

Xflight Technologies LLC
GYRO User & Installation Guide

Version 1.1

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Xflighttech.com



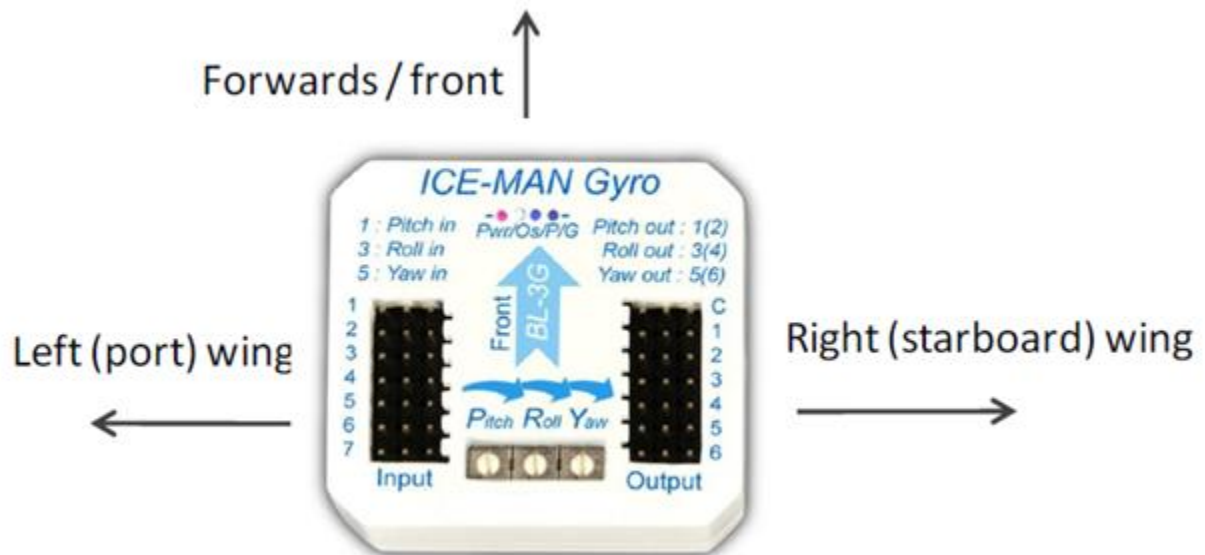
A. Terms, Conditions and Warranty.

These products are only intended to be used in LSA Class Experimental Aircraft or Ultralights (as defined by the FAA in the USA) under the full responsibility of the pilot. The Gyro and associated components are intended to be used to manipulate secondary control surfaces only, allowing the pilot full manual control of the primary control surface and of the aircraft

See Appendix A for details

B. Installation:

Mount the Gyro on a foam or padded base to protect from vibration and as close as possible to the fuselage center line, with the blue arrow pointing forward as shown. (Before permanently securing the Gyro to the aircraft see Section D on setup below).



The modified Bluelight Technologies ICE-MAN advanced gyro is used for stability control

