

The iGyro Simplified!

I have a confession. Frankly, I am an older person. As such, the common wisdom is that I should move slowly, complain a lot and struggle with new technology. Unfortunately, all three are probably true to some extent.

The hesitancy to jump into newer, more complicated technology has probably kept me from looking seriously at gyroscopic control augmentation in my jets, despite the advances of the offerings in this area. I came up with lots of reasons ... lack of speed based sensitivity gain, complexity of installation, compatibility, risk ... and so on. But the tipping point came when Jack Price from Durallite called with information on the new Powerbox iGyro three axis system. I have used Powerbox electronics for years and their products have always been innovative and reliable, so I decided to give this new system a closer look.

Jumping to the end of the story ... I move more sprightly, I am a happy guy, and I am hooked on the iGyro. In short, it has a wide range of capabilities, is easy to install, and performed remarkably well. Like most complex, highly functional technology, however, there is a learning curve to climb. What I will attempt to do here is provide a checklist that will (hopefully) simplify the process for you, and improve your chances for success.

A couple of caveats. First, while much of iGyro set up process is the same for all radio types, there are some manufacturer specific steps. My comments here will be representative of a JR DSM2 set up ... you will need to spend a little time with the radio section of the manual to identify the wiring and binding instructions for your radio type. Secondly, while the capabilities of this little piece of equipment are vast, my checklist will be devoted to basic installation, set up and first flights. Again, a review of the manual will highlight some of the advanced features I will not touch on. Finally, this is not an in-depth technical review. I could talk about MEMs sensors and nano technology at length, but then I couldn't title this article THE IGYRO SIMPLIFIED.

OK, lets get started. I will cover the installation and programming steps in a few minutes, but there is basic information you should be aware of first that will be helpful before you unpack the box.

- + The iGyro has up to five inputs. They consist of two aileron channels, two elevator channels and one rudder channel. If you have twin rudders, you will need a Y harness or a Matchbox.
- + In some radio configurations, such as the JR DSM2 or DSMX mode, the iGyro actually serves as the receiver for the gyro stabilized channels. Three additional remote antennas will be required.
- + The sensitivity (gain) of a traditional gyro is typically set to prevent oscillation at the highest speed, where the least sensitivity is required. It will thus suffer from a lack of

authority during slower speeds and the landing phase. An optional GPS sensor on the iGyro will feed speed data to the system, allowing it to actually increase sensitivity (gain) as the aircraft slows. I highly recommend this option.

- + The iGyro operates in two primary modes, “normal” mode and “heading” mode. “Normal” mode functions in the traditional sense of a gyro ... if a gust of wind causes the plane to roll unintentionally, the gyro counteracts this external force. In “heading” mode, the gyro maintains a constant control surface input to achieve a constant heading. An example would be a constant rudder deflection to maintain level flight in a knife edge. “Heading” mode is normally in operation when the stick is at neutral position while “normal” (or damping) mode takes over when the stick is away from center position commanding a change in attitude. The nice thing about separating control into these two modes is that you can set sensitivity (gain) for each independently, or even fly with one or the other mode off.
- + iGyro operation is controlled through a dedicated channel associated with a three position switch. Switch position 1 sets the gain for all flight surfaces to zero, basically turning off the iGyro. Positions two and three are for pilot configurable gyro gain values between 1% and 100%. You may choose to use position 2 to turn on damping mode and position 3 to turn on both damping and heading. Or, if you did not purchase the optional GPS sensor, you may want to have gain at low levels in position 2 and high levels in position 3. It is up to the pilot to decide how to use these switch positions. Note: it is not desirable to have the rudder in heading mode during normal flight, as it will cause the plane to “knife edge” through the corners, which is an interesting but non-scale look. Heading mode on the rudder should be turned on for maneuvers like knife edge, slow rolls, four point rolls, etc., but you should be able to turn it off in either position 2 or 3.
- + Flight testing will determine the exact sensitivity for each of the control surfaces required for your specific model. For this flight testing, you will need a minimum of one and preferably two channels on a temporary basis to find the proper amount of gain in the air. It is best that you use channels that you can associate with a rotary knob. When gain is determined and permanently saved in the iGyro, these channel(s) will once again be available for other purposes.

With these basics in mind, let’s get started with the preliminary work of installing, configuring and testing the iGyro. It is a twelve step process. Formal menu names from the iGyro screens are in **BOLD** print. Important cross checks are in ***Bold Oblique***.

Step One: Fly the model without the iGyro installed.

- ☞ It is important to establish trims on all the flight surfaces before you activate the iGyro.
- ☞ Do not program in any cross control surface mixing, such as rudder to aileron, aileron differential or aileron to rudder, as the iGyro will compensate for these corrective mixes when activated.

- It is OK to program crow functions.
- I would recommend also programming elevator trim to compensate for flap deployment, particularly if there is a significant amount required. It will be useful to have this mix available should you ever decide to land with the iGyro turned off as well.

