

Futaba®

RATE GYRO

GY520

760/1520 μ s
System

AVCS

Active Angular Velocity Control System

INSTRUCTION MANUAL

YAW-AXIS STABILIZER FOR MODEL HELICOPTER
(RATE GYRO)

1M23N21902



Thank you for purchasing a GY520 AVCS gyro.

Before using your new gyro, please read this instruction manual thoroughly and use the gyro properly and safely. After reading this manual, store it in a safe place.

FOREWORD

The GY520 is a small heading hold AVCS rate gyro for model helicopters. Advanced tail control from electric helicopters to 90 size helicopters is realized by adoption of an advanced high speed control algorithm.

*AVCS: Active Angular Velocity Control System

[GY520 Features]

- Small size and light weight (20.8x20.8x11.0mm, 8g)
- High speed control (280Hz/560Hz variable)
- F3C mode and 3D mode selectable
- Compatible with both digital (1520 μ S/760 μ S) and analog servos
- Simple setting by button and LED combination
- Parameters can be set through a PC by using the optional USB adapter (CIU-2) and dedicated software (Expansion function)

[Recommended servos]

Helicopter servos;

- 1520 μ S neutral type
S9254, BLS254, S9257 (for small EP helicopters)
- 760 μ S neutral type
S9256, BLS251

⚠ CAUTION



Always set the mode matched to the type of servo to be connected to the GY520. (Servo selection function p.24)

- The GY520 is compatible with digital (1520 μ S and 760 μ S) servos. However, the mode matched to the type of servo must be selected. If the GY520 is operated in the wrong mode it may malfunction or the servo may be damaged.

TABLE OF CONTENTS

FOR SAFETY

- Meaning of Special Markings ----- 4
- Mounting/Operating Precautions ----- 4
- Fuselage Maintenance Precautions ----- 7

BEFORE USE

- Set Contents ----- 8
- Name and Function of Each Part ----- 10
- GY520 Operation ----- 12

INSTALLATION AND ADJUSTMENT

- Installing to Fuselage ----- 15
- Initialization ----- 18
- Linkage Adjustments ----- 19
- Flight Adjustments ----- 21

DESCRIPTION OF FUNCTIONS

- GY520 Operating Parameters Setting ----- 23
- Gyro Sensitivity Setting ----- 28

REFERENCE

- Specifications ----- 37
- Repair Service (in U.S.A.) ----- 39

Warning: This product contains a chemical known to cause cancer and birth defects or other reproductive harm.

- No part of this manual may be reproduced in any form without prior permission.
- The contents of this manual are subject to change without prior notice.
- This manual has been carefully written. Please write to Futaba if you feel that any corrections or clarifications should be made.

FOR SAFETY

To ensure safe use, observe the following precautions.

Meaning of Special Markings

Pay special attention to the safety at the parts of this manual that are indicated by the following marks.

Mark	Meaning
 DANGER	Procedures which may lead to a dangerous condition and cause death or serious injury to the user if not carried out properly.
 WARNING	Procedures which may lead to a dangerous condition or cause death or serious injury to the user if not carried out properly, or procedures where the probability of superficial injury or physical damage is high.
 CAUTION	Procedures where the possibility of serious injury to the user is small, but there is a danger of injury, or physical damage, if not carried out properly.

Symbol:  ; **Prohibited**,  ; **Mandatory**

Mounting/Operating Precautions

WARNING



Insert the connectors fully and firmly.

- If a connector works loose due to vibration during flight, control may be lost and result in a dangerous situation.



Always use the GY520 with a FASST-2.4GHz system or PCM system.

- Using the GY520 with an FM system, when noise enters, the wrong neutral position may be memorized.

! When mounting the GY520, provide a little surplus so that the sensor connection cables are not too taut.

- If the GY520 cables are too taut, the gyro will not display its full performance. If the sensor peels, control will be lost and result in a dangerous situation.

! Always check the direction of operation of the servos.

- If you attempt to fly the model when a servo operates in the wrong direction, the fuselage will spin in a fixed direction and enter an extremely dangerous state.

⚠ CAUTION

! Always set the mode matched to the type of servo to be connected to the GY520. (Servo selection function p.24)

- The GY520 is compatible with digital (1520 μ S and 760 μ S) servos. However, the mode matched to the type of servo must be selected. **If the GY520 is operated in the wrong mode it may malfunction or the servo may be damaged.**

! Always use the accessory sensor tape to install the GY520 to the fuselage.

- This is necessary to securely fasten the sensor to the fuselage so that operation of the gyro does not transmit unwanted fuselage vibrations directly to the sensor.

! Mount the GY520 so that metals or other conductive objects do not touch these cases.

- The GY520 uses a conductive resin case to reduce electromagnetic interference. Because the surface of the case is conductive, metal objects may cause a short circuit.

Precautions When Turning on the Power Switch

 Do not move the helicopter until the flashing of the monitor LED goes out (in about 5 seconds). Also, do not move the transmitter rudder stick from the neutral position during this period.

 When the rudder neutral position was changed by the linkage, the rudder neutral position in the AVCS mode must always be re-read before use.

• **Re-reading method:**

Turn on the transmitter in the AVCS mode, then turn on the gyro. Or quickly switch (interval of within 1 second) the remote gain channel switch between the AVCS mode and Normal mode at least three times and switch the AVCS side with the transmitter in the ON state. This memorizes the new rudder position inside the GY520.

 **Avoid sudden temperature changes.**

- Sudden temperature changes will cause the neutral position to change. For example, in the winter, do not fly immediately after removing the model from inside a heated car and in the summer, do not fly immediately after removing the model from inside an air conditioned car. Allow the model to stand for about 10 minutes and turn on the power after the temperature inside the gyro has stabilized. Also, if the gyro is exposed to direct sunlight or is mounted near the engine, the temperature may change suddenly. Take suitable measures so that the gyro is not exposed to direct sunlight, etc.

 **Check the remaining receiver/gyro/servo nicd battery operating time during the adjustment stage and decide how many flights are remaining.**

 **Never use the transmitter rudder trim in the AVCS mode.**

- When the rudder is trimmed during flight, the neutral position will change.

 **When using the GY520 in the AVCS mode, set revolution mixing to OFF.**

 **Do not strike the gyro body against a hard object or drop the gyro onto a concrete or other hard floor surface.**

- The gyro sensor is vulnerable to shock and may be damaged by strong shock.

Fuselage Maintenance Precautions

CAUTION

 **Use a tale rotor drive tube or other part with a high torsion performance for the tail drive.**

Take the strength of the tail into account during inspection and adjustment.

- The amount of improvement of gyro performance has a considerable effect on the fuselage vibration level or the size, type, linkage method, looseness, etc. of the tail rotor.

Since a higher gain than usual can be used then the tail rotor is more effective, the load on the tail is also greater.

 **Always perform proper maintenance for ultimate performance.**

- The rigidity of the fuselage tail has a large effect on gyro performance.

 **Make the fuselage vibration as small as possible.**

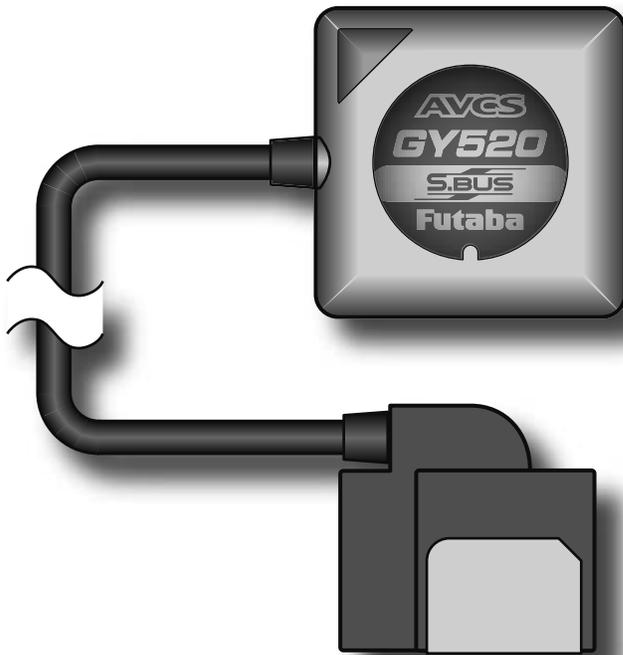
- Fuselage vibration has an adverse affect on gyro operation.

