

NEJ-3000 PIEZO ELECTRONIC GYRO SYSTEM



JRPG3000

FEATURES

- **M.P.C. (Multi Pulse Control) System** — The high frequency output pulse of the NEJ-3000 is three times faster than existing electronic gyros for unmatched performance.
- **Over-travel limiters** prevent servo over-stroke.
- **A built-in remote gain controller** allows gain adjustment from the transmitter.
- **Newly developed offset drift canceling circuitry.**
- **Solid state design with no moving parts** for an almost infinite lifetime.
- **Linear dynamic range up to 720 degrees per second.**
- **Compatible with JR and Futaba systems**

SPECIFICATIONS

Operating Voltage:	4.8 - 6.0V
Operating Current:	50 mA (gyro only)
Dimensions:	
Gyro Sensor:	33 x 33 x 35 mm
Amplifier:	38 x 18 x 53 mm
Weight:	
Gyro Sensor:	1.3 oz
Amplifier:	1.1 oz.

INTRODUCTION

JR's NEJ-3000 Piezo Electronic Gyro System represents the latest in technological advancements. The NEJ-3000, combined with JR's 2700G Super Servo, offers superior "holding power" in all conditions, unequalled by any other gyro system. Its advanced M.P.C. (Multi Pulse Control) System has a high frequency output that allows the NEJ-3000 to react up to three times faster than existing electronic gyros.

Important: JR's NEJ-3000 **must** be used in conjunction with JR's 2700G Super Servo. JR's 2700G Super Servo feature an ultra quick response and transit time, and its total servo stroke (throw) is specifically matched to give the best possible resolution when used with the NEJ-3000 Piezo Gyro. The 2700G Super Servo feature a metal gear train — standard plastic gears can strip because of quick changes in servo direction/velocity when hooked to the NEJ-3000 Gyro.

Important: Because of the highly active/aggressive characteristics of this gyro/servo, heavier than normal loads are placed on the tail rotor drive train. Take special note to ensure that the main drive gear system and tail rotor gear box is in good working order with the correct gear mesh and unworn teeth. Also be sure it is properly greased with all screws secured with Locktite, etc.

On Miniature Aircraft X-Cell series of helicopters, a heavy-duty front tail rotor tune up kit is recommended. (part # MIN0832)

Note: The NEJ-3000 Piezo Gyro's operational features and functions are very different from any other type of gyro. The adjustments, including travel adjust, exponential, dual rates, tail rotor compensation values, gain values and endpoint limits, will be very different from your previous normal settings. **Do not install the NEJ-3000 in your helicopter using your current set-up.** The capabilities of this gyro are much greater; therefore the adjustment values will be different, and you must adjust them correctly to realize the system's full potential.

Carefully read this instruction manual and be sure you fully understand and follow each segment before your first flight.

INSTALLATION

There are several important criteria that you must consider in deciding where to mount the gyro sensor.

Vibration.

JR's NEJ-3000 is as much as 30 times more sensitive and responsive than other gyros. Because vibration is motion, the NEJ-3000 Gyro senses even minute vibrations and acts upon them, sending the rudder servo an opposing command. For optimum results, it's imperative that your helicopter is as vibration free as possible. All rotating components (e.g., main gear, head, tail rotor, blades, clutch, etc.) should be in perfect balance. Equally important, the engine should run smoothly and consistently. Spending the extra time to ensure that your machine is running perfectly will allow the gyro gain to be turned up higher, more effectively holding the tail.

When mounting the gyro sensing unit, it's important to take vibration into consideration. While many helicopters have a gyro mounting plate incorporated into their design, it's a good idea to experiment with different Piezo sensor mounting positions, test flying to establish the position that gives the smoothest tail rotor response at the highest possible gain.

Heat.

The Piezo sensor is sensitive to drastic changes in temperature. Note that the case features a matte chrome finish that is designed to reflect heat. When mounting the gyro sensing unit, be sure that it is located away from the engine and exhaust system so the heat does not transfer to the sensing unit. Also, when subjecting your helicopter to temperature changes (e.g., going from your warm car to the cold outdoors), allow the gyro's temperature to stabilize for about 10 minutes before flying.

