futaba S9256 Digital Hi Speed (560Hz/760µS): **FUTM0226**
Futaba BLS251 Brushless Heli Servo (560Hz/760µS): **FUTM0521**

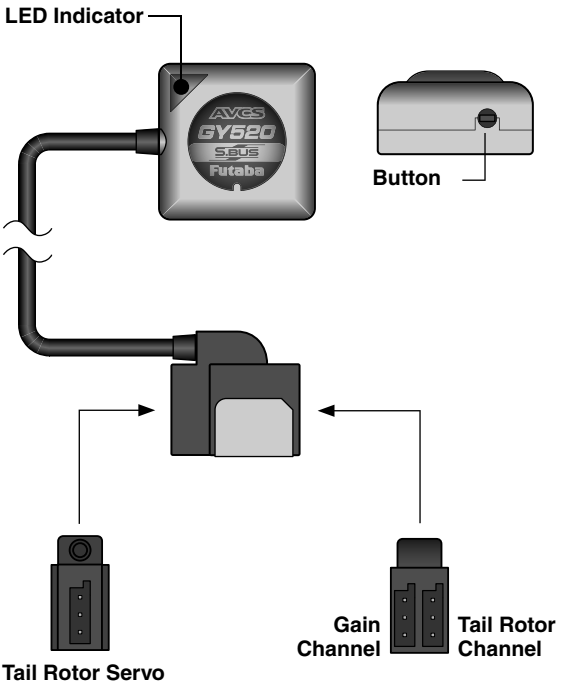
REPLACEMENT & OPTIONAL ITEMS

Futaba PC Interface CIU-2 for GY520: **FUTM0951**

FSH64 GY520 Extension 200 mm (2): **FUTM4664**
FSH65 GY520 Extension 350 mm (2): **FUTM4665**
FSH66 GY520 Extension 55 mm (2): **FUTM4666**
FSH67 GY520 Extension 80 mm (2): **FUTM4667**
FSH68 GY520 Extension 130 mm (2): **FUTM4668**

FSH69 GY520 Mounting Pad 2x22x22 mm (10): **FUTM4669**
FSH70 GY520 Mounting Pad 3x22x22 mm (10): **FUTM4670**

FSH71 GY520 Shield Plate 1x22x22 mm (3): **FUTM4671**


LED Indicator
AVCS
GY620
S.BUS
Futaba
Button
Tail Rotor Servo
Gain
Channel
Tail Rotor
Channel

Slow Flash: 1/2 Second or longer

Fast Flash: 1/4 Second or shorter

CONDITION	LED INDICATOR	DESCRIPTION
Initialization	*Slow Red Flash*	*No Receiver Pulse or Sensor Error*
	Slow Blue Flash	*Warm-Up*
	Fast Blue Flash	*Sensor Initialization*
Operating	*Solid Blue*	*Normal Mode, Ready for Flight*
	Solid Red	*AVCS Mode, Ready for Flight*
	Slow Violet Flash	*At the Neutral Position*
	Fast Blue or Red Flash	*Gyro is Rotating*

INTRODUCTION

The Futaba® GY520 is the smallest and lightest heading hold AVCS gyro available today. Its cutting-edge MEMS (Micro Electro Mechanical System) sensor design, ultra high-speed processing speed and advanced PID control algorithm put it a quantum leap ahead of all other heading hold gyros in size, weight and performance. The GY520 has been optimized to work with small electric models and larger nitro (.30 through .91) sized helicopters.

WARNING!

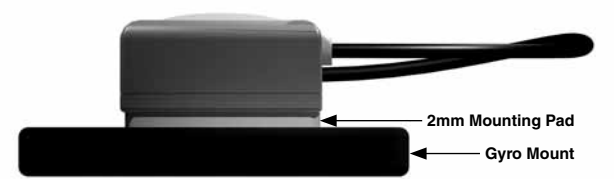
- **Newer high end servos and other radio equipment are capable of placing large demands on the power systems in use today. When using a regulator you must ensure that the regulator is capable of delivering the current demands of the equipment you have selected. In addition to this make sure the wiring and switch you have selected are capable of handling high current draws.**
- Even though the GY520 is a high performance gyro it will be necessary to ensure that the helicopter mechanics are also in optimum operating condition. Please use the guidelines below and address all issues before installing and test flying the GY520.
- The GY520 must be used with a rigid tail rotor drive system. Any modern torque tube or belt drive system should be adequate. Do not attempt to fly the GY520 using a wire driven tail rotor system.
- Always ensure the drive gears, torque tube, pulleys, belt, bearings and shafts are in proper working condition. If any of these items are damaged or worn they must be replaced.
- The linkage rod, tail rotor bell crank, pitch slider and tail rotor grips must operate without friction to obtain the best performance from the GY520. If any binding is present it must be fixed before the helicopter can be flown. Binding in the tail rotor control linkage will decrease the performance of the GY520 gyro and this may also shorten the servo lifespan. Please take the time now to ensure the tail rotor system on your helicopter is working correctly, without friction or binding.
- Vibration will affect the gyro's overall performance. All rotating components on the helicopter should be balanced to minimize vibrations in flight. Ensure that your motor is running smooth and all vibrations have been addressed before installing and test flying the GY520.