BEFORE USE

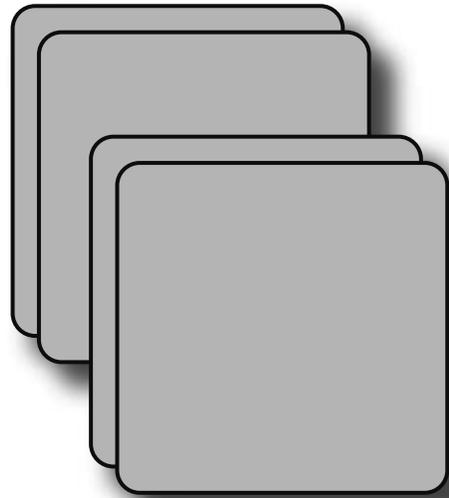
Set Contents

After unpacking the GY520 set, first check if the following parts are provided:

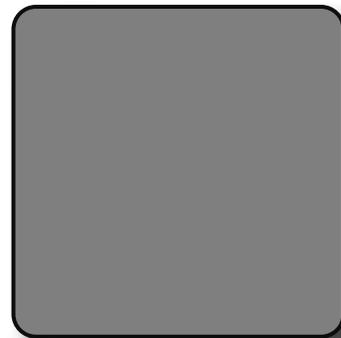
GY520



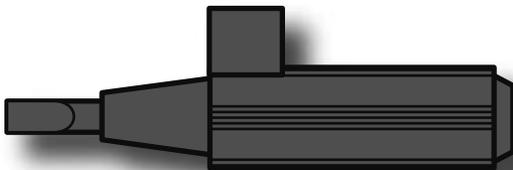
Sensor tape
(2mm and 3mm thick)



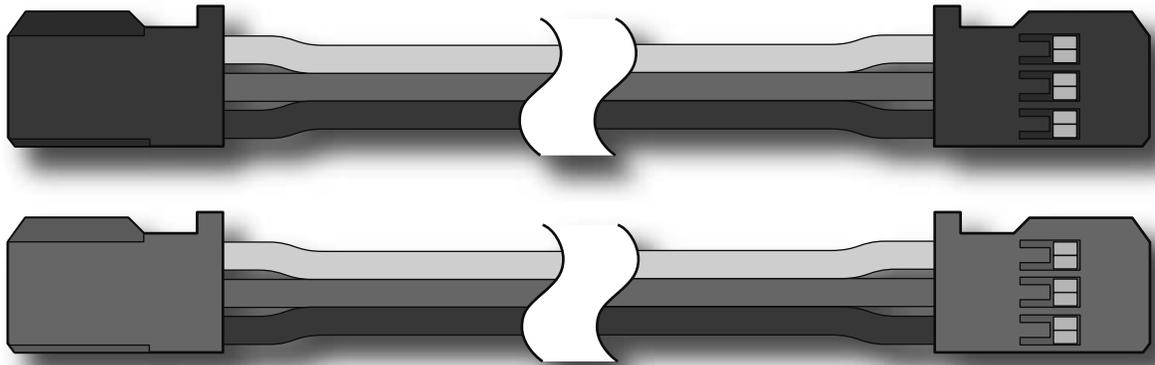
Damping plate



Mini screwdriver

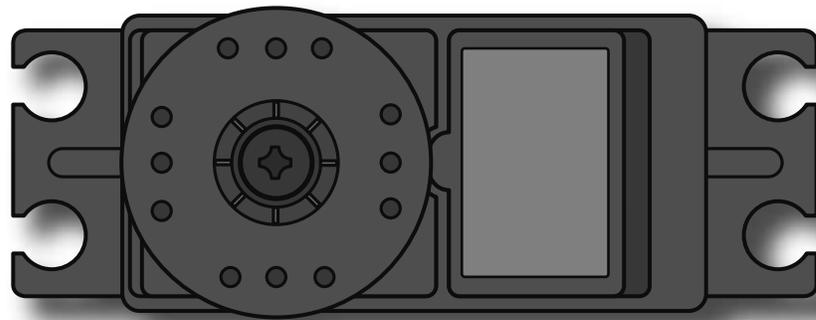


Connection cord(Black/Red)

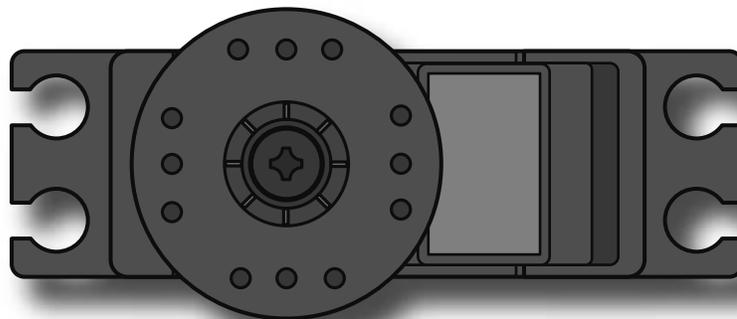


Servo (x1): (Only a set w/servo)

S9254 or BLS254



S9257



*Servo horn etc. are supplied at a set w/servo.

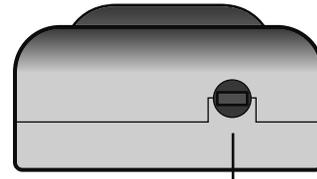
Name and Function of Each Part

Monitor LED

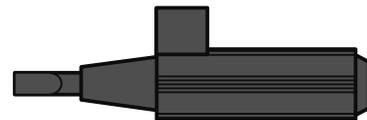
- Indicates the operating state and setting state. (Blue, red, violet/ steady light, blinking)

Button switch

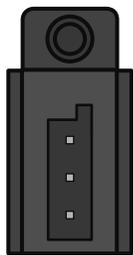
- Used to set the **GY520** operating parameters.



- When operating the button, always use the accessory miniature screwdriver and do not use excessive force.



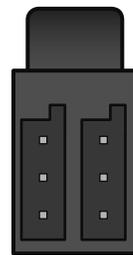
(Connector box)



(Output connector)

Rudder servo connection

(Left)
Gyro sensitivity input



(Right)
Rudder input

(Receiver connector)

- Use the accessory connection cord to connect the receiver to the connector box.

Monitor LED display

The monitor LED displays the gyro's operating state.

Operation	State	LED display	
Starting	No servo pulse/sensor error	<i>Red</i>	<i>Slow blink</i>
	Warm-up	<i>Blue</i>	<i>Slow blink</i>
	Sensor initialization	<i>Blue</i>	<i>Fast blink</i>
Operating	Normal mode (gyro static)	<i>Blue</i>	<i>On</i>
	AVCS mode (gyro static)	<i>Red</i>	<i>On</i>
	At the neutral offset in the AVCS mode (gyro static)	<i>Violet</i>	<i>Slow blink</i>
	Gyro rotating clockwise (depending on the installing direction)	<i>Blue</i>	<i>Fast blink</i>
	Gyro rotating counter-clockwise (depending on the installing direction)	<i>Red</i>	<i>Fast blink</i>

GY520 Operation

The GY520 is used by switching between Normal mode operation and AVCS mode operation from the transmitter. (See p28 for a description of the operation mode and sensitivity setting method.)

The differences between the operation modes are shown in the table below.

Operation mode	Operation
Normal mode	The GY520 operates with the angle correction function in the OFF state. When the helicopter is moving forward a weathervaning effect appears as a special feature.
AVCS mode	An integration function is added and the angle correction function is turned on. As a special feature, the model stubbornly holds its position even in a side wind while moving forward and backward.

GY520 initialization

When the power is turned on, the interior of the GY520 is automatically initialized. When the rudder servo operates four times between right and left, the initialization is completed. When the power is turned on in the AVCS mode, the AVCS mode operation reference data (rudder neutral position) is updated. Therefore, always pay attention to the following when turning on the power.

⚠ CAUTION

(Caution at power ON)



Do not move the helicopter and rudder stick for about 5 minutes after the gyro power (shard with the receiver) is turned on.

- When the power is turned on, the interior of the GY520 is automatically initialized. Do not move the helicopter and rudder stick until the LED of the GY520 lights red or blue.