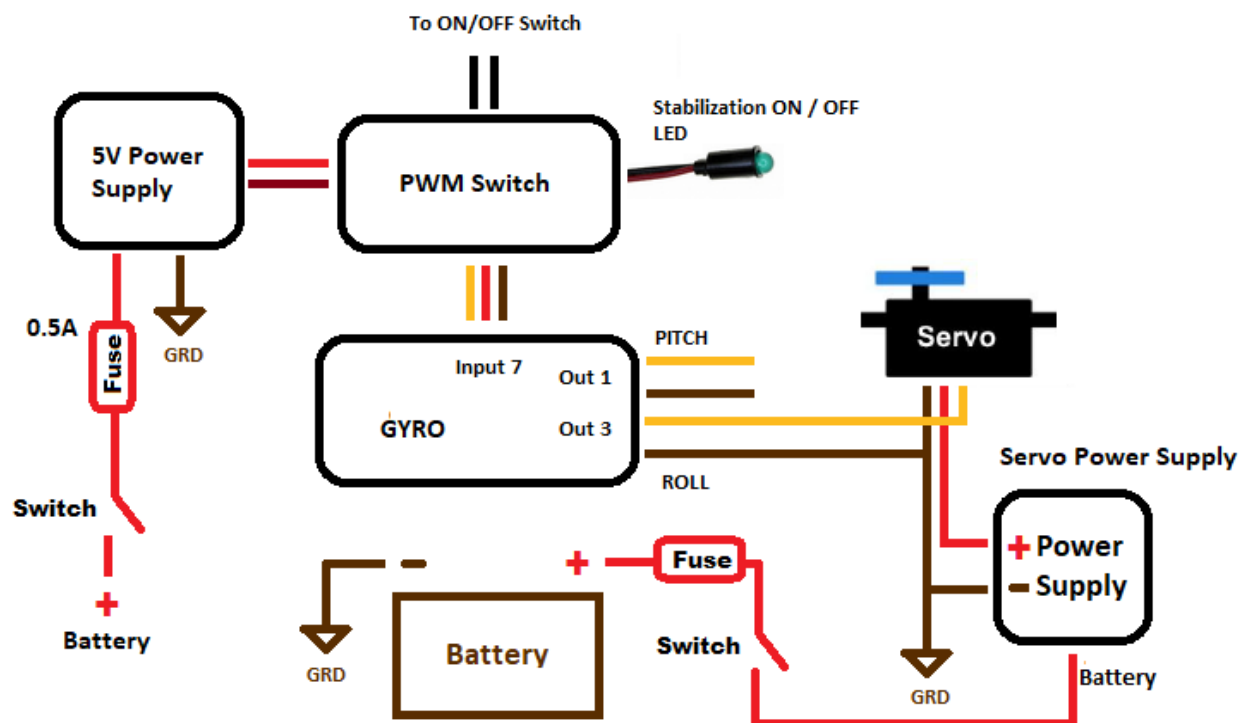
The Gyro is designed to work with PWM servos, controlling elevator (pitch) and aileron (roll) trim tabs and optionally rudder (yaw) trim tabs. Alternatively, secondary aileron control surfaces may be controlled for roll. The primary control surfaces must always be solely under the full control of the pilot.

C. Wiring:

Wire the Gyro Controller and Servos to separate fused circuits:

Gyro and PWM Switch Wiring

Connect the 5V power supply to the battery via a 0.5A fuse and switch. Connect the PWM Switch to Gyro input #7 via the cable provided (this also provides the Gyro power).



Connect the PWM switch to Input # 7 of the Gyro, and servos to Gyro outputs # 1 to # 4, with the ground wire to the outside of the connectors as shown below:
(Make sure you do **NOT** connect to the output marked "C")



Always connect the ground wire on the outside of the connector (input and output)

Servo Wiring

The servos use a separate fused power circuit, so the red servo power wire needs to be cut and connected to the servo power supply as shown above for pitch and roll.

- Gyro Output # 1* is for **Pitch** (Output # 2 is Inverse Pitch and can be used if the servo moves in the opposite direction than desired)
* Make sure you do NOT connect to the first output connector marked "C"
- Gyro Output # 3 is for **Roll** (Output # 4 is Inverse Roll and can be used if the servo moves in the opposite direction than desired)
- Gyro Output # 5 (optional) is for **Yaw**

Servo wires are usually colored as below:

Orange or White	Signal
Red	Power
Black or Brown	Ground

If you are planning to have more than one servo per axis, e.g. for differential aileron movement, then a Y-cable may be used to split the signal to both servos.

It is recommended that shielded cable be used for the servo signal wiring (with the shield connected to ground). Differential drivers are strongly recommended for cable runs greater than 10 feet (available from xflighttech.com).

Wiring Summary

Wire	Gyro Connection	Orientation
Gyro Input # 7	PWM Switch Input	Orange/White Signal on Inside Red Power, in middle Brown/Black Ground on Outside
Gyro Output # 1	Pitch Signal	Orange/White Signal on Inside Red (power, middle) do NOT use (cut wire) Brown/Black Ground on Outside
Gyro Output # 2	Inverse Pitch Signal	Orange/White Signal on Inside Red (power, middle) do NOT use (cut wire) Brown/Black Ground on Outside
Gyro Output # 3	Roll Signal	Orange/White Signal on Inside Red (power, middle) do NOT use (cut wire) Brown/Black Ground on Outside
Gyro Output # 4	Inverse Roll Signal	Orange/White Signal on Inside Red (power, middle) do NOT use (cut wire) Brown/Black Ground on Outside
Gyro Output # 5	Yaw Signal	Orange/White Signal on Inside Red (power, middle) do NOT use (cut wire) Brown/Black Ground on Outside

