G400 PIEZO GYRO SYSTEM

Helicopter Use Only
JRPG400

FEATURES

- Compact integrated design for easy installation/connection
- No moving parts for a nearly unlimited service life
- Linear dynamic range up to 720 degrees per second
- 10 times faster response time than mechanical gyros
- Manual gain control for easy set up
- Patented offset drift canceler
- New silver/chrome finish to isolate RF & dissipate heat
- Compatible with JR and other brand radio systems

SPECIFICATIONS

Operating Voltage:	4.8V–6.0V
Operating Current:	28 mAh
Dimensions:	37H x 28W x 36L
Weight:	35g
Dynamic Range:	0 – 720° per second
Battery Requirements:	4.8 – 6.0V 1000ma minimum

INTRODUCTION

JR's latest Piezo gyro, the G400, utilizes a new state-of-the-art integrated design for easy installation, while retaining the same performance levels found in more expensive gyros like JR's G450 Piezo gyro.

Unlike standard mechanical type gyros that use a motor, flyweights, bearings, etc., the G400 Piezo gyro system is totally free of moving parts that in time wearout, giving the G400 a nearly unlimited service life.

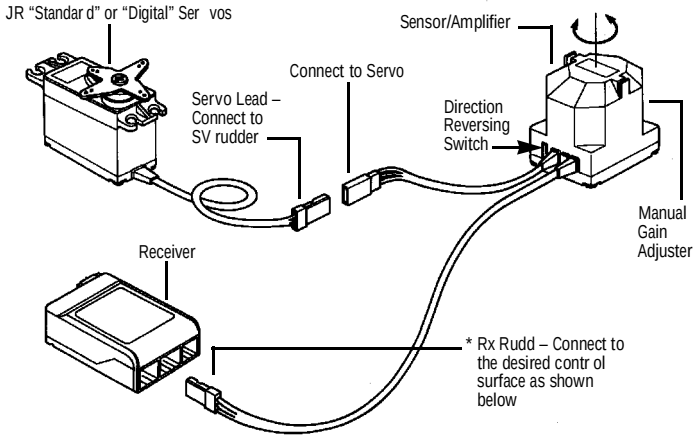
The G400 offers a true linear response of up to 720 degrees per second. The G400 is also 10 times more sensitive and has a faster response time than any current mechanical type gyro, making the G400 one of the highest performance entry level gyros available.

It is important to note that the operational features of the G400 Piezo gyro are very different than that of a mechanical type gyro system. Many current settings, including the travel volume, exponential, dual rates, and tail rotor revolution mixing values, must all be changed from their previous normal settings in order to achieve the correct tail rotor/control surface response and maximum performance that the G400 has to offer.

It is not recommended that the G400 be installed and flown in a model that was previously set up using a mechanical type gyro without first readjusting the function values as described in these instructions.

Carefully read these instructions so you will fully understand and become comfortable with the functions and operating characteristics of the G400 prior to installation and initial test flights.

CONNECTIONS



Radio Type Connections

JR	Futaba/HRC	Airtronics Z
red to red	red to red	red to red
brown to brown	brown to black	brown to black
orange to orange	orange to white	orange to white

Please note that if the system is connected incorrectly, the G400 will not function, but no damage will occur to any of the radio components. After successful connection, secure the gyro to the servo connection with a small piece of tape to prevent possible disconnection during use.

Servo Selection

The G400 Piezo gyro offers greatly improved response time, sensitivity and performance as compared to other Piezo gyros. However, in order to realize these improvements, great care and consideration must be taken in the selection of the servos to be used.

In general, the quicker the transit time and the more accurate the centering tendencies of the servo, the better the gyro will perform.

If a servo with a slow transit time is used, the G400 may become too quick for the servo, resulting in a "wag" or "hunting" situation which will require the user to reduce the percentage of gain. This reduction in gain will also reduce the holding power and, therefore, the performance of the G400. The following JR servos are recommended for use with the G400:

STANDARD SERVOS		TRANSIT TIME
JRPS4735	Ultra Speed Servo	.15 sec/60°
JRPS4721	Ultra Torque Servo	.22 sec/60°
JRPS4131	Ultra Precision Servo	.23 sec/60°
JRPS531	Premium Sport Servo	.21 sec/60°
JRPS517	Standard BB Servo	.26 sec/60°

INSTALLATION AND HOOK-UP

There are three important criteria that must be considered in deciding on the position you should mount the G400.