Operation in AVCS mode

If the rudder stick is operated or the helicopter is moved when the helicopter was stopped during operation in the AVCS mode, the servo will not return to the neutral position even if the rudder stick is returned to the neutral position, and when the rudder stick is moved, the rudder servo controls operation until the tail reaches the maximum point. This is caused by addition of an integration function as an AVCS mode operation and is not an abnormality. In actual flight, the gyro constantly monitors movement of the tail and controls the servo so that movement of the tail is stopped.

Rudder linkage neutral position;

When flown in the AVCS mode, the GY520 automatically trims the rudder even if the rudder linkage change slightly and linkage changes are difficult to judge. However, for the gyro to operate at peak performance, it is important that the servo horn be perpendicular to the linkage rod when the rudder servo linkage is in the neutral position.

For this reason, adjust the linkage by initially flying in the Normal mode and taking the rudder neutral position. Adjust the linkage without using transmitter rudder as much as possible and adjust the pitch angle of the tail rotor so that the rudder is in the neutral position when the servo horn is perpendicular to the linkage rod. This position is the rudder neutral reference position in the AVCS mode.

There are the following two methods of reading this neutral reference position to the gyro:

Methods of reading the AVCS neutral reference position	
Method (1)	Operate the Normal/AVCS mode selector switch 3 times within 1 second and set it to the AVCS mode side. The position of the rudder stick at this time is memorized at the gyro.
Method (2)	Turn on the gyro power in the AVCS mode. The rudder stick position at this time is memorized at the gyro.

AVCS mode servo neutral position check method;

If the rudder stick or the helicopter was moved in the AVCS mode, the servo will not return to its original neutral position. When the power is turned on, the servo will return to the neutral position. The servo neutral position can also be checked by the following method.

Neutral position	Move the rudder stick 3 times to its full stroke to the left and check method right at an interval of within 1 second and immediately return the rudder stick to the neutral position. The servo moves to the neutral position about 1 second later.
-------------------------	--

⚠ CAUTION



Never use the transmitter rudder trim in the AVCS mode.

- When the rudder is trimmed during flight, the neutral position will change.
-



When using the GY520 in the AVCS mode, set revolution mixing to OFF.



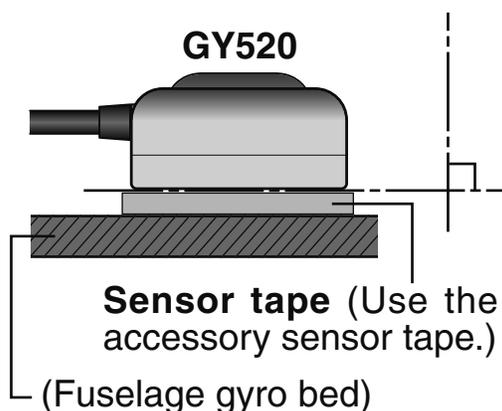
When the rudder neutral position was changed by the linkage, the rudder neutral position in the AVCS mode must always be re-read before use.

INSTALLATION AND ADJUSTMENT

Install and adjust the GY520 as described below.

Installing to Fuselage

Installing the gyro

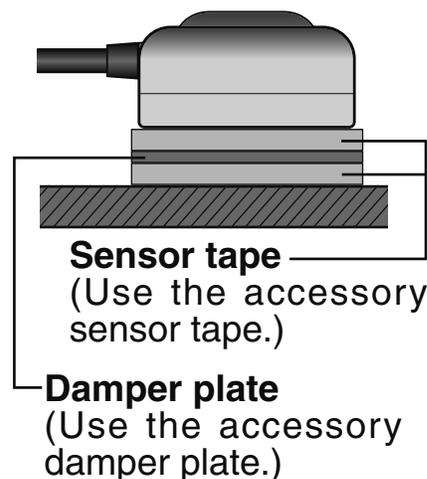


[IMPORTANT] Install the sensor so that the bottom of the gyro is perpendicular to the main shaft axial direction. Offset of this axis will also react in the roll and pitch directions.

[IMPORTANT] The gyro sensor is very sensitive to vibration. Adjust it so that helicopter vibrations are minimal. In addition, provide a margin when securing the cable coming from the gyro body.

[Gyro handling precautions]

- * Always use the accessory sensor tape and install the gyro to the center (vertical and horizontal equal) of the sensor tape. This tape is designed to effectively absorb the vibrations from the helicopter.
- * Use a cleaner to wipe off oil from the bottom and fuselage mounting surfaces of the sensor.
- * The sponge may tear near the corners of the sensor tape depending on the use. If the helicopter is flown in this state, vibrations may not be sufficiently absorbed and the sensor may fall off. Before flight, always check the sensor installation state. If the sponge is torn, replace it.
- * When twitching of the tail caused by vibration of the fuselage cannot be suppressed, install the accessory damper plate by sandwiching it between pieces of sensor tape.



⚠ CAUTION

⊘ Do not strike the gyro body against a hard object or drop the gyro onto a concrete or other hard floor surface.

- The gyro sensor is vulnerable to shock and may be damaged by strong shock.

Vibration

The gyro sensor used is called a vibration gyro. Its construction is such that a microscopic moving part on a silicon wafer is vibrated and the Coriolis force generated is sensed and the angular speed is detected. Therefore, it is intrinsically sensitive to extraneous vibration. It is affected more by X, Y, and Z axes linear vibrations than yaw axis revolving vibration. If the applied vibration exceeds the sensor's allowable value, gyro operation will be affected and the tail will quiver or twitch.

The helicopter generates vibrations over a wide frequency range, from basic engine vibration (200Hz at 12,000) to several thousand kilohertz. Vibrations up to several hundred hertz are visible to the eye. High frequency vibration may cause the gyro to operate erroneously even if visible vibration is not generated.

Always use the excellent vibration absorption sponge tape supplied to mount the GY520. Two kinds of sponges matched to the fuselage are provided. Use of the 2mm thick sponge is affective for electric helicopters, etc. and use of the 3mm thick sponge is affective when the fuselage vibration of gasoline engine helicopters, etc. is large.

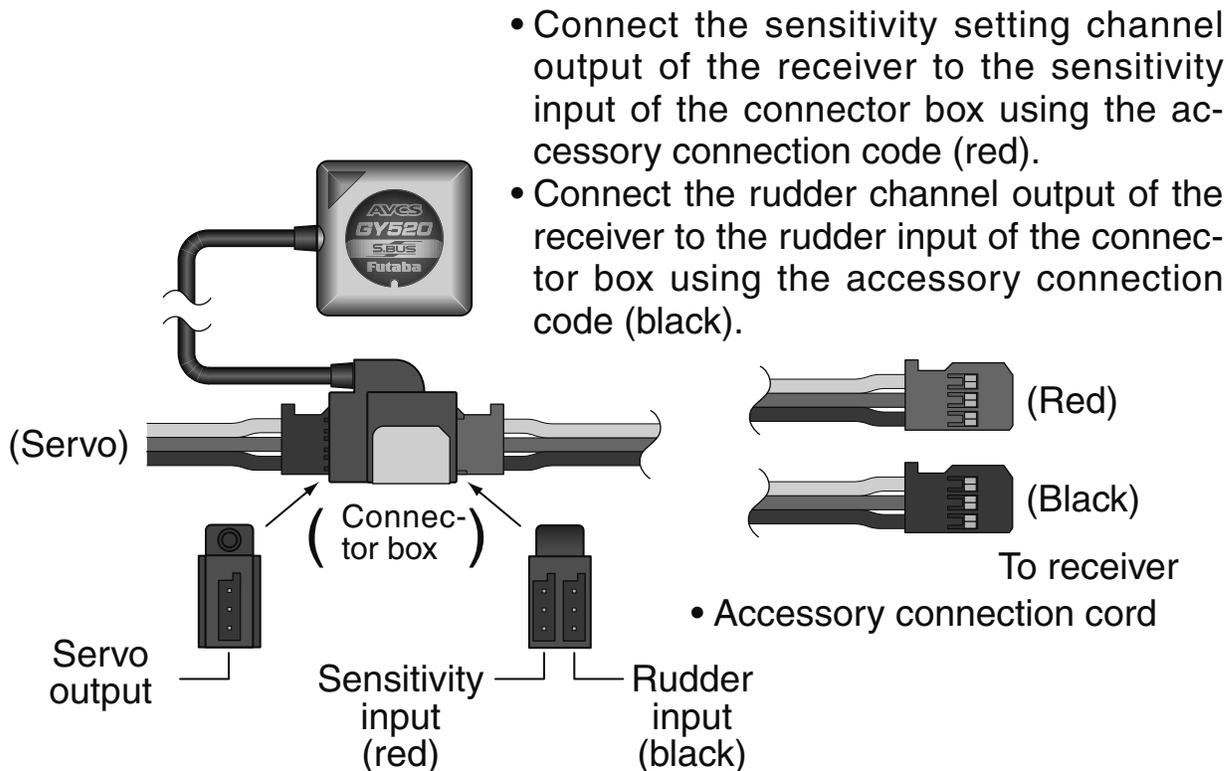
Install using one piece of sponge tape at the center on the helicopter gyro mount.