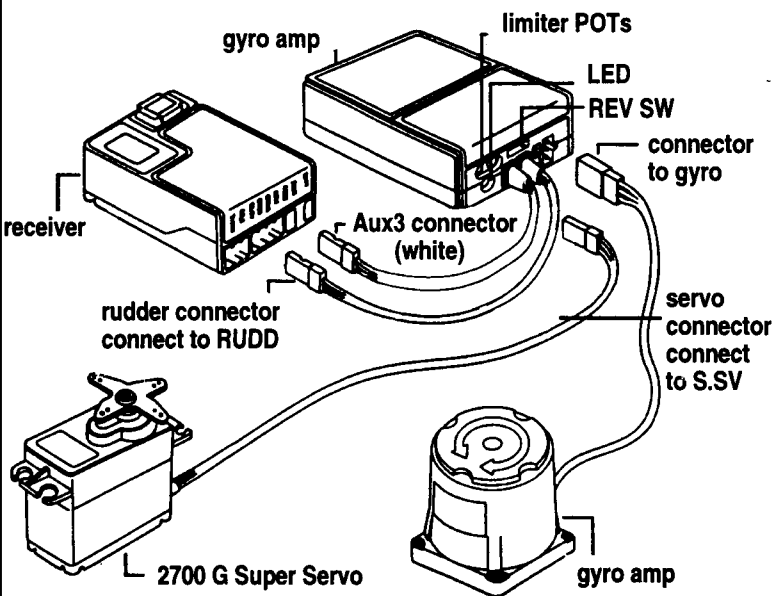
INSTALLING THE GYRO SENSOR

Thoroughly clean the bottom of the gyro sensor and the mounting area with rubbing alcohol. Use one layer of the supplied double-sided tape to securely mount the sensor in position.

Note: Do not use thick foam tape or multiply layers of double-sided tape as is common practice with other gyros. The NEJ-3000's sensor is vibration/shock mounted inside its case via a rubber/air dampening system and no further vibration isolation is necessary.

INSTALLING THE AMPLIFIER

Using the 1/4" or thicker foam, wrap the amplifier and the receiver together, making sure that at least one thickness of foam is between the receiver and amplifier. Fasten the receiver and amplifier to the radio tray using rubber bands, making sure they are securely held in place. If space restrictions don't permit the amplifier and receiver to be mounted together, wrap them individually in foam and mount each in a convenient location. Use an optional servo extension lead if necessary.



HOOK-UP

Step 1: On the gyro amplifier, locate the lead marked RUDD. Connect this lead to the rudder channel in the receiver.

Step 2: On the amplifier, locate the remaining lead marked AUX 3. Note that it has a white connector attached for identification. When using a PCM-10, 10S, 10SX or XP8103 radio system, connect this lead to the Aux 3 channel in the receiver.

Note: When using this gyro with other radios, the Aux 3 lead must be connected to the appropriate channel — the one you use to alter the gain. For example, if you want to use the gear switch to alter the gain, plug the Aux 3 lead into the gear channel and use the travel adjust and sub-trim function to achieve the desired gain in both switch positions.

Note: You may also set the gain by using a proportional knob on your transmitter. In this case, plug the Aux 3 connector into the corresponding channel in the receiver.

Step 3: On the amplifier, locate the S-SV (Super Servo) receptacle. Plug the rudder servo into this receptacle, noting the correct polarity as indicated by the shape of the plug.

Note: The NEJ-3000 is designed to work specifically with JR's 2700G Servo. To achieve the maximum benefit of this gyro system, the 2700G Servo has a stroke (travel) that's matched to the NEJ-3000. Plus, the 2700G has a super fast response time, metal gears and JR's exclusive Super Servo Amplifier that gives maximum torque and speed immediately off center.

Step 4: On the amplifier, locate the gyro receptacle. Plug the gyro sensor lead into the gyro receptacle, noting the correct polarity as indicated by the tab on the connector.

SET-UP AND ADJUSTMENT

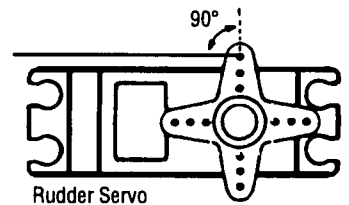
The NEJ-3000 Piezo Gyro gives true linear feedback response of rotation rates from as little as 1° per minute up to over 720° per second. Because of its high response rate and authority, the adjustment values (e.g., travel adjust, exponential, tail rotor compensation, etc.) will be very different from what you're used to.

Following is the step-by-step procedure that must be followed to achieve the highest level of performance from your gyro system.

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

Step 2: On your transmitter, reset all the rudder trimmers (sub-trim, trim offset, stunt trim, mechanical trim lever, etc.) to zero or center. Set the throttle/pitch stick at exactly the hover position (normally 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 three seconds. A bright LED light on the amplifier will come on after three seconds, indicating the gyro has digitally stored the zero rotation value.