#1 Heat. The Piezo sensor is sensitive to drastic temperature changes; in some cases a neutral drift will occur.

When mounting the Gyro, be sure it is located away from the engine and exhaust system so none of the heat will transfer to the Gyro from these or any other helicopter parts that might change temperature during operation.

Also, when subjecting your helicopter to temperature differentials (e.g., going from your warm car to the cold outside), allow the gyro's temperature to stabilize for about 10 minutes before flying.

#2 Vibration. The Piezo gyro is 10 times more sensitive to rotational motion than a standard mechanical type gyro. Plus, it has a 10 times faster response time (the time it takes the gyro system to react to motion). Because vibration is motion, the Piezo gyro senses even minute vibrations and acts upon them (sending the servo an opposing command) 10 times faster than a standard gyro.

It is, therefore, important to reduce the vibration of your model to a minimum by making sure that everything is balanced, straight and properly adjusted.

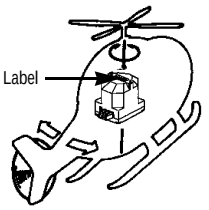
The Gyro should be mounted away from inherent high vibration areas (e.g., engines).

#3 Location. The Gyro should be mounted as close to the center of gravity (normally the main shaft) as possible while taking into account the points made in #1 and #2 above. Many helicopters provide mounting bases near the main shaft. Use them only if they are positioned away from heat-generating sources. If it is not possible to locate the Gyro near the main shaft, an alternate location to consider is up front on the servo tray.

When choosing a mounting location for the G400, make sure you position the gyro so that you have easy access to the manual gain adjuster, located on the back side of the gyro. On initial flights, it will be necessary to access this gain adjuster to fine tune the gain value setting.

Installing the G400

Refer to the following diagrams for proper Gyro positioning. Mount the G400 with the label facing upward as shown in the diagram at right. Please note that the unit must be mounted so the sides of the unit are parallel to the main rotor shaft.



Be sure to thoroughly clean the G400's mounting area and the aircraft's mounting location with rubbing alcohol prior to attachment. Use one layer of the supplied double-sided tape to secure the unit in place. It is not recommended that "thick" foam tape be used as this could reduce the effectiveness/performance of the G400.

Final Connections

Step 1: Connect the RX Rudd connector to the rudder channel/function of the receiver.

If the G400 is located away from the receiver, an optional servo extension (purchased separately) may be used.

Step 2: Connect the desired servo to be used into the SV Rudd lead of the G400.

SET-UP AND ADJUSTMENT

The G400 Piezo gyro gives true linear feedback and response of rotation rates up to over 720 degrees per second (standard gyros are limited to approximately 250 degrees per second).

Thus, the gyro is still sensing at high rotation rates, giving appropriate feedback to the servo. This allows for more consistent pirouettes in the wind and improved 540 stall turns with aggressive stops.

Because of this high rate of rotation sensing, the adjustment values (i.e., travel adjust, dual rates, exponential, tail rotor compensation) will be very different than what you're used to.

Following on the next page is the set-up and adjustment procedure that must be followed to achieve the highest level of performance from your system.

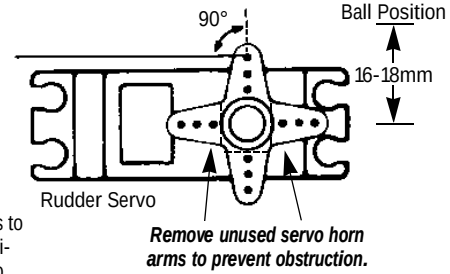
Set-Up

Step 1: Unhook the tail rotor linkage from your rudder servo and swing the servo arm out of the way. Lightly grasp the tail rotor pushrod at the servo end and run the tail rotor through its entire pitch range. The tail rotor linkage should move through its entire range smoothly with very little friction and no rough spots. Work on the linkage system until this is achieved.

Step 2: On your transmitter, set all rudder trimmers (sub-trim, trim offset, mechanical trim, etc.) to zero. Set the throttle/pitch stick at exactly the hover position (standard hover position is 50%). Turn off or zero out both the revolution mixing up and down and the acceleration mixing.