Effective damping of vibrations is possible in this state, but if the tail quivers or twitches, the gyro may be affected by vibrations. Basically, countermeasures must be taken against the source of vibrations generated by the helicopter. The damping effect can also be increased by mounting the gyro by sandwiching the accessory damping plate between 2 pieces of sponge tape.

Two types of sponge tape are supplied; 2mm and 3mm thick. The 3mm sponge tape has a better shock absorption effect than the 2mm sponge tape. Select and use the tape matched to the fuselage.

Connection method

Connect the GY520, receiver, and servos as shown below.



⚠ WARNING



Insert the connectors fully and firmly.

- If a connector works loose due to vibration during flight, control may be lost and result in a dangerous situation.

⚠ CAUTION



Always set the mode matched to the type of servo to be connected to the GY520. (Servo selection function p.24)

- The GY520 is compatible with digital (1520 μ S and 760 μ S) servos. However, the mode matched to the type of servo must be selected. **If the GY520 is operated in the wrong mode it may malfunction or the servo may be damaged.**

Initialization

Before adjusting the linkage, make the settings and checks described in "GY520 Initialization", "Gyro Sensitivity Initialization", and "Transmitter Setting Check" below.

GY520 Initialization

Set the following GY520 operating parameters in advance. For a description of the setting method, see "GY520 Operating Parameters Setting" (p.23).

[F3C/3D mode setting]

- When delicate rudder operation is necessary, select the F3C mode and when you want to react to rudder stick operation more sensitively, select the 3D mode.

[Servo selection]

- Select the mode matched to the type of servo to be connected to the GY520.

When using a BLS254/S9254/S9257/S9253, select the digital 1520 μ S mode, when using a BLS251/S9256/S9251, select the digital 760 μ S mode, and when using an analog servo, select the analog servo mode.

[Response setting]

- For a 3D aerobatic helicopter or a small helicopter, optimize control by selecting the high speed mode. For a large scale helicopter and tail heavy fuselage, optimize control by selecting the low speed mode. Select the optimum value during flight.

Gyro Sensitivity Initialization (Tentative setting)

Set the gyro sensitivity at the transmitter. For a description of the setting method, see the "Gyro Sensitivity Setting" (p.28) item.

Tentatively set the sensitivity when hovering and in flight to the following values:

- **Hovering: 70%** (both AVC and NOR)
- **Flight: 40%** (both AVC and NOR)

Transmitter Settings Check

Check the transmitter settings in the AVCS mode. Check that the transmitter is not set so that the neutral position has shifted.

[Transmitter setting]

- Set all rudder mixings to INH.
- Set all hovering and flight rudder trims to the same position.
- Set the rudder steering angle to 100% under all conditions.
- Also set the T14MHz, etc. condition delay function to INH.

The neutral offset in the AVCS mode can be checked at the GY502 LED. When the LED is slowly blinking violet, neutral offset is present.

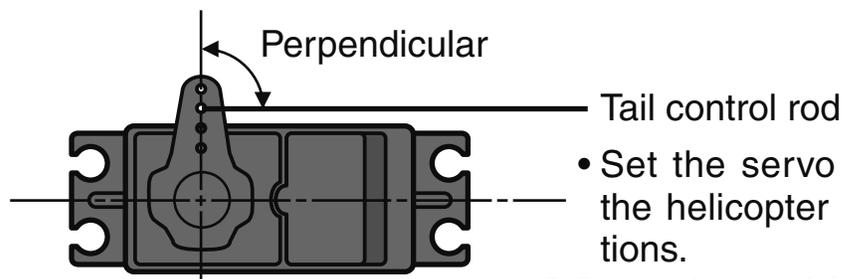
Linkage Adjustment

Adjust the linkage as described below.

* Perform initial linkage adjustment in the Normal mode. In this case, make adjustments mechanically. Make trim adjustments at the transmitter as small as possible.

Rudder Servo Linkage Check

- In the rudder neutral position, connect the linkage at the position at which the servo horn and the tail control rod are perpendicular.



- Set the servo horn length based on the helicopter manufacturer's instructions.

Move the rudder stick to the right and left and check the direction of operation of the tail rotor. If the tail

rotor turns in the wrong direction, reverse the direction using the transmitter reverse function.

Gyro operation direction check

If the rudder gyro moves to the right when the nose of the helicopter moves to the right, the gyro direction is correct.

- If the rudder servo moves in the opposite direction, switch the direction using GY520 reverse setting (p.24).

⚠ CAUTION



Always check the gyro operation direction.

- If you try to fly the helicopter while the gyro direction is incorrect, the helicopter will yaw in a fixed direction and create a very dangerous situation.

Limit setting

Set the rudder servo operation limit angle at which the servo

horn does not strike the linkage.

- For a description of the adjustment method, see "GY520 Limit Setting" (p.25).
- When flying, the servo horn does not move beyond this angle, thus protecting the linkage. However, if the setting is too low, the gyro characteristics will be affected.
- At limit setting, only the stick operates. The gyro does not operate.

Flight Adjustments

1 In the AVCS mode, turn on the transmitter power and then turn on the receiver power. This initializes the GY520 and simultaneously reads the AVCS mode reference data (rudder neutral).

- Do not move the helicopter or rudder stick until the GY520 LED lights red (approximately 5 seconds).

2 Hover in the Normal mode and adjust the rudder neutral position.

- In the AVCS mode, the rudder neutral position is automatically set and linkage changes cannot be verified. First, perform rudder neutral position adjustment in the Normal mode.
- If the rudder servo neutral position has changed considerably, readjust the linkage.

3 After rudder neutral position adjustment in the Normal mode is complete, update and memorize the AVCS mode memory as described below. This memorized data becomes the neutral position reference in the AVCS mode. If rudder trim was changed, don't forget to update the memory.

- In the AVCS mode, turn on the power or operate the AVCS mode switch 3 times within 1 second and set it to the AVCS mode. The rudder stick position at this time is memorized at the gyro.

4 Adjust the sensitivity to the position at which hunting does not occur during hovering and flight.

- Since the GY520 has an extremely fast response, hunting almost never occurs. Adjust the sensitivity while observing the pirouette and stall turn stopping conditions, etc.

5 Adjust the hovering and flight rudder effect using the transmitter's D/R or AFR function.

- Do not perform adjustment using the END POINT (ATV) function. If the END POINT (ATV) function is used, trimming may change.

This ends basic adjustments.

Pirouette speed

The pirouette speed of a helicopter is completely controlled in accordance with the amount of rudder control. For 100% rudder operation amount, the pirouette speed is set to approximately 450deg/sec (at 100% gyro sensitivity) in the F3C mode and to 720deg/sec in the 3D mode. In addition, in the F3C mode, the setting is such that the pirouette speed increases as the gyro sensitivity decreases so that the hovering and flight pirouette speeds change automatically.

The dynamic range (controllable range) of the gyro sensor is adjusted to approximately 800deg/sec. Therefore, when the rudder operation amount exceeds this dynamic range, the helicopter enters the full pitch state and pirouettes at ultra high speed. Be especially careful in the 3D mode because the pirouette speed is set to a high speed and the helicopter will enter this state when the rudder operation amount exceeds 110%. The rudder operation amount can be set using the AFR, DR, and END POINT (ATV) functions of the transmitter.

DESCRIPTION OF FUNCTIONS

GY520 Operating Parameters Setting

Set the GY520 operating parameters after switching from the Normal mode to the Setting mode. There are 6 setting items in all.

[Switching to the Setting mode]

- Press the GY520 button for about 3 seconds (until the violet LED lights momentarily). The GY520 is switched to the following Setting modes.