Step 4: Install the servo arm so that it's exactly 90° to the tail rotor pushrod (see diagram). You may find that the splines are slightly offset on your servo, not allowing an exact 90° positioning. If so, rotate the servo arm to another arm position and try again. Secure the arm in place with the provided screw. Attach the pushrod to the arm at approximately 12mm out from the center. Later we will optimize this distance out on the arm.

Step 5: Be sure the rudder servo is moving in the correct direction. A right servo command should move the nose of the helicopter to the right. (If you're unsure, seek help from someone with more experience.) Reverse the servo direction in the transmitter's programming if necessary.

Step 6: Give a right rudder command and note the direction the rudder servo moves (clockwise or counterclockwise). Then pick up the helicopter and quickly rotate the nose to the left. The servo should move in the same direction as it did when you applied right rudder (clockwise or counterclockwise). If the rudder servo rotates in the opposite direction, switch the reverse switch located on the amplifier in the opposite direction.

ADJUSTMENT OF THE TRANSMITTER

The NEJ-3000 Gyro is much more responsive than standard gyros, and it can sense and correct for rotation rates at over 720° per second (standard gyros are limited to approximately 250° per second). Because of this, the travel adjust and exponential values will be much greater than they are with other gyros to obtain the optimum feel and rotation rates.

Travel Adjust

Set the rudder's travel adjustment to maximum right and left. If you're using a JR PCM-10/10S/10SX, set the travel adjustment to 150% left and 150% right.

Dual Rates

The recommended starting points for dual rates are:

Flight Mode	Maneuver	Dual Rate Value
Normal	Hovering	60%
Flight Mode 1	540 stall turns	100%
Flight Mode 2	Standard aerobatics	60%
Flight Mode 2 or 3	3D aerobatics	90%

Exponential

Because a very large stroke is used (150%), the control sensitivity around neutral is very high. Exponential is necessary to reduce the sensitivity around neutral. The recommended starting points of exponential are:

Flight Mode	Maneuver	Exponential Value
Normal	Hovering	40%
Flight Mode 1	540 stall turns	60%
Flight Mode 2	Standard aerobatics	60%
Flight Mode 2 or 3	3D aerobatics	60%

Note: After you have gained some experience and flight time, you can adjust travel adjust, dual rate and exponential values to suit your flying style. Some points to remember:

- Dual rate and travel adjust affect the maximum rotation rate at full stick deflection.
- Travel adjust can be used to independently adjust maximum right and left rotation rates; it is normally used to make both right and left rotation rates the same.
- Exponential is used to affect the sensitivity (feel) around neutral. Once you achieve the desired maximum rotation rate using travel adjust and dual rates, use the exponential adjustment to establish the desired sensitivity (feel) around center. On the PCM-10S/SX, you can adjust the exponential for each flight mode.

Tail Rotor Compensation

The NEJ-3000 combined with the 2700G Servo alters the servo stroke, offering greater resolution. Consequently, when compared to other gyro systems, the NEJ-3000 will require you to reduce all the tail rotor compensation values (e.g., revo mixing up down, stunt trim, +/- P mixes, etc.). Following are some basic starting values to work with.

Note: Because of the many variables involved with each different helicopter (e.g., engine, fuel, blades, exhaust system, gear ratios available, etc.), you can only achieve the optimum settings with careful flight testing and adjustment for your particular set-up.

PCM-10/10S/10SX Revo Mixing

Normal	Up 5%	Down 5%		-P0%
Stunt Mode			+P2%	-P2%

Note: If you're using multi-point programmable mixing (PCM-10SX only) for tail rotor compensation, reduce mixing values by approximately 60%-80%.

Stunt Trim

Test fly and adjust stunt trim until the tail tracks directly behind the body in fast forward flight full throttle full pitch.

Remotely Adjustable Gain

The NEJ-3000 features a built-in remotely adjustable gain controller. When using the PCM-10S/10SX, plug the Aux 3 lead from the amplifier into the receiver's Aux 3 position. This will allow gain controller adjustments to be made in Code 44 of your transmitter. (Also, see the PCM-10S/10SX instruction manual, Code 44.)

Code 44 (PCM10SX)

Enter Code 44 in your JR PCM-10S/10SX transmitter, and press the SEL on the screen to activate the gyro sensing adjustment. Notice that by flipping the Aux 3 switch on the upper right of the transmitter, an arrow just left of the gain values switches from gain value 0 to gain value 1. As a starting point, set the lower gain at 75% and the forward flight gain at 55%.