Servo Installation Tips:

- Install servos such that they do not interfere with primary control surface operation. Even if servos get stuck fully extended, you should still have full manual control of the aircraft
- Make sure the secondary / trim flight control surfaces move smoothly from max up to max down deflection across a good portion of the servo full range rotation. I.e. do not have them be so sensitive that the servo only moves through a small rotation for full deflection or moves through a large rotation for a very small deflection
- Make sure there is no possibility of the servos being driven beyond the control surface hard stops.
- Ensure the servo torque rating is sufficient for the loads required. (There are resources online to assist with this calculation).
- Ensure you provide a regulated power source for the servos as specified by the manufacturer for maximum torque
- Avoid switching the servo circuit on when on the ground, during take-off and landing or when flying at low level, as the servo signal wires may be susceptible to noise pickup.

D. Setup and Operation

It is important to understand that the Gyro provides roll, pitch (and yaw) stability only. It does not have any navigational capability, and so will not hold a specific track or altitude. It is designed to react to turbulence and unwanted disturbances in pitch, roll and yaw.

Orientation Test

Once everything is connected and the servos are installed and before permanently securing the Gyro to the aircraft, you need to check the servo orientation to make sure that the Gyro action is in the correct direction on the ground (you may need to temporarily increase gain for this – see section below):

PITCH:

1. Power on the Gyro and Servo circuits.
2. Switch on Gyro Stabilization (Stabilization ON/OFF and green Gyro 'G' LEDs come ON)
3. The servos should be at their central neutral positions
4. Pitch the Gyro UP to simulate a sudden unwanted pitch up movement. You should see the elevator trim tab quickly correct for this and move UP (allowing the airflow against the trim tab to push the elevator DOWN). The trim tab will then quickly return to center.
5. Repeat for Gyro DOWN.

Pitch Trim Tab

Action	Expected Movement
Gyro Pitch UP	Trim Tab Up (Elevator DOWN) to pitch aircraft DOWN
Gyro Pitch DOWN	Trim Tab Down (Elevator UP) to pitch aircraft UP

ROLL:

6. The servos should be at their central neutral positions
7. Roll the Gyro LEFT to simulate a sudden unwanted roll left movement. You should see the port aileron trim tab quickly correct for this and move UP (allowing the airflow against the trim tab to push the aileron DOWN). The trim tab will then quickly return to center. Check opposite movement for the starboard trim tab
8. Repeat for Gyro RIGHT.

Roll Trim Tab

Action	Expected Movement
Gyro Roll LEFT	Port Trim Tab Up (Port Elevator DOWN) to roll aircraft RIGHT
Gyro Roll LEFT	Starboard Trim Tab Down (Starboard Elevator UP) to roll aircraft RIGHT
Gyro Roll RIGHT	Port Trim Tab Down (Port Elevator UP) to roll aircraft LEFT
Gyro Roll RIGHT	Starboard Trim Tab Up (Starboard Elevator DOWN) to roll aircraft LEFT

9. If the Gyro action is reversed for either pitch or roll, then you can either:
 - a. Use the alternate Gyro **inverse** output, or
 - b. Physically reverse the servo installation

Gain

The default values are more than likely good enough but can be adjusted (when on the ground) to increase or decrease sensitivity.

It is important to ensure the gain values are not too high as this will cause the servos to move about rapidly in response to vibration and possibly overheat.



The gain values can be adjusted directly on the Gyro with the small screwdriver provided, when on the ground; clockwise to increase and anti-clockwise to decrease as indicated.

Gyro LED Indications:



LED	Color	Meaning
Pwr	Red	Power ON
Os	Blue	Software running
P	Red	PC updating firmware
G	Green	Gyro enabled (Stabilize ON/OFF Switch)

This is an advanced Gyro Controller, with many more parameters and configurations that can be adjusted using the manufacturer's setup software. Interested users may contact Steve@XflightTech.com for an advanced user manual and free configuration software.