[Setting mode]

(Parameter)	(Setting)	(LED display)
1. Servo selection	Digital 1520 μ S servo*	Blue 1 blink
	Digital 760 μ S servo	Red 1 blink
	Analog servo	Violet 1 blink
2. Reverse setting	Normal*	Blue 2 blinks
	Reverse	Red 2 blinks
3. Limit setting	(Servo operation limit setting)	Blue 3 blinks
4. F3C/3D mode setting	F3C mode*	Blue 4 blinks
	3D mode	Red 4 blinks
5. Response setting	Reference*	Blue 5 blinks
	Fast	Red 5 blinks
	Slow	Violet 5 blinks
6. Data reset	(Resets settings (1)-(5).)	Blue 6 blinks

*: Initial setting

[Setting item switching]

- Press the button for about 2 seconds (until the violet LED lights momentarily). The setting item is switched.

1. Servo selection

[LED 1 blink]

Selects the mode matched to the type of servo connected to the gyro. Use a Futaba gyro dedicated servo.

- Compatible with 3 types of servo.
- The gyro operates at top performance when used with a digital 760 μ S servo.

CAUTION



Always set the mode matched to the type of servo connected to the gyro.

- If operated in the wrong mode, the gyro may malfunction or the servo may be damaged.

Setting	LED state	Servo type selection method
Digital 1520μS servo*	Blue 1 blink	1. Press the button and set to the LED fast blinking state. (Fast blinking stops in about 1 second.) 2. When the button is momentarily pressed again in the LED fast blinking state, the setting is switched.
Digital 760μS servo	Red 1 blink	
Analog servo	Violet 1 blink	

*: Initial setting

Compatible servos:

- Digital 1520 μ S servo: BLS254, S9254, S9257, S9253
- Digital 760 μ S servo: BLS251, S9256, S9251
- Analog servo: All analog servos

2. Reverse setting

[LED 2 blinks]

Sets the gyro operation direction. Set the operation direction so that when the nose of the helicopter is moves to the right, left correction rudder is applied and when the nose of the helicopter is moves to the left, right correction rudder is applied.

⚠ WARNING



Always check the gyro operation direction.

- If you try to fly the helicopter while the gyro direction is incorrect, the helicopter will yaw in a fixed direction and create a very dangerous situation.

Setting	LED state	Method of changing gyro operation direction
Normal*	Blue 2 blinks	1. Press the button and set to the LED fast blinking state. (Fast blinking stops in about 1 second.)
Reverse	Red 2 blinks	2. When the button is momentarily pressed again in the LED fast blinking state, the setting is switched.

*: Initial setting

3. Limit setting

[LED 3 blinks]

Sets the rudder servo operation limit angle. Adjust the angle after mounting the servo to the fuselage.

Servo operation limit setting method

1. Blinking of the LED 3 times indicates that the gyro is in the limit setting mode. When the button switch is pressed once, the LED blinks rapidly and the gyro enters the single-side (PWM signal wide side) setting mode. The servo operates up to the memorized limit position.
2. When the rudder stick is moved to the left and right during this adjustment, the servo deflection angle is increased and decreased. When the button switch is momentarily pressed once when the rudder servo is in the position at which the rudder linkage does not strike a stopper or any part of the fuselage, that position is memorized. The LED momentarily lights violet. To complete setting, move the servo to the position to be memorized at the other (narrow) side. Move the rudder stick to the left and right and set the limit position the same as the setting described above.

When setting is complete, the LED will blink 3 times.

3. In this state, move the rudder stick and check if the limit positions are normal. (The servo operating angle moves 1.5 times the movement of the stick.) If there is any offset, press the button switch and repeat setting in both directions.

DESCRIPTION OF FUNCTIONS

Note1: If setting the limit position to 50% or less of the servo operating angle is attempted, an error will occur. When the color of the LED is red, the operating angle is 50% or less. Limit setting is possible at the position at which the LED lights blue.

Note2: Before setting the limit position for the first time, disconnect the linkage rod from the horn to protect the rudder linkage.

4. F3C/3D mode setting [LED 4 blinks]

Sets the gyro operation mode (flight mode). Set the F3C mode when delicate rudder operation is necessary. In the 3D mode, rudder stick operation reacts more sensitively.

Setting	LED state	Method of changing gyro operation direction
F3C mode*	Blue 4 blinks	1. Press the button and set to the LED fast blinking state. (Fast blinking stops in about 1 second.)
3D mode	Red 4 blinks	2. When the button is momentarily pressed again in the LED fast blinking state, the setting is switched.

*: Initial setting

5. Response setting [LED 5 blinks]

Sets the helicopter tail response. Generally, the tail response of 3D aerobatic helicopters and small helicopters is fast. Conversely, the tail response of large scale helicopters and tail heavy helicopters is slow. Response setting optimizes control by matching gyro control to the tail response of the helicopter.

- The response can be set in 3 steps. Select the best value by flight adjustment.

Setting	LED state	Method of changing gyro operation direction
Reference*	Blue 5 blinks	1. Press the button and set to the LED fast blinking state. (Fast blinking stops in about 1 second.)
Fast	Red 5 blinks	2. When the button is momentarily pressed again in the LED fast blinking state, the setting is switched.
Slow	Violet 5 blinks	

*: Initial setting

6. Data reset

[LED 6 blinks]

Returns the gyro settings to their initial state. After data reset, set each parameter again.

Reset method

1. Press the button momentarily. The LED blinks fast. (Fast blinking stops in about 1 minute.)
2. In the LED fast blinking state, press the button 3 times. The LED color changes to violet and the data is initialized.

The setting item return to the Servo Selection automatically.

The initial states are:

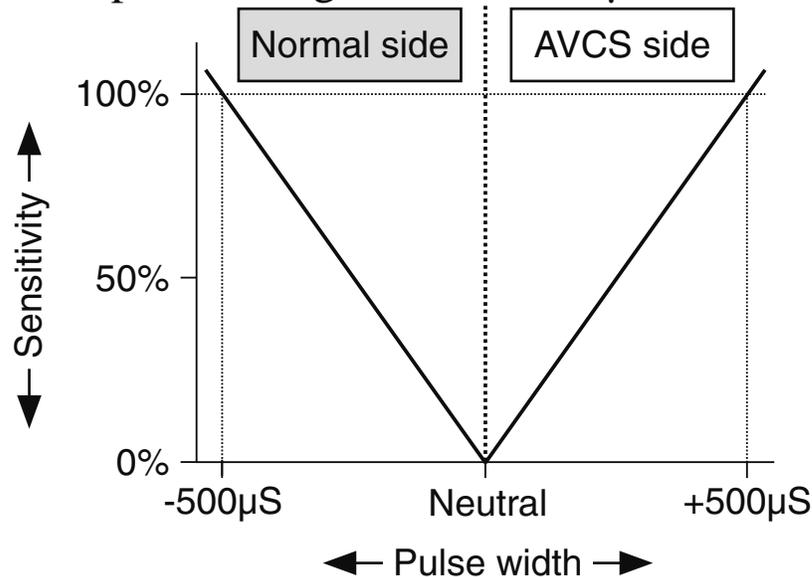
Parameter	Initial state
1. Servo selection	Digital 1520 μ S
2. Reverse setting	Normal
3. Limit setting	Right, left 420 μ S
4. F3C/3D mode	F3C mode
5. Response setting	Reference

When returning to the Normal mode at the end of parameters setting, cycle the receiver and gyro power.

Gyro Sensitivity Setting

The figure below shows the relationship between the GY520 gyro sensitivity and the transmitter gyro sensitivity channel pulse width.

At the neutral position the sensitivity becomes zero and enters the AVCS mode side at the + pulse width side and the Normal mode side at the - pulse width side. The sensitivity becomes 100% when the pulse change width is 500 μ S.



- The newest FUTABA transmitters with gyro sensitivity setting function make AVCS/Normal mode setting and sensitivity setting easy.

For transmitters without a gyro sensitivity setting function, connect the sensitivity setting connector to a vacant switch channel and set the gyro sensitivity using the END POINT (ATV) function of that channel. At 100% ATV, the sensitivity becomes approximately 100%. (For FUTABA transmitter)

- Optimum sensitivity is the position just before the tail of the helicopter starts hunting. Make adjustments during actual flight.

For a 90 class helicopter, the sensitivity criteria is hovering: 70-100% and idle up: 30-60%. For small helicopters with a high tail sensitivity, the optimum sensitivity of the gyro is a low setting.