Step Two: Create a working copy of the aircraft program.

- While this is an optional step, I would strongly recommend that you create a copy of the model in an unused program slot in your radio. If you are adapting an existing plane to the iGyro, this will be important to preserving any changes to channel assignments, dual rate and/or existing mix settings you make as you install the iGyro, should you ever decide to remove it.
- **Measure and record throws and trim points. This will allow you to cross check everything during iGyro installation and programming.**

Step Three: Install the gyro unit.

- Study the diagrams in the manual that apply to your specific receiver type.
- The iGyro can be installed horizontally, vertically or laterally as long as the unit is at right angles to the direction of flight. Do not install it diagonally. Make sure the unit is secure, as any movement of the unit will cause the gyros to react.
- The location of GPS sensor is not critical as long as it is kept a reasonable distance from carbon fiber or metal.
- The sensor switch does not need to be permanently mounted. Assuming the plug is accessible, the switch only needs to be connected for programming.
- If you are using Spectrum technology, install the remote antennae as you normally would.
- Move aileron, elevator and rudder servo leads from your receiver to the appropriate labeled slot on the iGyro. Note that the ground wire must be on the top, or screen side, of the iGyro.
- If you are using jumper wires to provide power to the iGyro from the Spectrum/JR receiver, strip out the signal (orange) wire, leaving just the red and brown wires. This is important, as stray signals between the receiver and the iGyro will adversely impact binding and may lead to other forms of interference.

Step Four: Complete any radio reprogramming.

- If you need to change any model functions to clear channels for the iGyro mode control and gain adjustment, now is the time to do so.
- Reset any channels that you will use for iGyro mode control and gain control in the radio. Clear out any sub-trims and reset the throws to 100 percent in either direction. Eliminate any reversing that has been selected for these channels. Clear any mixing from these channels. **Confirm these channels are clear by observing the monitor function on your radio.**

- ✎ Assign a three position switch for mode control and rotary knob(s) for gain adjustment and verify their operation through the “monitor” function.
- ✎ If you are a heavy user of dual rates, consider a reduced value. The gyro control will damp stick inputs. I ended up with about 50% of the rates I normally use.

□ Step Five: Plug in the Sensor Switch and play with the menus.

- ✎ The “set” button on the switch serves as a “select” button while the other two buttons move the circular cursor or change values.
- ✎ The small circular cursor lights up when a menu item is selected, and is hollow when an item is not.
- ✎ When assigning channels in the **INPUT MAPPING** menu, a value of “0” means that there is no channel assigned. All other values refer to the channel used for that function in your radio.
- ✎ Play with the various menus. It is a good way to gain quick familiarity with the basic parameters they contain and in a few quick minutes, you will be comfortable enough to begin programming. You can’t hurt anything at this point.

□ Step Six: Select the receiver type and bind the iGyro (if applicable).

- ✎ Insert a bind plug into your receiver (if applicable) and switch on the power to the model.
- ✎ Select the **RECEIVER SETTINGS** menu on the iGyro. Cursor to the appropriate radio technology and select. The cursor will light up momentarily and then turn off when the selection is recorded.
- ✎ Cursor down to the **BIND** option (if applicable) and select. You will see a message appear on the iGyro OLED screen instructing you to turn off power to the receiver. Do so.
- ✎ Turn on the power to the receiver once again and when all of the satellite antennae are flashing, hold the bind button on the radio and power it up. When all the satellite antenna LEDs are solid, remove the bind plug.
- ✎ Don’t be alarmed at this point if some of the flight controls do not work properly. You need to assign channel numbers to them in the next step before the iGyro will recognize the proper programming from your radio.

□ Step Seven: Assign channels to flight controls.

- ✎ Select the **INPUT MAPPING** menu. As you noted when you were playing with the programming, there are five separate screens in this menu. The first defines the channels your radio is using to control ailerons, elevators and rudder. The second, third and fourth are used to assign the temporary channel or channels you will be using for gain control adjustment during flight testing. The fifth and final screen defines the channel you are using for the three position mode switch.

- Start on the first screen and enter the channel from your radio associated with each of the control surfaces you are using. ***At this point, test all of the control surfaces. They should be moving in the proper direction. Throws and trim points should cross check against the pre-installation measurements you took.***
- On the second, third and fourth screens in this menu, you will assign the channels you have selected to temporarily control the gain adjustment during flight testing. For now, assign a gain control channel to all of the flight control surfaces in the “normal” gain sections on all three pages. This will allow you to test and set the proper direction of gyro correction in one of the next steps. Keep the channel assignment at “0” in all the “heading” sections for now. Remember, a “0” value means there is no variable gain channel assigned.
- On the final screen of the **INPUT MAPPING** menu, assign the channel for the iGyro mode switch.
- ***Double check the operation of the iGyro mode switch by returning to the main screen and verifying that the Flight Mode value displayed changes from 1 to 2 to 3 as you operate the switch.***

Step Eight: Define the position of the iGyro.