The gyro should be mounted on a rigid platform, at least 6in [152mm] away from a Nitro Engine. It is not necessary to mount the gyro near the main shaft of the helicopter but it is very important that the mounting area chosen is rigid. Please refer to your helicopter manufacturer's instructions for recommended mounting locations.

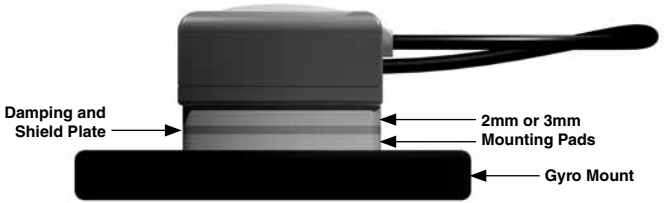
Installing the gyro

The GY520 is supplied with two 2mm Mounting Pads, two 3mm Mounting Pads, and one 1mm Damping and Shield Plate to help accommodate several installation methods. Most electric helicopters with minimal vibrations can use one 2mm mounting pad to mount the gyro onto the Gyro Mount. If the GY520 is mounted near the ESC, near a servo, or near the tail rotor belt we highly recommend using two 2mm Mounting Pads and the steel Damping/Shield Plate to help prevent electromagnetic interference from reaching the gyro.

Recommended Installation for Smaller Electric Helicopters
(250, 450, and 500 size helis)



Recommended Installation for Larger Electric Helicopters and All Nitro Helicopters



On smaller electric helicopters it is best to mount the gyro using one 2mm mounting pad. When mounting the gyro in a larger electric or .50 through .91 size nitro helicopter we recommend using two 3mm Mounting Pads and the Damping/Shield Plate.

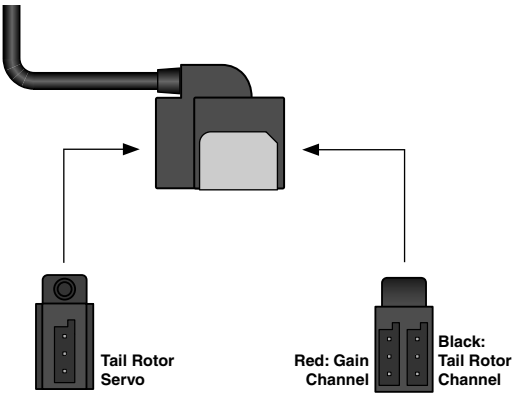
TROUBLESHOOTING

If you experience erratic gyro operation (drifting, not holding well or inconsistent pirouette rate), please follow the troubleshooting tips listed below.

1. Always verify that your model's tail rotor control and drive system are working correctly.

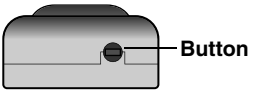
2. Electromagnetic interference could affect the gyro or tail rotor servo. Use the metal damping and shield plate or mount the gyro in a different location, away from the electronic speed control, servos and drive motor.

3. The trouble may be caused by vibration. Verify that your helicopter's components are balanced. If problems persist, try mounting the gyro in a different location. Various combinations of the gyro mounting tape may help to mask the issue.



Connect the supplied extensions to the GY520 connecter block as indicated. Route the wires through the helicopter mechanics and connect them to the appropriate receiver channels. To determine the appropriate receiver channels please check your transmitter's instruction manual. Using a piece of double sided tape, mount the GY520 connector block onto the helicopter, ensuring that you leave some slack in the wire leading to the gyro. Using wire mounts, wiring fixtures molded into the helicopter, or hook and loop material, route the extensions to the receiver. Ensure that the extensions leading to the receiver cannot become entangled in rotating components and make sure the extensions are not rubbing against metal or carbon fiber which may damage the wires.

