U.S. Department
of Transportation
**Federal Aviation
Administration**

800 Independence Ave., S.W.
Washington, D.C. 20591

July 17, 2015

Exemption No.12065
Regulatory Docket No. FAA–2015–1335

Mr. Joshua M. Lambeth
Birds Eye Productions, LLC
1838 East Ellis Street
Phoenix, AZ 85042

Dear Mr. Lambeth:

This letter is to inform you that we have granted your request for exemption. It transmits our decision, explains its basis, and gives you the conditions and limitations of the exemption, including the date it ends.

By letter dated April 24, 2015, you petitioned the Federal Aviation Administration (FAA) on behalf of Birds Eye Productions, LLC (hereinafter petitioner or operator) for an exemption. The petitioner requested to operate an unmanned aircraft system (UAS) to conduct aerial videography and cinematography, augment real estate listings videos, and search and rescue missions.

See Appendix A for the petition submitted to the FAA describing the proposed operations and the regulations that the petitioner seeks an exemption.

The FAA has determined that good cause exists for not publishing a summary of the petition in the Federal Register because the requested exemption would not set a precedent, and any delay in acting on this petition would be detrimental to the petitioner.

Airworthiness Certification

The UASs proposed by the petitioner are the Syndrones X8 and Ritewing Fixed Wing.

The petitioner requested relief from 14 CFR part 21, *Certification procedures for products and parts, Subpart H—Airworthiness Certificates*. In accordance with the statutory criteria provided in Section 333 of Public Law 112−95 in reference to 49 U.S.C. § 44704, and in

consideration of the size, weight, speed, and limited operating area associated with the aircraft and its operation, the Secretary of Transportation has determined that this aircraft meets the conditions of Section 333. Therefore, the FAA finds that the requested relief from 14 CFR part 21, *Certification procedures for products and parts, Subpart H—Airworthiness Certificates,* and any associated noise certification and testing requirements of part 36, is not necessary.

The Basis for Our Decision

You have requested to use a UAS for aerial data collection[1]. The FAA has issued grants of exemption in circumstances similar in all material respects to those presented in your petition. In Grants of Exemption Nos. 11062 to Astraeus Aerial (*see* Docket No. FAA−2014−0352), 11109 to Clayco, Inc. (*see* Docket No. FAA−2014−0507), 11112 to VDOS Global, LLC (*see* Docket No. FAA−2014−0382), and 11213 to Aeryon Labs, Inc. (*see* Docket No. FAA−2014−0642), the FAA found that the enhanced safety achieved using an unmanned aircraft (UA) with the specifications described by the petitioner and carrying no passengers or crew, rather than a manned aircraft of significantly greater proportions, carrying crew in addition to flammable fuel, gives the FAA good cause to find that the UAS operation enabled by this exemption is in the public interest.

Having reviewed your reasons for requesting an exemption, I find that—

- They are similar in all material respects to relief previously requested in Grant of Exemption Nos. 11062, 11109, 11112, and 11213;
- The reasons stated by the FAA for granting Exemption Nos. 11062, 11109, 11112, and 11213 also apply to the situation you present; and
- A grant of exemption is in the public interest.

Our Decision

In consideration of the foregoing, I find that a grant of exemption is in the public interest. Therefore, pursuant to the authority contained in 49 U.S.C. 106(f), 40113, and 44701, delegated to me by the Administrator, Birds Eye Productions, LLC is granted an exemption from 14 CFR §§ 61.23(a) and (c), 61.101(e)(4) and (5), 61.113(a), 61.315(a), 91.7(a), 91.119(c), 91.121, 91.151(a)(1), 91.405(a), 91.407(a)(1), 91.409(a)(1) and (2), and 91.417(a) and (b), to the extent necessary to allow the petitioner to operate a UAS to perform aerial data collection. This exemption is subject to the conditions and limitations listed below.

[1] Aerial data collection includes any remote sensing and measuring by an instrument(s) aboard the UA. Examples include imagery (photography, video, infrared, etc.), electronic measurement (precision surveying, RF analysis, etc.), chemical measurement (particulate measurement, etc.), or any other gathering of data by instruments aboard the UA.

Conditions and Limitations

In this grant of exemption, Birds Eye Productions, LLC is hereafter referred to as the operator.