Suggested Gain Setting:

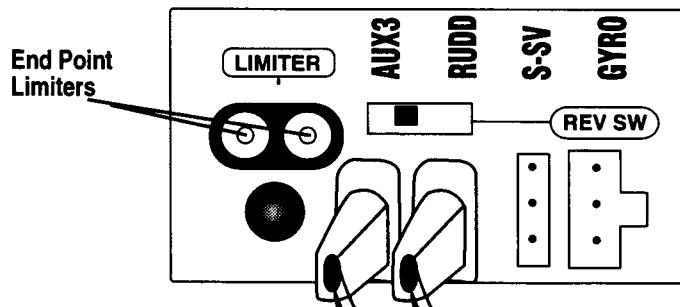
Hover Gain Value 75%	Forward Flight Gain Value 55%
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Set the rudder trim rate to 50% (Code 83)

Adjusting the Endpoint Limiters

With the travel adjust set to 150%, you will notice that moving the rudder stick to its extremes may bind (over-stroke) the tail rotor linkage. JR's NEJ-3000 has a unique feature that electronically limits the maximum servo travel, preventing binding/over-stroking of the rudder linkage — but it has no effect on the maximum control authority during high pirouettes.

Two pots located on the amplifier control the maximum allowable right and left servo stroke.



With your radio system on, give a full right rudder command. Using a small straight screwdriver, adjust the right potentiometer while noticing the rudder servo. Adjust the pot until the servo has maximum available travel but no binding occurs. Then give a full left rudder command and adjust the other pot to the point just before the servo binds. This sets the maximum available travel and eliminates linkage binding/over-stroking while the helicopter is on the ground.

Note: You will notice that with the travel limiters adjusted, it appears that the rudder stick only works the servo throughout half its stroke. This is normal! During flight, the gyro provides feedback to the servo that combines information about its rotation rate and the gain setting that gives proportional rotation rates throughout the rudder's stick travel.

Important: When properly adjusted, it is totally normal for the rudder stick to only affect the rudder's position around the center half of its stroke. During flight, the gyro senses the rotation rate of the helicopter, and the rudder servo works normally throughout its total stroke.

Gain Adjustment

Hover the helicopter. If necessary, adjust the tail rotor linkage so that very little, if any, rudder trim is needed to maintain a constant heading.

Now increase the hovering gain value (Code 44) 5%, and hover the helicopter again. Continue increasing the gain by 5% increments, hovering the helicopter each time until the helicopter starts to oscillate (hunt). When hunting occurs, back down the gain value just below the point where hunting begins. This final value should be between 75 and 100%.

If the gain value is adjusted to 100% and no hunting occurs, move the rudder pushrod connection at the servo outward one hole on the servo arm and retest.

If hunting occurs at less than 75% gain value, move the rudder pushrod connection at the servo inward one hole on the servo arm and retest.

Next, hover the helicopter and readjust the gain value just below hunting. The final hovering value should be between 75% and 100%. This process ensures that the NEJ-3000 Gyro has the most effective authority over the tail rotor system, most aggressively "holding" the tail in position.

Next, fly the helicopter in fast forward flight with the gain in the low gain position. If no hunting occurs, land and increase the low gain value by 5%. Do this until hunting begins to occur, then back off the gain approximately 5%. This final low gain value will be approximately 15% below the high gain settings.

REMOTE GAIN CONTROL SET-UP WITH OTHER RADIOS

The NEJ-3000's remote gain adjustment also works with other systems that have AUX channels. In the case of a proportional knob, plug the white AUX connector in the appropriate receiver jack. Proportional gain is then achieved by rotating the knob to the desired position.

If a two-position switched channel is available, the gain sensitivity can be adjusted in each position using the travel adjustments.

When using a switched channel for gain control, the gain adjustment is achieved by adjusting the endpoints of that switched channel.

Important: Always turn on your transmitter first. Then turn on your receiver. Allow the model to sit motionless for three seconds (until the red LED comes on) before moving/starting your model.

Note: During flight, it's normal for the LED to turn off and on.

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 specific 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 or MasterCard, or we can return the equipment C.O.D. cash-only. If you prefer to use a credit card, include your card number and expiration date.

Mail your system to:

Horizon Service Center
4105 Fieldstone Road
Champaign, Illinois 61821
(217) 355-9511