Once the power system is installed into your helicopter please move onto the next section to learn how to program the gyro.



Entering Programming Mode

Press and hold the button on the side of the GY520. After 3 seconds the LED indicator will momentarily change to violet. Release the button and the gyro will begin flashing once per second. The color shown is the option selected for the 1st parameter [Servo Type]. For example, if you see one Blue Flash then the [Servo Type] is set to Digital 1520µS. If you see one Red Flash then the [Servo Type] is set to Digital 760µS servo. The number of flashes is the parameter number you are viewing and the color of the LED indicates the setting that has been selected. Please see the GY520 Parameters and Settings Table.

Changing the setting within a parameter

To move to the next setting within a parameter, quickly (less than one second) press and release the button on the gyro. The LED will begin flashing rapidly. This indicates that the gyro needs confirmation of the change. While the LED is flashing, rapidly press and release the button again to confirm the change. The confirmation request flash will last one second, after this period of time the gyro will return to the parameter menu without making a change. Always ensure that the change has taken place by counting the number of flashes and verify the color of the indicator LED.

Moving to the next Parameter

Press and continue to hold the button on the side of the GY520. After 2 seconds the LED indicator will momentarily change to violet. Release the button and the gyro will move to the next parameter. The number of flashes will change to reflect this.

GY520 Parameters and Settings Table

PARAMETER	SETTING	LED INDICATION
1. Servo Selection	Digital 1520µS Servo*	Blue, 1 Flash
	Digital 760µS Servo	Red, 1 Flash
	Analog Servo	Violet, 1 Flash
2. Gyro Compensation Direction	Normal*	Blue, 2 Flashes
	Reverse	Red, 2 Flashes
3. Servo Limits		Red, 3 Flashes
4. Flight Mode	F3C Mode*	Blue, 4 Flashes
	3D Mode	Red, 4 Flashes
5. Response	Standard*	Blue, 5 Flashes
	Fast	Red, 5 Flashes
	Slow	Violet, 5 Flashes
6. Data Reset	(Resets Settings 1 – 5)	Blue, 6 Flashes

* Default Setting

Parameter 1: **Servo Type [1 FLASH]**

Select the appropriate setting for the servo you are using.

LED INDICATOR *SERVO TYPE*	***SERVO COMPATIBILITY***
Blue, 1 Flash *Digital 1520µS Servo**	*Futaba S9650 EP Heli Digital Servo*
	Futaba S9257 EP Heli Digital Servo
	Futaba S9253 Digital Servo
	Futaba S9254 Digital Servo
	Any digital servo capable of a 280 Hz update rate.
Red, 1 Flash *Digital 760µS Servo*	*Futaba S9251 Digital High Speed Servo*
	Futaba S9256 Digital High Speed Servo
	Futaba BLS251 Brushless Heli Servo
Violet, 1 Flash	*All analog (non-digital) servos.*

** Default Setting*

WARNING!

The servo type parameter within the GY520 must match the type of servo you are using. Incorrect setting may damage the GY520 or the servo, possibly resulting in a loss of control of the model during flight.

Parameter 2: Gyro Compensation Direction [2 FLASHES]

LED INDICATOR	DESCRIPTION
Red, 2 Flashes	*Normal Compensation**
Blue, 2 Flashes	*Reverse Compensation*

** Default Setting*

WARNING!

Verify that the gyro compensates the correct direction before flight. If the compensation direction is incorrect the model will pirouette uncontrollably at a very high rate.

This parameter controls which direction the gyro will compensate when the helicopter rotates. Once the tail rotor linkage is connected to the servo, pick the helicopter up by the main shaft and rotate the mechanics counter-clockwise. The gyro should compensate by adding clockwise rotation pitch to the tail rotor blades. If the gyro compensates by adding counter-clockwise rotation pitch to the tail rotor blades then it will be necessary to reverse the Gyro Compensation Direction setting.

Parameter 3: Servo Limits [3 FLASHES]

LED INDICATOR	DESCRIPTION
Red, 3 Flashes	*Limit Testing Mode*
Blue, 3 Flashes	*Set limit using tail rotor stick.*

The Servo Limit parameter is used to set the mechanical limits for the tail rotor servo. To obtain the highest performance it is recommended to adjust the servo arm length to set the mechanical limits and then use the servo limits parameter to make small adjustments.

WARNING!