Failure to comply with any of the conditions and limitations of this grant of exemption will be grounds for the immediate suspension or rescission of this exemption.

1. Operations authorized by this grant of exemption are limited to the Syndrones X8 and Ritewing Fixed Wing when weighing less than 55 pounds including payload. Proposed operations of any other aircraft will require a new petition or a petition to amend this exemption.

2. Operations for the purpose of closed-set motion picture and television filming are not permitted.

3. The UA may not be operated at a speed exceeding 87 knots (100 miles per hour). The exemption holder may use either groundspeed or calibrated airspeed to determine compliance with the 87 knot speed restriction. In no case will the UA be operated at airspeeds greater than the maximum UA operating airspeed recommended by the aircraft manufacturer.

4. The UA must be operated at an altitude of no more than 400 feet above ground level (AGL). Altitude must be reported in feet AGL.

5. The UA must be operated within visual line of sight (VLOS) of the PIC at all times. This requires the PIC to be able to use human vision unaided by any device other than corrective lenses, as specified on the PIC's FAA-issued airman medical certificate or U.S. driver's license.

6. All operations must utilize a visual observer (VO). The UA must be operated within the visual line of sight (VLOS) of the PIC and VO at all times. The VO may be used to satisfy the VLOS requirement as long as the PIC always maintains VLOS capability. The VO and PIC must be able to communicate verbally at all times; electronic messaging or texting is not permitted during flight operations. The PIC must be designated before the flight and cannot transfer his or her designation for the duration of the flight. The PIC must ensure that the VO can perform the duties required of the VO.

7. This exemption and all documents needed to operate the UAS and conduct its operations in accordance with the conditions and limitations stated in this grant of exemption, are hereinafter referred to as the operating documents. The operating documents must be accessible during UAS operations and made available to the Administrator upon request. If a discrepancy exists between the conditions and

limitations in this exemption and the procedures outlined in the operating documents, the conditions and limitations herein take precedence and must be followed. Otherwise, the operator must follow the procedures as outlined in its operating documents. The operator may update or revise its operating documents. It is the operator's responsibility to track such revisions and present updated and revised documents to the Administrator or any law enforcement official upon request. The operator must also present updated and revised documents if it petitions for extension or amendment to this grant of exemption. If the operator determines that any update or revision would affect the basis upon which the FAA granted this exemption, then the operator must petition for an amendment to its grant of exemption. The FAA's UAS Integration Office (AFS−80) may be contacted if questions arise regarding updates or revisions to the operating documents.

8. Any UAS that has undergone maintenance or alterations that affect the UAS operation or flight characteristics, e.g., replacement of a flight critical component, must undergo a functional test flight prior to conducting further operations under this exemption. Functional test flights may only be conducted by a PIC with a VO and must remain at least 500 feet from other people. The functional test flight must be conducted in such a manner so as to not pose an undue hazard to persons and property.

9. The operator is responsible for maintaining and inspecting the UAS to ensure that it is in a condition for safe operation.

10. Prior to each flight, the PIC must conduct a pre-flight inspection and determine the UAS is in a condition for safe flight. The pre-flight inspection must account for all potential discrepancies, e.g., inoperable components, items, or equipment. If the inspection reveals a condition that affects the safe operation of the UAS, the aircraft is prohibited from operating until the necessary maintenance has been performed and the UAS is found to be in a condition for safe flight.

11. The operator must follow the UAS manufacturer's maintenance, overhaul, replacement, inspection, and life limit requirements for the aircraft and aircraft components.

12. Each UAS operated under this exemption must comply with all manufacturer safety bulletins.

13. Under this grant of exemption, a PIC must hold either an airline transport, commercial, private, recreational, or sport pilot certificate. The PIC must also hold a current FAA airman medical certificate or a valid U.S. driver's license issued by a state, the District of Columbia, Puerto Rico, a territory, a possession, or the Federal government. The PIC must also meet the flight review requirements specified in 14 CFR § 61.56 in an aircraft in which the PIC is rated on his or her pilot certificate.