The sensitivity adjustment method is different depending on the transmitter used. Refer to the setting examples shown below.

When using T14MZ/T12Z/T12FG transmitter

Use the gyro mixing function to set the sensitivity and mode for each condition used.

- Up to 3 sensitivities can be set for each flight condition

[Transmitter Setting]

1 Set the gyro rate in both directions to 100% at the END POINT (ATV) setup screen.

2 Call the GYRO screen and set the sensitivity and mode for each condition.

Setting example;

- Adjust 70% (both AVC and NOR) as the reference when hovering and 40% (both AVC and NOR) as the reference during flight.

The following setting example uses SW-A to switch between AVCS70% (rate 1) and NOR70% (rate 2).

T14MZ

- Enables only the number of functions used by the current condition.
- Selects the rate switches and sets the ON direction when 2 or more sensitivities are used.

(Normal condition screen)

	ACT	Type	Rate	Switch	CTRL	Rate	Group
Rate 1	ON	GY	AVCS 70% (70%)	SW-A	NULL	+ 0% (+0%)	Sngl
Rate 2	OFF	GY	NOR 70% (70%)	SW-A	NULL	+ 0% (+0%)	Sngl
Rate 3	INH	GY	AVCS 0% (0%)	ON	NULL	+ 0% (+0%)	Gr.

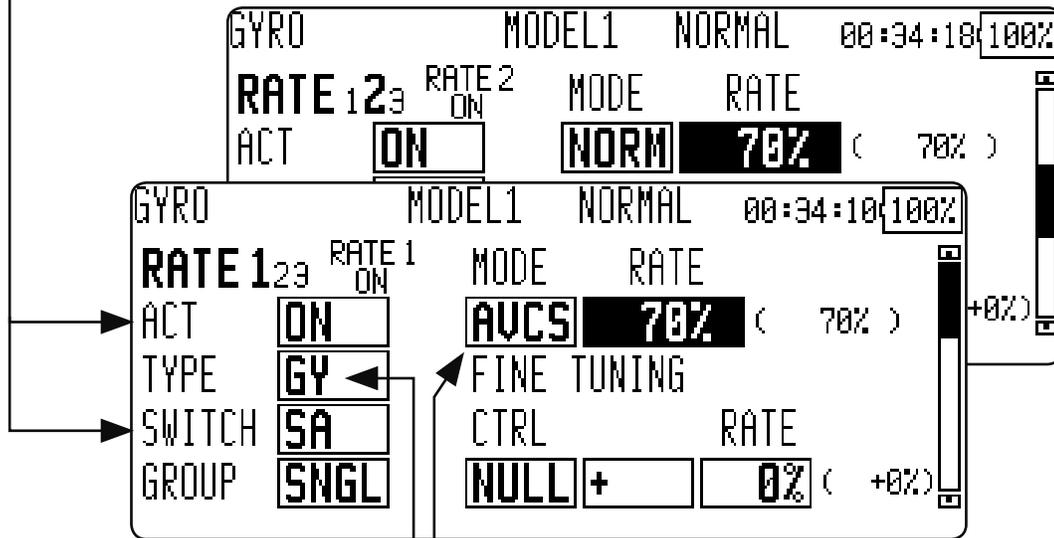
- Select "GY" as the gyro type.
- Mode selection (AVCS or NOR) and sensitivity adjustment

DESCRIPTION OF FUNCTIONS

T12Z

- Enable only the number of functions you want to use with the current condition. (Figure below: 1 rate and 2 screens)
When using 2 or more sensitivities, perform switch selection and ON direction setting at each rate screen.

(Normal condition screen)

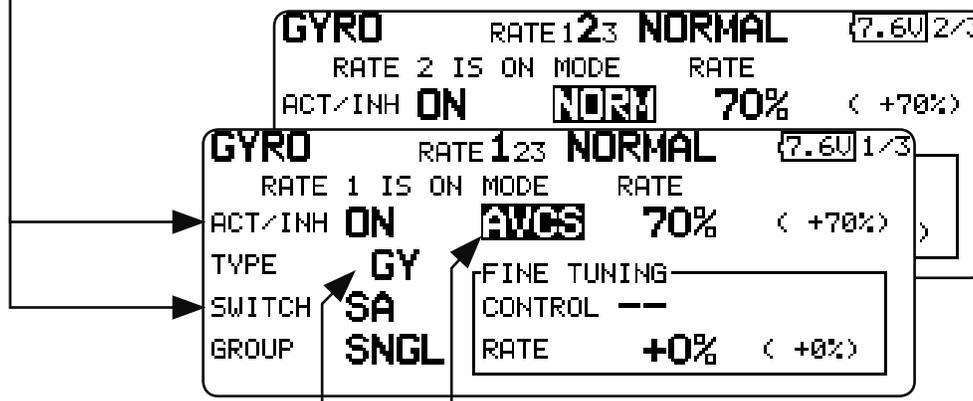


- Selects "GY" as the gyro type.
- Mode selection (AVCS or NOR) and sensitivity adjustment

T12FG

- Enable only the number of functions you want to use with the current condition. (Figure below: 1 rate and 2 screens)
When using 2 or more sensitivities, perform switch selection and ON direction setting at each rate screen.

(Normal condition screen)



- Selects "GY" as the gyro type.
- Mode selection (AVCS or NOR) and sensitivity adjustment

When using a T10C/T9CS/T7C transmitter

Use the gyro mixing function to set the sensitivity for each condition.

[Transmitter setting]

1 Set the 5ch (gyro sensitivity) rate of both directions to 100% using the END POINT setup screen.

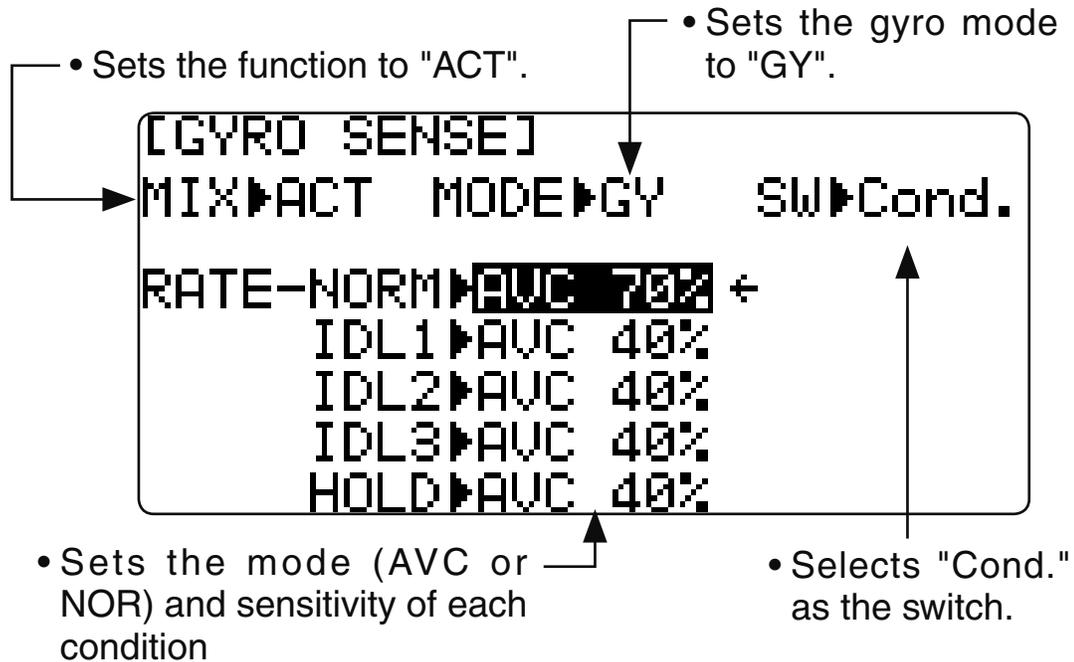
2 Call the GYRO SENS setup screen and set the sensitivity for each condition.

Setting example;

- Adjust 70% (both AVC and NOR) as the reference when hovering and 40% (both AVC and NOR) as the reference during flight.