- To prevent damage to the servo always perform limit setup with the tail rotor linkage disconnected and simply hold the linkage over the linkage ball to verify settings.
- While in the servo limits parameter the gyro no longer functions. Always ensure that the gyro is functioning correctly and it is not in the servo limits parameter before flying the helicopter.

Setting the servo limits:
Go to the SERVO LIMITS parameter. While in the servo limits parameter the gyro compensation no longer functions and the tail rotor servo will always center. This can be used to set the centering position for the tail rotor linkage and the tail rotor stick can be moved to verify that the limits are set correctly. While in the servo limits parameter the tail rotor stick is 150% more effective to compensate for any tail rotor AFR or D/R adjustments made within the radio. Please do not be concerned if the tail rotor servo reaches its limit before the tail rotor stick reaches its physical limit.

WARNING!

If one of the servo limits is set to a position less than 50% of the total throw, the LED on the gyro will turn red. When the LED is red, you will not be able to move to the next limit setting or exit the limit setting parameter. If the current value is greater than 50% then the LED will be blue and the setting is acceptable.

Quickly press and release the button once to enter limit setting mode. The LED will flash quickly and the tail rotor servo will travel to the set limit. When the transmitter's tail rotor stick is moved to the left or to the right the servo limit will increase or decrease. Hold the tail rotor linkage over the linkage ball and adjust the servo limit using the tail rotor stick until no binding occurs. If the LED turns red, then the travel value is less than 50% and this is not acceptable. Please decrease the servo arm length to reduce throw.

Quickly press and release the button once. If the limit is acceptable the LED will momentarily change to Violet and the servo will travel to the opposite limit setting. Hold the tail rotor linkage over the linkage ball and adjust the servo limit using the tail rotor stick until no binding occurs. If the LED is flashing red then the travel value is less than 50% and this is not acceptable. Please decrease the servo arm length to reduce throw.

Quickly press and release the button once to return to the SERVO LIMITS parameter. If the limit settings are accepted the LED will momentarily change to violet. You can now move the tail rotor stick again to verify that the settings are correct. If you need to adjust the settings again simply repeat the above procedure to adjust the servo limit settings.

Parameter 4: Flight Mode [4 FLASHES]

WARNING!

Always make small (1%) adjustments to the tail rotor D/R or EPA once the value exceeds 100%. Over 100%, it is possible to exceed the sensor's Angular Velocity Sensing Range (+/- 800° per second). The gyro will then no longer control the pirouette rate or consistency. The pirouette rate will be extremely fast.

If you experiment with the ultra-fast pirouette rate, make sure that your flight battery and fuel tank are secure. Also be certain that your model's tail rotor drive train is up to the task.

LED INDICATOR/MODE	DESCRIPTION
Blue, 4 Flashes *F3C Flight Mode**	*450 deg/sec pirouette rate at 100% D/R*
	Softer pirouette starts and stops.
Red, 4 Flashes *3D Flight Mode*	*720 deg/sec pirouette rate at 100% D/R*
	Aggressive pirouette starts and stops.

** Default Setting*

Selects the flight mode. Always try the F3C flight mode first and if you determine that the gyro is not aggressive enough, then try the 3D flight mode. The F3C Flight Mode will satisfy most pilots.

Parameter 5: Gyro Response Rate [5 FLASHES]

LED INDICATOR	DESCRIPTION
Blue, 5 Flashes	Standard Response*
Red, 5 Flashes	Fast Response
Violet, 5 Flashes	Slow Response

** Default Setting*

Sets the gyros response rate. The standard setting is acceptable for most helicopters. We recommend trying this setting first. On extremely small or lightweight helicopters with high performance tail servos and high performance tail setups, the Fast response rate may work better. The slow response rate should be used on larger and heavier scale models. This setting will affect the pirouette rate, pirouette starts and stops, and the gyro compensation response as well.

Parameter 6: Data Reset [6 FLASHES]

Restores the gyro to the factory default settings. It will be necessary to reprogram all parameters again before flying the model.

PARAMETER	DEFAULT SETTING
1. Servo Type	Digital 1520µS
2. Gyro Compensation Direction	Normal
3. Servo Limits	100% / 100%
4. Flight Mode	F3C
5. Gyro Response	Standard

To perform the Data Reset:
Quickly press and release the button on the gyro. The gyro LED will begin flashing quickly requesting confirmation of the Data Reset. To confirm the Data Reset the gyro button must be quickly pressed and released 3 times, within 2 seconds. Once the data reset is performed the gyro will automatically return to the Servo Type Selection [Blue, 1 Flash] parameter.