Step 3: Turn on your receiver and allow the helicopter to remain totally motionless for 3 seconds. This procedure is necessary to allow the G400 time to establish and record the center or neutral positions.

Step 4: Remove the servo arm and replace it so that it is exactly 90 degrees to the tail rotor pushrod (see diagram). You may find that the splines in the screw output shaft are just offset enough on your servo arm so as to not allow 90 degree positioning. Rotate the servo arm to another arm and try again. Find the arm that is closest to 90 degrees and secure it in place with the provided screw.



Remove unused servo horn arms to prevent obstruction.

Control Rod Ball Placement

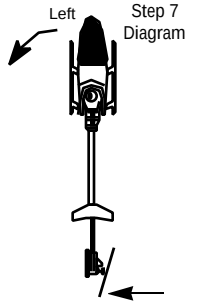
For best performance, attach the tail control rod ball to the servo arm at a distance of approximately 16–18mm from the center mounting screw of the servo arm. The performance of the G400 will be greatly reduced if the tail control rod ball is attached at a distance of less than 16mm, as this position will not make full use of the G400's sensing abilities.

Step 5: Be sure the rudder servo is moving in the proper direction. A right servo command should move the nose to the right (if you're unsure, seek help from someone more experienced). Reverse the servo direction in the transmitter if necessary.

Step 6: Give a right rudder command and note the direction the rudder servo moves (clockwise or counterclockwise). Now pick up the helicopter and quickly move the nose to the left. The servo should move in the same direction. If it moves in the opposite direction, switch the small reverse switch located on the gyro sensor/amplifier in the opposite direction.

Step 7: To verify that the G400 is compensating in the correct direction, please refer to the diagram at right for clarification:

With a quick motion, rotate the nose of the helicopter to the left while viewing the servo arm/tail rotor blades. If correct, the leading edge (front) of the tail rotor blades should pitch to the left as shown. Reverse the direction of the gyro compensation if necessary using the Direction Reversing Switch located on the Sensor/Amplifier Unit.



Right Rudder Command
(tail blades pitch left)

Overdriving the Tail Rotor

As illustrated above, the transmitter gives a command to the servo to find a specific position (e.g., full right rudder). The gyro senses the right rotation and gives the opposite command (left) to the servo. The final servo position (and hence the rotation rate) is based upon the transmitter's command versus the gyro's gain setting versus the rotation rate.

In order to get really rapid rotation rates with some helicopters, it may be necessary to use a travel adjustment that on the ground (no rotational feedback from the gyro) actually exceeds the mechanical limitations of the tail rotor mechanism. In flight, the Piezo gyro will reduce the travel so binding will not occur. But be very careful on the ground to ensure that you don't give hard over rudder commands.

Transmitter Adjustments

Travel Adjust

Set the rudder travel adjustment to maximum right and left. If you are using a JR XP642, XP652, XP783 or XP8103, set this adjustment to 125% left and 125% right. Note: This may overdrive the tail rotor mechanism on the ground. However, in flight, the gyro will reduce the throw, preventing binding at the extremes. You can test this by physically spinning the helicopter as described previously.

Dual Rates

The recommended starting points for dual rates are:

Maneuver	Dual Rate	Flight Mode
Hover	80%	Normal
540 Stall Turn	100%	Flight Mode 1
Standard Aerobatics	80%	Flight Mode 2 (optional)

After some experience and flight time is gained, these values can be adjusted to suit your preference. We recommend adjusting the dual rate values to obtain the desired maximum rotational rate during a maneuver.

Example:

If a 100% dual rate yields too high of a rotation rate in the 540 stall turn when the rudder stick is fully displaced, reduce the dual rate value until the desired rotation rate is achieved.

Exponential

Because a very large servo stroke is utilized (125% L, 125% R), the control sensitivity around neutral is very high. Exponential is recommended to reduce this over-sensitivity around neutral. Following are the recommended expo settings:

Maneuver	Exponential V alue	Flight Mode
Hover	30%	Normal
540 Stall Turns	30%	Flight Mode 1
Std Aerobatics	40%	Flight Mode 2 (optional)

After some experience and flight time is gained, these values can be changed to suit your preference.