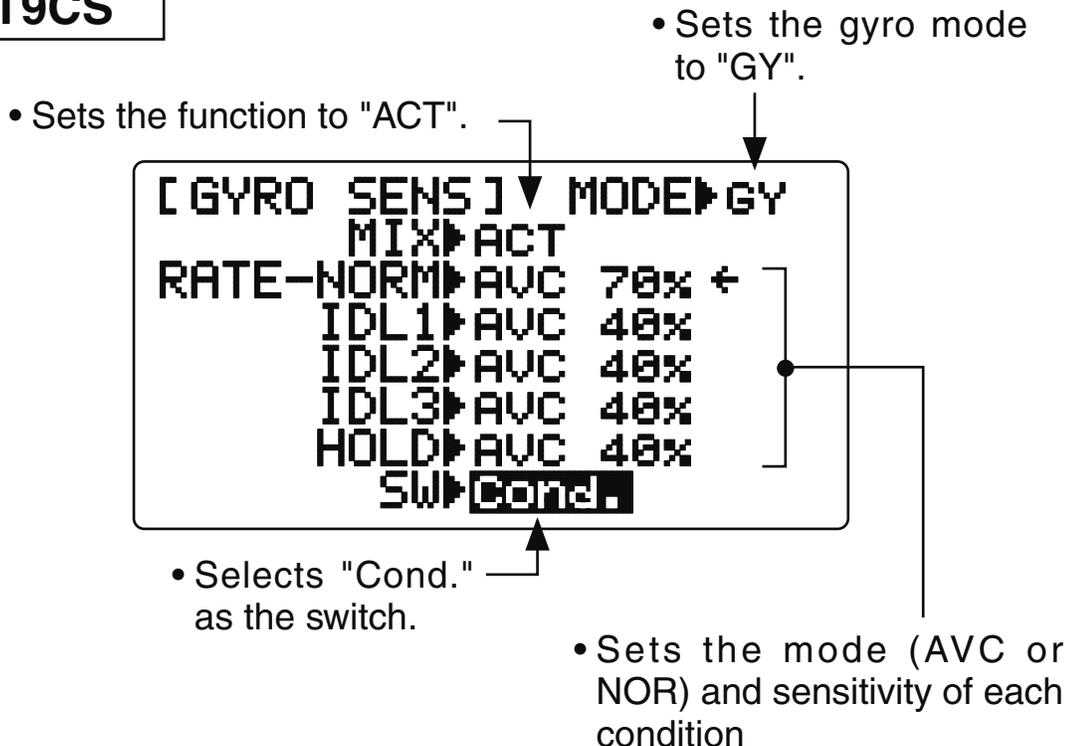
The following setting example shows the sensitivity set to AVCS70% for normal conditions and to AVCS40% for other conditions.

T10C

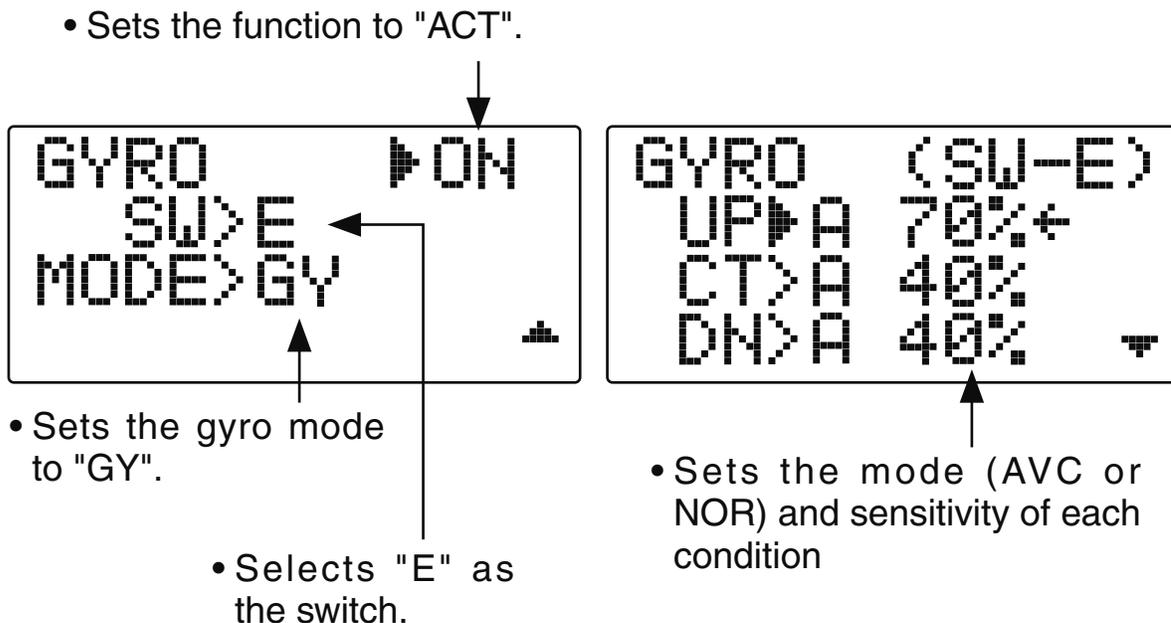


DESCRIPTION OF FUNCTIONS

T9CS



T7C



When using a T6EX transmitter

Use the gyro mixing function to set the sensitivity of each direction of the gyro switch.

[Transmitter setting]

1 Set the 5ch (gyro sensitivity) rate of both directions to 100% using the EPA setup screen.

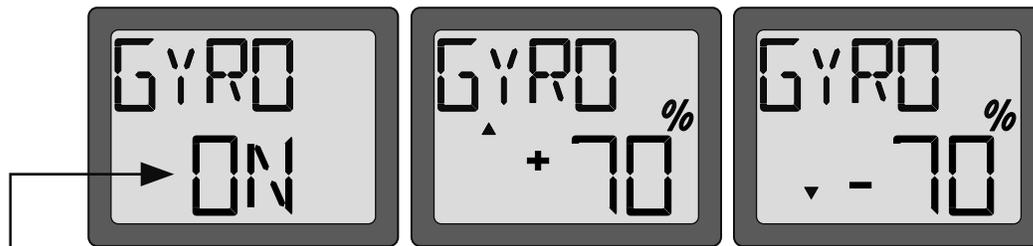
2 Call the GYRO setup screen and set the sensitivity for each direction of the switch.

Setting example;

- Adjust 70% (both AVC and NOR) as the reference when hovering and 40% (both AVC and NOR) as the reference during flight.

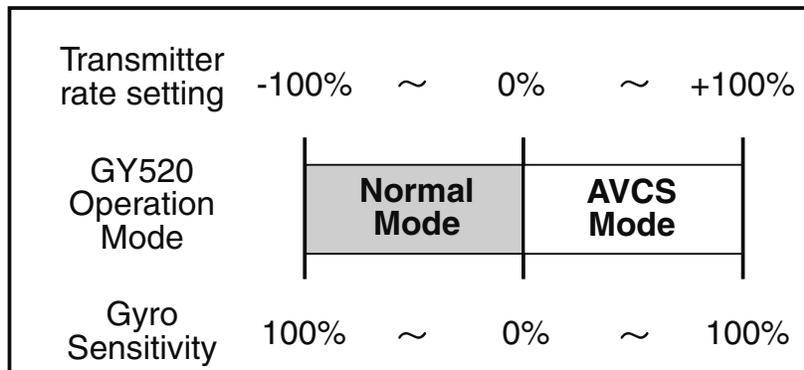
The following setting example shows the sensitivity set to AVCS70% for up side and to Normal70% for down side.

T6EX



- Sets the function to "ON".

- Sets the mode (AVC or Normal) and sensitivity of each direction of the switch



DESCRIPTION OF FUNCTIONS

T9Z (world champion model) transmitter

Use the GYRO SENSE function to set the mode and sensitivity for each condition used.

- Two sensitivities can be used for each flight condition.