Appendix A.

Xflight Technologies LLC Terms, Conditions and Warranty

1. **PARTIES.** This Contract represents the terms and conditions of sale of Xflight Technologies Products by and between Xflight Technologies LLC, of 1982 State Rd 44, New Smyrna Beach, Florida 32168, USA ("Seller"), and Buyer ("Buyer").
2. **ITEMS PURCHASED.** Seller agrees to sell, and Buyer agrees to buy, one or more of the following products (the "Goods") in accordance with the terms and conditions of this Contract:

Products
Xflight GYRO controller and related components

3. **INTELLECTUAL PROPERTY.** Intellectual property created, made, or originated by the officers, employees, or contractors of Seller shall remain the sole and exclusive property of Seller. Any intellectual property associated with Goods, specifically the software, shall remain the property of Seller. Seller retains all rights to its pre-existing intellectual property and any intellectual property it creates in connection with the development and manufacturing of the Goods of this agreement. Parties agree that Seller will retain ownership of all rights in any invention and work product developed pursuant to the agreement and acknowledges that all materials created by the Seller pursuant to and related to the agreement belong to the Seller under United States intellectual property laws.
4. **TRIM & AUTOPILOT COMPONENTS**
Xflight Gyro, Autopilot and Manual Trim components are ONLY intended for control of trim tabs or secondary flight control surfaces via high torque PWM servos and must NEVER be used for direct control of primary flight control surfaces.
5. **TRIM TABS**
Xflight Technologies is not providing any specific advice on trim tab size, location, installation or servo installation and weight distribution, with possible implications for induced flutter. Always consult with the original designer or kit manufacturer or an aeronautical engineer before making changes to your aircraft
6. **WARRANTIES.** The Goods are sold on an "AS IS" basis. SELLER SHALL IN NO EVENT BE LIABLE FOR ANY INCIDENTAL, SPECIAL, OR CONSEQUENTIAL DAMAGES OF ANY NATURE, EVEN IF SELLER HAS BEEN ADVISED OF THE POSSIBILITY OF SUCH DAMAGES. Seller's liability, if any, for defective Goods, is limited to replacement, repair or refund of the defective Goods, at Seller's option for up to 30 days from date of purchase.

7. **PERSONAL USE.** Buyer agrees to limit the operation and use of purchased Goods to personal recreational use. Buyer agrees to not develop or resell Goods, its components, or documentation to another party without Seller's written authorization.
8. **PRODUCT RISKS.** Buyer acknowledges that the ownership and operation of newly developed autopilot and AHRS products, including the subject Goods contemplated by this contract, comes with many unforeseeable risks and potential hazards. Buyer has reviewed the risks, safety hazards and recommendations provided by Seller in the User Guide. Buyer has considered these risks and represents himself as a consumer with a sophisticated understanding of aircraft operation and mechanics, vehicle physics, flying safety protocols, and the concepts underlying the Goods' design. Buyer accepts all foreseeable and unforeseeable risks associated with the ownership and operation of the Goods, components, and related equipment.
9. **INDEMNIFICATION.** Buyer shall defend, indemnify, and hold harmless Seller, including its officers and agents, from any and all actual or alleged claims, demands, causes of action, liability, loss, damage and/or injury (to property or persons, including without limitation wrongful death), associated with the ownership and operation of the Goods of this contract. This indemnity shall apply in all actions, whether brought by an individual or other entity, or imposed by a court of law or by administrative action of any federal, state, or local governmental body or agency, arising out of or incident to any acts, omissions, negligence, or willful misconduct of Buyer, its personnel, employees, agents, contractors, or volunteers in connection with or arising out of Buyer's actions. This indemnification applies to and includes, without limitation, the payment of all penalties, fines, judgments, awards, decrees, attorneys' fees, and related costs or expenses, and any reimbursements to Seller for all legal expenses and costs incurred by it.
10. **REMEDIES ON DEFAULT.** In addition to any and all other rights a party may have available according to law, if a party defaults by failing to substantially perform any provision, term or condition of this Contract (including without limitation the failure to make a monetary payment when due), the other party may terminate the Contract by providing written notice to the defaulting party. This notice shall describe with sufficient detail the nature of the default. The party receiving such notice shall have 30 days from the effective date of such notice to cure the default(s). Unless waived by a party providing notice, the failure to cure the default(s) within such time period shall result in the automatic termination of this Contract.
11. **ARBITRATION.** Any controversies or disputes arising out of or relating to this Contract shall be resolved by binding arbitration in accordance with the then-current Commercial Arbitration Rules of the American Arbitration Association. The parties shall select a mutually acceptable arbitrator knowledgeable about issues relating to the subject matter of this Contract. In the event the parties are unable to agree to such a selection,