14. The operator may not permit any PIC to operate unless the PIC demonstrates the ability to safely operate the UAS in a manner consistent with how the UAS will be operated under this exemption, including evasive and emergency maneuvers and maintaining appropriate distances from persons, vessels, vehicles and structures. PIC qualification flight hours and currency must be logged in a manner consistent with 14 CFR § 61.51(b). Flights for the purposes of training the operator's PICs and VOs (training, proficiency, and experience-building) and determining the PIC's ability to safely operate the UAS in a manner consistent with how the UAS will be operated under this exemption are permitted under the terms of this exemption. However, training operations may only be conducted during dedicated training sessions. During training, proficiency, and experience-building flights, all persons not essential for flight operations are considered nonparticipants, and the PIC must operate the UA with appropriate distance from nonparticipants in accordance with 14 CFR § 91.119.

15. UAS operations may not be conducted during night, as defined in 14 CFR § 1.1. All operations must be conducted under visual meteorological conditions (VMC). Flights under special visual flight rules (SVFR) are not authorized.

16. The UA may not operate within 5 nautical miles of an airport reference point (ARP) as denoted in the current FAA Airport/Facility Directory (AFD) or for airports not denoted with an ARP, the center of the airport symbol as denoted on the current FAA-published aeronautical chart, unless a letter of agreement with that airport's management is obtained or otherwise permitted by a COA issued to the exemption holder. The letter of agreement with the airport management must be made available to the Administrator or any law enforcement official upon request.

17. The UA may not be operated less than 500 feet below or less than 2,000 feet horizontally from a cloud or when visibility is less than 3 statute miles from the PIC.

18. If the UAS loses communications or loses its GPS signal, the UA must return to a pre-determined location within the private or controlled-access property.

19. The PIC must abort the flight in the event of unpredicted obstacles or emergencies.

20. The PIC is prohibited from beginning a flight unless (considering wind and forecast weather conditions) there is enough available power for the UA to conduct the intended operation and to operate after that for at least five minutes or with the reserve power recommended by the manufacturer if greater.

21. Air Traffic Organization (ATO) Certificate of Waiver or Authorization (COA). All operations shall be conducted in accordance with an ATO-issued COA. The exemption holder may apply for a new or amended COA if it intends to conduct operations that cannot be conducted under the terms of the attached COA.

22. All aircraft operated in accordance with this exemption must be identified by serial number, registered in accordance with 14 CFR part 47, and have identification (N−Number) markings in accordance with 14 CFR part 45, Subpart C. Markings must be as large as practicable.

23. Documents used by the operator to ensure the safe operation and flight of the UAS and any documents required under 14 CFR §§ 91.9 and 91.203 must be available to the PIC at the Ground Control Station of the UAS any time the aircraft is operating. These documents must be made available to the Administrator or any law enforcement official upon request.

24. The UA must remain clear and give way to all manned aviation operations and activities at all times.

25. The UAS may not be operated by the PIC from any moving device or vehicle.

26. All Flight operations must be conducted at least 500 feet from all nonparticipating persons, vessels, vehicles, and structures unless:
    a. Barriers or structures are present that sufficiently protect nonparticipating persons from the UA and/or debris in the event of an accident. The operator must ensure that nonparticipating persons remain under such protection. If a situation arises where nonparticipating persons leave such protection and are within 500 feet of the UA, flight operations must cease immediately in a manner ensuring the safety of nonparticipating persons; and
    b. The owner/controller of any vessels, vehicles or structures has granted permission for operating closer to those objects and the PIC has made a safety assessment of the risk of operating closer to those objects and determined that it does not present an undue hazard.

    The PIC, VO, operator trainees or essential persons are not considered nonparticipating persons under this exemption.

27. All operations shall be conducted over private or controlled-access property with permission from the property owner/controller or authorized representative. Permission from property owner/controller or authorized representative will be obtained for each flight to be conducted.

28. Any incident, accident, or flight operation that transgresses the lateral or vertical boundaries of the operational area as defined by the applicable COA must be reported to the FAA's UAS Integration Office (AFS−80) within 24 hours. Accidents must be reported to the National Transportation Safety Board (NTSB) per instructions contained on the NTSB Web site: www.ntsb.gov.

If this exemption permits operations for the purpose of closed-set motion picture and television filming and production, the following additional conditions and limitations apply.

29. The operator must have a motion picture and television operations manual (MPTOM) as documented in this grant of exemption.