Exiting Programming Mode:
Once you have completed setting up the parameters simply turn the receiver power off.

Following your transmitter instructions, program your transmitter as follows:

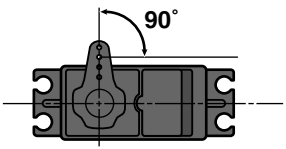
- ❑ Enable the gyro function within the transmitter.
- ❑ Set the gyro mode to AVCS (GY) within the transmitter.
- ❑ Set the remote gyro gain to 70% AVCS in the transmitter for the Normal and Hold flight conditions and use 40% AVCS for all idle up conditions. See "Setting The Gain" section later in this manual for more details.
- ❑ Set the Tail Rotor ATV/EPA to 100% for both left and right.
- ❑ Set D/R to 75% for both left and right. This will reduce the maximum pirouette rate. Make adjustments to these values once the initial test flight has been completed.
- ❑ It is recommended that you run 30% softening expo on the tail rotor channel.

WARNING!

Do not connect the tail rotor servo to the gyro until the servo type has been selected. Operating the servo using the incorrect setting may damage the GY520 or the servo.

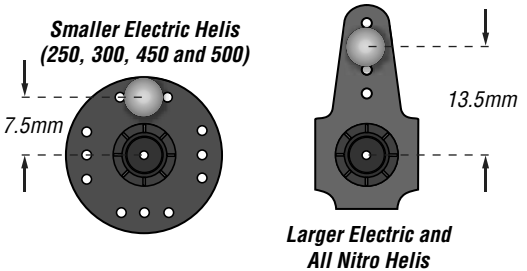
Once these steps are completed, turn the receiver power on and allow the gyro to initialize. Follow the instructions within the "***GY520 Programming***" section of the manual and select the Servo Type that matches the servo you have chosen to use. Power down the receiver for now.

❏ Install the tail rotor servo into the mechanics and connect the servo to the gyro. Remove the servo arm screw from the servo. Turn the receiver power on and allow the gyro to initialize. Enter programming mode and go to parameter 3 – Servo Limits [Red, Three Flashes]. While in the servo limits parameter the servo will remain centered.



❏ Place an appropriate servo arm onto the servo and ensure that it is perpendicular to the tail rotor pushrod as shown. Remove the unused sides of the servo arm.

❏ Install the control ball supplied with your helicopter onto the servo arm. For smaller electric helicopters (250, 300, 450 and 500 size) we recommend placing the ball 7.5mm from center. For larger electric models or nitro powered models we recommend placing the ball 13.5mm from center. Once the control ball has been installed place the arm back onto the servo ensuring that it is perpendicular to the tail rotor pushrod. Install the servo arm screw.



❑ Follow the instructions within the GY520 programming section and set the servo limits for the tail rotor servo. Hold the tail rotor linkage over the linkage ball to avoid damaging the servo. Once the limits are set you can place the linkage onto the linkage ball. When using AVCS mode the optimum setup is to have 0° of pitch with the tail rotor servo centered and use all of the available pitch range available in the tail without binding.

❑ Turn the receiver power off to exit programming mode and then turn the receiver power back on. Once the gyro has completed initialization move the tail rotor stick to the right on the transmitter and verify that right (clockwise rotation) tail rotor pitch is inputted to the tail rotor blades. If left tail rotor pitch is inputted to the tail rotor blades, then it will be necessary to reverse the tail rotor channel in the transmitter.

❑ Pick the helicopter up by the main shaft and rotate the mechanics counter-clockwise (from the top). The gyro should compensate by adding clockwise rotation pitch to the tail rotor blades. If the gyro compensates by adding counter-clockwise rotation pitch to the tail rotor blades then it will be necessary to reverse the Gyro Compensation Direction setting within the gyro (refer to the GY520 Programming section earlier in this manual).

If you are going to fly AVCS Heading Hold mode exclusively, then the gyro setup is now complete.

❏ Transmitter and Receiver batteries are fully charged.

❏ The gyro mounting pads are in good condition.

❏ The gyro wiring has some slack in it and all wires are clear of the main frame.

❏ Power on the transmitter and receiver. Allow the gyro to initialize.

❏ The GY520 servo type parameter matches the servo you are using.

❏ The Tail rotor servo arm is perpendicular to the pushrod and the pitch slider is centered.

❏ The servo does not bind when full left or full right tail rotor is applied.

❏ The gyro is operating in the correct mode (AVCS or Normal).

❏ The tail rotor stick operates the tail rotor the correct direction.