- To define what is up/down, left/right and fore/aft to the iGyro, you will program the orientation of the unit. This is accomplished by defining which way the OLED screen and switch plug face.
- In the **GENERAL SETTINGS** menu, select these two items and enter the proper values. There is a slight language anomaly here ... up/down is really asking top or bottom.

Step Nine: Define zero point.

- Set the model on the ground in a level attitude with the receiver on and the motor switched off. Select ZERO GYRO from the menu. Depress the “set” button and observe the cursor disc. It should light up, and then return to hollow status after a few seconds.
- Move the aileron, elevator and rudder sticks to both ends of their travel. Do this only once for each control surface.
- If you change trim settings, it is advisable to repeat this procedure.

Step Ten: Set Gain and check direction of movement.

- Assuming you have assigned all of the **NORMAL** gain control settings to the temporary gain control channel operated by the rotary knob in step seven, increase the gain setting to 100% . Flip the three position mode switch to position 2 to activate the gyros.
- The iGyro should now be compensating for movement of the airplane. If the direction of any control surface is opposite the intended movement, go to the **GYRO SETTINGS** screen and select “reverse” for **DIRECTION**.

🔊 *When you are done, go back and recheck for proper gyro reaction a second time, as an incorrect setting here will be a serious problem in the air.*

☐ Step 11: Preflight Programming and checks

🔊 If you have only one channel available for gain control, assign it first to the **NORMAL** gain selection in the **INPUT MAPPING** menu, test fly, set the **NORMAL** gain channel back to 0, and then reassign the gain control channel to the **HEADING** selection. If you have two channels available for gain control, assign one of them to the **NORMAL** gain selections and assign the other to the **HEADING** gain selections. With only one channel, you will need to make one flight for each of the six gain settings. With two channels, three flights will suffice.

🔊 *As you power up the aircraft prior to flight, check to make sure that all of the LEDs in the remote antennae are solidly lit, all control surfaces move in the proper direction, the iGyro OLED screen shows that the GPS is logged in and that the sensors show activity (do not read "idle") when the plane is moved. Flip the three position mode switch and check to make sure that the mode cycles on the OLED.*

🔊 *Make sure the mode switch is in position 1 and that the rotary knob is set to zero gain. Move the aircraft to ensure there is no gyro activity. Flip the mode switch to position 2 and set the gain to 100%. Move the aircraft and validate that the gyro is only active on the control surface being set, and that the direction of operation is correct.*

🔊 Reset the mode switch to position 1 and reduce the gain to 0%.

☐ Step 12: Set the Gain(s) in flight

🔊 Take off with the mode switch in position 1. Fly a high racetrack pattern at a slow, but comfortable speed.

🔊 Flip the switch to position 2 as the plane passes, and observe that there is no change in flight characteristics.

🔊 On the next circuit, increase the gain slowly until you see oscillation of the control surfaces. Then back off the gain slightly until the oscillation stops.

🔊 Gradually increase speed to maximum and make sure the oscillation does not reappear. If it does, you will need to land and adjust the **AIRSPEED FACTOR** to a value of 3 on the **GYRO SETTINGS** screen. Repeat the test.

🔊 If you are using both **NORMAL** and **HEADING** gain controls, set the **NORMAL** gain first and then move on to the **HEADING** gain.

🔊 Briefly move the mode switch to position 3 to copy the settings to this position.

🔊 Leave the knob(s) set to the gain values you have selected and land the aircraft. Before you switch power off, save the values permanently in the iGyro. This is accomplished by resetting the gain control channel back to 0 on the appropriate **INPUT MAPPING** screen for the control surface and mode you were testing. When the gain control channel for aileron, for example, is reset to 0 (no channel assigned), the iGyro stores the value between 1-100% that was last set.

You can confirm this by checking the value on the GYRO SETTINGS menu and by moving the model with the mode switch in positions 2 and 3.

As I mentioned at the outset, the iGyro has some additional features and functions that you may wish to take advantage of as you gain experience with the unit. A quick perusal of the manual will explain these. The kit also contains a USB cable that will allow you to apply updates as they become available. Any updates and a Windows program to apply them are available on the Powerbox website.

The impact of the iGyro on the flight characteristics of any aircraft are significant and will immediately reduce your pilot load and result in arrow straight and smooth maneuvers. I conducted my evaluation using a DV8R, a plane with a high degree of coupling between control surfaces. For example, I was using a very high degree of aileron differential to provide axial rolls which became unnecessary with the iGyro in operation.

My last thought is to encourage you to get in the habit of performing the preflight checks outlined in Step 11. If anything should go astray with the iGyro, these checks should catch the problem while still on the ground. If a problem does develop in the air, be ready to flip the gyro mode switch to position 1. Practice this occasionally such that the execution of this is natural. When you fly with the iGyro turned off, you will also develop an appreciation for how capable this little piece of equipment truly is!