30. At least 3 days before aerial filming, the operator of the UAS affected by this exemption must submit a written Plan of Activities to the local Flight Standards District Office (FSDO) with jurisdiction over the area of proposed filming. The 3-day notification may be waived with the concurrence of the FSDO. The plan of activities must include at least the following:
    a. Dates and times for all flights;
    b. Name and phone number of the operator for the UAS aerial filming conducted under this grant of exemption;
    c. Name and phone number of the person responsible for the on-scene operation of the UAS;
    d. Make, model, and serial or N−Number of UAS to be used;
    e. Name and certificate number of UAS PICs involved in the aerial filming;
    f. A statement that the operator has obtained permission from property owners and/or local officials to conduct the filming production event; the list of those who gave permission must be made available to the inspector upon request;
    g. Signature of exemption holder or representative; and
    h. A description of the flight activity, including maps or diagrams of any area, city, town, county, and/or state over which filming will be conducted and the altitudes essential to accomplish the operation.

31. Flight operations may be conducted closer than 500 feet from participating persons consenting to be involved and necessary for the filming production, as specified in the exemption holder's MPTOM.

Unless otherwise specified in this grant of exemption, the UAS, the UAS PIC, and the UAS operations must comply with all applicable parts of 14 CFR including, but not limited to, parts 45, 47, 61, and 91.

This exemption terminates on July 31, 2017, unless sooner superseded or rescinded.

Sincerely,

/s/
John S. Duncan
Director, Flight Standards Service

Enclosures

Joshua M Lambeth (Birds Eye Productions, LLC), Phoenix AZ - Section 333 Exemption Petition

April 24th, 2015

U. S. Department of Transportation Docket Management System
1200 New Jersey Ave,
SE Washington, DC 20590

Re: Exemption Request Section 333 of the FAA Reform Act of the Federal Aviation Regulations from 14 C.F.R. 45.23(b); 14 C.F.R. Part 21; 14 C.F.R. 61.113(a)&(b); 91.7(a); 91.9(b) (2); 91.103(b); 91.109; 119.121; 91.151(a); 91.203(a)&(b); 91.405(a); 91.407(a) (1); 91.409(a) (2); 91.417(a)&(b)

Dear Sir or Madam, I, Joshua M Lambeth (Birds Eye Productions, LLC), am writing pursuant to the FAA Modernization and Reform Act of 2012 and the procedures contained within 14 C.F.R. 11, to request that I, Joshua M Lambeth (Birds Eye Productions, LLC), an owner and operator of small unmanned aircraft, be exempted from the Federal Aviation Regulations ("FARs") listed below so that I, Joshua M Lambeth (Birds Eye Productions, LLC), may operate my small ultra lightweight unmanned aircraft system ("UAS") in commercially regulated airspace by the Federal Aviation Administration ("FAA").

As described herein I, Joshua M Lambeth (Birds Eye Productions, LLC), have experience in flying hobby helicopters and planes for recreational purposes for the past nine (9) years. I have flown small and large remote control (RC) gas and electric aircraft models for those nine (9) years without incident and pledge my continued commitment to safety on all future flights. Following exemption and approval by the FAA, I, Joshua M Lambeth (Birds Eye Productions, LLC), will primarily use my professionally built octo-copter[1] and fixed wing[2] UAS equipped with cameras for the following applications: aerial videography/cinematography to safely enhance films and commercials; augmentation of real estate listing videos; and the creation of visual and topography layout videos for Search and Rescue (SAR) missions for state and local agency's, education, agricultural inspections and building and construction zone inspections.

1 Appendix A – SynDrones x8 Operators Manual 2 Appendix B – Ritewing Fixed Wing Operator Manual

Joshua M Lambeth (Birds Eye Productions, LLC), Phoenix AZ - Section 333 Exemption Petition

My, Joshua M Lambeth (Birds Eye Productions, LLC)'s, exemption request would permit the operation of ultra lightweight, unmanned (i.e. piloted by remote control) UAS's for the development of community and government use videos, permissible within property boundaries for individual homeowners and within in tightly controlled, limited airspaces predetermined in areas away from the general public, airports, heliports and vehicular traffic. Currently, similar lightweight, remote controlled UAS's are legally operated by unmonitored amateur hobbyists with no safety plan or controls in place to prevent catastrophe. With that in mind, I, Joshua M Lambeth (Birds Eye Productions, LLC), have personally installed safety protocols/controls/flight manual[3] to avoid and prevent public hazard, as well as any catastrophic manned aircraft hazard. Furthermore, it is my intent to assist future FAA safety protocols and regulations exclusive to lightweight UAS's for specific video and photography usage by sharing information with the FAA as I, Joshua M Lambeth (Birds Eye Productions, LLC), record flight data and other pertinent information gained through permitted flight operations.