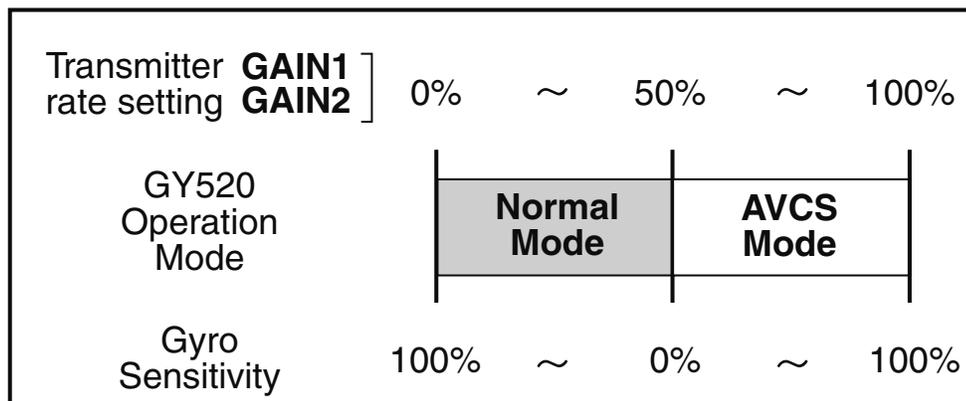
[Transmitter setting]

1 Set the 5ch (GYR) rate of both directions at the ATV setup screen.

2 Call the GYRO SENS screen.

3 Select "DUAL" mode (DUO).

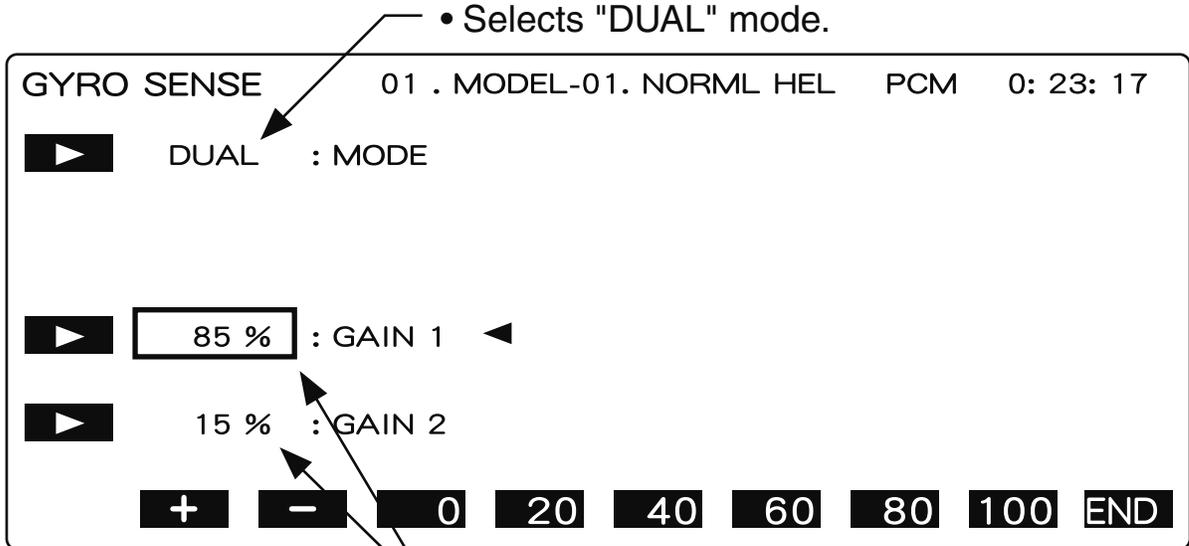
4 Set the sensitivity by adjusting the "GAIN1" and "GAIN2" rates.



For steps 2-4, see the setting example on the next page.

Setting example;

- The example shown below uses a switch to switch the AVCS70%(GAIN1) and Normal70%(GAIN2) modes and sensitivities at each normal condition.



- Sets the sensitivity.
Switches GAIN1 and GAIN2 by switch.

- Adjust the setting of each condition during hovering and flight by making the values shown below the reference. (Example when used by switching the AVCS and Normal mode sensitivities by switch)

Sensitivity Switch		Sensitivity when hovering	Sensitivity in flight
	AVCS side GAIN1	85%	70%
	Normal side GAIN2	15%	30%
	(Actual sensitivity)	70%	40%

The GAIN1 and GAIN2 set values are the AVCS mode setting above 50% and the Normal mode setting below 50%.

DESCRIPTION OF FUNCTIONS

When transmitter without dedicated mixing used

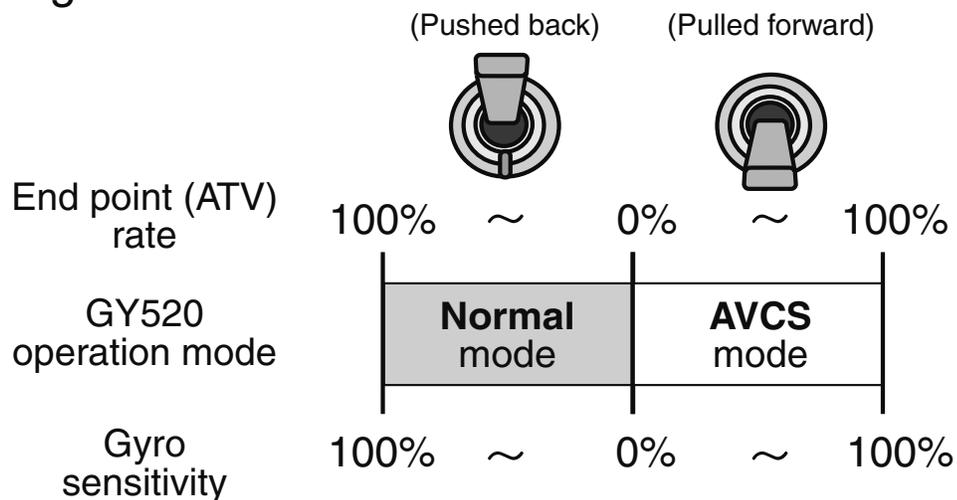
When the transmitter does not have a dedicated mixing function for GY gyro, use a vacant channel to set the sensitivity. Connect the GY520 gyro sensitivity input to the corresponding channel.

Adjust the AVCS side and Normal side sensitivity using the END POINT (ATV) function.

[Transmitter setting]

1 Call the END POINT (ATV) function.

2 Set the sensitivity by adjusting the rate of the sensitivity setting channel.



* However, sensitivity setting by END POINT (ATV) function may have a range over which setting is impossible. Check the END POINT (ATV) setting range of the transmitter used.

* The actual sensitivity of the GY520 depends on the transmitter used.

Setting example;

- Adjust 70% (both AVC and NOR) as the reference when hovering and 40% (both AVC and NOR) as the reference during flight.

REFERENCE

Specifications

* Specifications are subject to change without prior notice.

GY520 Ratings

- Yaw-axis stabilizer for helicopter (rate gyro)
- Control system: Advanced PID control
- Sensor: MEMS vibrating structure gyro
- Angular velocity range: ± 800 deg/sec
- Operating voltage range: DC 3.8V to 6.0V
- Current drain: 40mA (excluding a servo)
- Operating temperature: -10°C - $+45^{\circ}\text{C}$
- Dimensions: 20.8 x 20.8 x 11mm
- Weight: 8g

(Suggested servo for use with your GY520)

S9254 Ratings

(Digital 1520 μ S servo)

- Dimensions: 40 x 20 x 36.6mm
- Weight: 49g
- Speed: 0.06sec/60° (at 4.8V)
- Torque: 3.4kg-cm (at 4.8V)

BLS254 Ratings

(Digital 1520 μ S/brushless servo)

- Dimensions: 40 x 20 x 36.8mm
- Weight: 61g
- Speed: 0.06sec/60° (at 4.8V)
- Torque: 3.8kg-cm (at 4.8V)

S9257 Ratings

(Digital 1520 μ S servo for EP helicopter)

- Dimensions: 35.5 x 15 x 28.6mm
- Weight: 26g
- Speed: 0.08sec/60° (at 4.8V)
- Torque: 2kg-cm (at 4.8V)

S9256 Ratings

(Digital 760 μ S servo)

- Dimensions: 40 x 20 x 36.6mm
- Weight: 57g
- Speed: 0.06sec/60° (at 4.8V)

- Torque: 3.4kg·cm (at 4.8V)

BLS251 Ratings

(Digital 760 μ S/brushless servo)

- Dimensions: 40 x 20 x 36.8mm
- Weight: 61g
- Speed: 0.06sec/60° (at 4.8V)
- Torque: 3.8kg·cm (at 4.8V)

Repair Service (in U.S.A.)

If any difficulties are encountered while setting up or operating your GY520, please consult this 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 below:

<https://www.futabausa.com>

Phone:1-256-461-9399 FAX:1-256-461-1059

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 Corporation of
America
2681 Wall Triana Hwy
Huntsville, AL 35824, U.S.A.**