We recommend using exponential to adjust the control sensitivity from neutral to approximately 1/3 stick position.

Revo Mixing

The G400 actually increases the total servo stroke by approximately 35%. Compared with previous gyro systems, the Piezo gyro will require that you reduce the revo mixing and stunt trim values by approximately 35%.

Below are some basic starting values to work with.

Note: Because of the variables involved with each different helicopter (e.g., engines, fuel, blades, exhaust systems, aerodynamics, gear ratios, etc.), the optimum can only be achieved with careful tuning and adjustment to your particular helicopter.

XP642, XP652, XP783, XP8103 MIXING V ALUES

Normal	Up 20%	Down 15%
Flight Mode 1	Up 5%	Down 5%
Flight Mode 2	Up 5%	Down 5%

Stunt Trim

Test fly and adjust until the tail follows exactly behind the body in fast forward flight, full throttle/pitch.

Gain Value Adjustments

Hover

On initial test flights it will be necessary to adjust the mechanical control linkage/tail rotor blade pitch so the helicopter will have no tendency to rotate while in the hover position. Minor "fine tuning" adjustments can be made with the rudder trim lever. Once this has been achieved, increase the hover gain (pre-set at 65%) until the helicopter starts to oscillate (hunt). Back down the value just below the hunting point. The value should be between 65 and 95 percent. If so, proceed to the next step. If not, do the following:

Hunting occurs at less than 65% gain in hover—move the rudder pushrod connection at the servo inward one hole on the servo arm.

No hunting occurs even at 100% gain in hover—move the rudder pushrod connection at the servo outward one hole on the servo arm.

Forward flight the helicopter in fast forward flight (if you are comfortable) and increase the low gyro gain value until oscillation (hunting) occurs. Reduce the value slightly, just below the point of hunting. Try a few rolls and see if hunting occurs. Reduce the gain if necessary.

Now go back and fine tune your revo mixing, stunt trim, using your standard method or the method given in your specific radio's instruction manual.

WARRANTY COVERAGE

Your new equipment is warranted to the original purchaser against manufacturer defects in material and workmanship for 1 year from the date of purchase. During this period, Horizon Service Center will repair or replace, at our discretion, any component that is found to be factory defective at no cost to the purchaser. This warranty is limited to the original purchaser of the unit and is not transferable.

This warranty does not apply to any unit which has been improperly installed, mishandled, abused, or damaged in a crash, or to any unit which has been repaired or altered by any unauthorized agencies. Under no circumstances will the buyer be entitled to consequential or incidental damages. This limited warranty gives you specifc legal rights; you also have other rights which may vary from state to state. As with all fine electronic equipment, do not subject your unit to extreme temperatures, humidity or moisture. Do not leave it in direct sunlight for long periods of time.

REPAIR SERVICE INSTRUCTIONS

In the event that your equipment needs service, please follow the instructions listed below:

1. Return your system components only. Do not return your system installed in a model helicopter, plane, etc.

2. Use the original carton/packaging (molded foam container), or equivalent, to ship your unit. Do not use the carton itself as a shipping carton; you should package the equipment carton within a sturdy shipping container using additional packing material to safeguard against damage during transit. Include complete name and address information inside the carton, as well as clearly writing it on the outer label/return address area. Ship your equipment fully insured and prepaid. Horizon Service Center is not responsible for any damages incurred during shipping.

3. Include detailed information explaining your operation of the equipment and problem(s) encountered. Provide an itemized list of equipment enclosed and identify any particular area/function which may better assist our technicians in addressing your concerns. Date your correspondence and include your name, mailing address, and a phone number where you can be reached during the business day.

4. Warranty Repairs. To receive warranty service you must include a legible photocopy of your original dated sales receipt to verify your proof-of-purchase date. Providing that warranty conditions have been met, your radio will be repaired without charge.

5. Normal Non-Warranty Repairs. Should your repair cost exceed 50% of the retail purchase cost, you will be provided with an estimate advising you of your options.

Within your letter, advise us of the payment method you prefer to use. Horizon Service Center accepts VISA, MasterCard, or money orders. Please include your card number and expiration date.

Mail your system to: Horizon Service Center
4105 Fieldstone Road
Champaign, Illinois 61822
(217) 355-9511 www.horizonhobby.com