each party will select an arbitrator and the two arbitrators in turn shall select a third arbitrator, all three of whom shall preside jointly over the matter. The arbitration shall take place at a location that is reasonably centrally located between the parties, or otherwise mutually agreed upon by the parties. All documents, materials, and information in the possession of each party that are in any way relevant to the dispute shall be made available to the other party for review and copying no later than 30 days after the notice of arbitration is served. The arbitrator(s) shall not have the authority to modify any provision of this Contract or to award punitive damages. The arbitrator(s) shall have the power to issue mandatory orders and restraint orders in connection with the arbitration. The decision rendered by the arbitrator(s) shall be final and binding on the parties, and judgment may be entered in conformity with the decision in any court having jurisdiction. The agreement to arbitration shall be specifically enforceable under the prevailing arbitration law. During the continuance of any arbitration proceeding, the parties shall continue to perform their respective obligations under this Contract.

12. **NOTICE.** Any notice or communication required or permitted under this Contract shall be sufficiently given if delivered in person or by certified mail, return receipt requested, to the addresses listed above or to such other address as one party may have furnished to the other in writing. The notice shall be deemed received when delivered or signed for, or on the third day after mailing if not signed for.
13. **ASSIGNMENT.** Neither party may assign or transfer this Contract without prior written consent of the other party, which consent shall not be unreasonably withheld.
14. **ENTIRE CONTRACT.** This Contract contains the entire agreement of the parties regarding the subject matter of this Contract, and there are no other promises or conditions in any other agreement whether oral or written. This Contract supersedes any prior written or oral agreements between the parties.
15. **SEVERABILITY.** If any provision of this Contract shall be held to be invalid or unenforceable for any reason, the remaining provisions shall continue to be valid and enforceable. If a court finds that any provision of this Contract is invalid or unenforceable, but that by limiting such provision it would become valid and enforceable, then such provision shall be deemed to be written, construed, and enforced as so limited.
16. **WAIVER OF CONTRACTUAL RIGHT.** The failure of either party to enforce any provision of this Contract shall not be construed as a waiver or limitation of that party's right to subsequently enforce and compel strict compliance with every provision of this Contract.
17. **APPLICABLE LAW.** This Contract shall be governed by the laws of the State of Florida in the USA.

EXCHANGE OF GOODS

The following provisions relate to the physical exchange of Goods and payment forming the transaction of this agreement.

18. **TITLE/RISK OF LOSS.** Title to and risk of loss of goods shall pass to the buyer upon delivery F.O.B. at the seller's place of home or business to an agent of the buyer including a common carrier, notwithstanding any prepayment or allowance of freight by the seller.
19. **INSPECTION.** Buyer, upon receiving possession of Goods, shall have a reasonable opportunity to inspect the Goods to determine if the Goods conform to the requirements of this Contract. If Buyer, in good faith, determines that all or a portion of the Goods are non-conforming, Buyer may return the Goods to Seller at Buyer's expense. Buyer agrees to securely mail the goods back to buyer with electronic tracking to the address listed above.
20. **PAYMENT.** Payment due shall be made to Xflight Technologies LLC by cash, bank transfer, credit card or PayPal prior to shipment of Goods. If an invoice is not paid when due, seller will not ship Goods to Buyer. In addition to any other right or remedy provided by law, if Buyer fails to pay for the Goods when due or reverses credit card charges after shipment of Goods, Seller has the option to treat such failure to pay as a material breach of this Contract, and may cancel this Contract and/or seek legal remedies.
21. **PAYMENT OF TAXES.** Buyer agrees to pay all taxes of every description, country, federal, state, and municipal, that arise as a result of this sale, excluding income taxes.