❏ The gyro compensates the correct direction when the helicopter is rotated.

❏ The gain is set correctly and the gyro operates in the correct mode (AVCS or Normal) in every flight condition.

WARNING!

Always make small (1%) adjustments to the tail rotor D/R or EPA once the value exceeds 100%. Over 100%, it is possible to exceed the sensor's Angular Velocity Sensing Range (+/- 800° per second). The gyro will then no longer control the pirouette rate or consistency. The pirouette rate will be extremely fast.

If you experiment with the ultra-fast pirouette rate, make sure that your flight battery and fuel tank are secure. Also be certain that your model's tail rotor drive train is up to the task.

The Tail Rotor AFR or D/R function within the transmitter is used to adjust the pirouette rate of the helicopter. For example at 100% D/R, with the gyro set to F3C mode, the helicopter will achieve a 450 deg/sec pirouette rate. If you would like the model to pirouette faster, then increase the AFR or D/R. If you would like the model to pirouette slower, then decrease the AFR or D/R.

The gain should be raised until the tail begins to oscillate quickly (also called Tail Wag). Once this point has been achieved, reduce the gain by a couple of percent and test fly the model again. Check and set the gain for each flight mode. Typically the gain will be lower for the Idle up 1 and Idle up 2 flight modes due to the higher head speed being used. The gain for the Hold condition can also be much higher than other flight modes since the head speed is lower and the engine vibration is minimized.

The tail rotor ratio, tail rotor pitch range and tail blade length play a large part in achieving optimum tail rotor performance. The gain value can vary drastically from model to model and the exact value should not play a part in the evaluation of the gyro's performance. How the gyro operates during flight is the only concern of ours.

Most pilots today are using AVCS Mode. If you are just starting out, it is recommended that you use AVCS Mode exclusively from the start. Normal Mode is rarely used today due to the performance benefits of AVCS mode. When using AVCS mode all trimming of the tail is automatically handled by the gyro. If you should decide to use Normal Mode than all trimming and mixing must be setup by you.

If you will be using the Normal Mode (also referred to as Rate Mode) then a few changes to the setup will be necessary. The tail rotor should be set to 10 degrees of tail rotor pitch (to counteract torque) when the tail rotor servo is centered. With clockwise rotating main rotor blades this means 10 degrees of right tail rotor pitch will be necessary to counteract torque. In addition to this it will be necessary to use the tail rotor compensation or revolution mixing functions of your transmitter to help counteract torque. Please see your transmitter instruction manual for more information on how to set this up.

If you decide to switch between Normal Mode and AVCS Mode in flight, you must have the gyro re-learn the center position after making a trim change within the transmitter. To memorize the new center position simply flip the gain switch on the transmitter three times between Normal Mode and AVCS Mode within one second. The tail rotor servo will center, indicating that the new center position has been memorized.

Most modern computer transmitters will have a gyro function built into them. If this is the case, please refer to your transmitter's instruction manual. Most modern gyro functions will allow you to set the mode of operation and the gains for several flight conditions. The use of these functions is strongly encouraged. Shown below is a recommendation of settings:

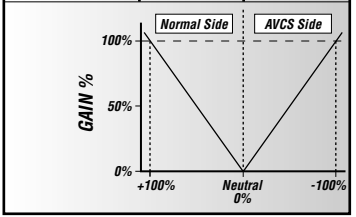
Recommended Gyro Function Settings:

Switch: Condition
Type: GY or AVCS

Gain Values

Normal: 70% A (AVCS)
Idleup 1: 40% A (AVCS)
Idleup 2: 40% A (AVCS)
Hold: 70% A (AVCS)

2-Position Switch	 *A*	 *B*
Gyro Mode	*NORMAL*	*AVCS*
Gain Channel ATV or EPA	*70%*	*70%*



If your transmitter does not have a Gyro function built in then it will be necessary to use the ATV or EPA function to control the gain. The Gyro Gain channel will generally be assigned to a switch which provides two gain values. Simply set the ATV or EPA for the gyro channel to the desired gain value and set the Gain Switch to the desired mode of operation. Unfortunately since you will only have one gain value available it will be necessary to use the lowest value needed (for example Idleup 2). When using this method of controlling the gain, one direction of the switch will be AVCS mode and the other direction of the switch will be Normal mode. Always ensure the gyro switch is set to the desired mode before flying. Do not accidentally change the gyro switch in flight.

RATE GYRO

GY520

760/1520μs System

AVCS Active Angular Velocity Control System

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