In addition, granting my, Joshua M Lambeth (Birds Eye Productions, LLC)'s, exemption request will comply with the Secretary of Transportation's (FAA Administrator's) instructions to not only integrate UAS's into the national airspace system, but to "...establish requirements for the safe operation of such aircraft systems [UAS's] in the national airspace system" under Section 333(c) of the Reform Act specific to the use of UAS's for real estate/Realtor purposes, educational videos, Search and Rescue, land/trusts inspections, agricultural field monitoring, film/video productions, and structure inspections, to aid state and local agency's. Further I, Joshua M Lambeth (Birds Eye Productions, LLC), will conduct my operations in compliance with the protocols described herein or as otherwise established by the FAA.

For the reasons stated below, I, Joshua M Lambeth (Birds Eye Productions, LLC), respectfully request the grant of an exemption allowing me to operate ultra lightweight, remote controlled UAS's to aid academic community awareness, to benefit/stimulate attraction to the metro Phoenix area and to enhance personal and public video feeds. A grant that will ultimately allow UAS's to play a more positive role in our local community by increasing employment opportunities, heightening security measures and decreasing government expenditures by reducing the need for heavier manned aircraft, containing costly, combustible fuel- a potential public hazard in and of itself.

3 Appendix C - Personal Protocols/Controls/Flight Manual

Joshua M Lambeth (Birds Eye Productions, LLC), Phoenix AZ - Section 333 Exemption Petition

I. Contact Information:

Joshua M Lambeth
Birds Eye Productions, LLC
Phoenix, AZ 85042
Phone: 480-489-0998
Email: josh@birdsiproductions.com

II. The Specific Sections of Title 14 of the Code of Federal Regulations From Which Joshua M Lambeth (Birds Eye Productions, LLC) Requests Exemption are:
14 CFR 21; 14 C.F.R. 45.23(b);
14 CFR 61.113 (a) & (b);
14 C.F.R. 91, et seq.;
14 CFR 407 (a) (1);
14 CFR 409 (a) (2); and,
14 CFR 417 (a) & (b).

III. The Extent of relief Joshua M Lambeth (Birds Eye Productions, LLC) Seeks and the Reason He Seeks Such Relief:
I, Joshua M Lambeth (Birds Eye Productions, LLC), submit this application in accordance with the Reform Act, 112 P.L. 95 §§ 331-334, seeking relief from any currently applicable FARs operating to prevent me, Joshua M Lambeth (Birds Eye Productions, LLC), contemplated commercial cinematic, academic and other flight operations within the national airspace system. The Reform Act in Section 332 provides for such integration of civil unmanned aircraft systems into our national airspace system as it is in the public's interest to do so. My, Joshua M Lambeth (Birds Eye Productions, LLC)'s, ultra lightweight UAS meets the definition of "small unmanned aircraft" as defined in Section 331 and therefore the integration of my ultra light weight UAS is expressly contemplated by the Reform Act. I would like to operate my ultra lightweight UAS prior to the time period by which the Reform Act requires the FAA to promulgate rules governing such craft. Thereby, providing direct experience and valuable information for formal regulation that can be administered uniformly to all related UAS aerial video and photography. The Reform Act guides the Secretary in determining the types of UAS's that may operate safely in our national airspace system. Considerations include: The weight, size, speed and overall capabilities of the UAS's; Whether the UAS will be operated near airports or heavily populated areas; and, Whether the UAS will be operated by line of sight. 112 P.L. 95 § 333 (a).

Joshua M Lambeth (Birds Eye Productions, LLC), Phoenix AZ - Section 333 Exemption Petition

Each of these items reflect in favor of an exemption for me, Joshua M Lambeth (Birds Eye Productions, LLC). My UAS's utilize eight (8) or less rotating propellers for balance, control and stability. My UAS's are equipped with the following via video and data telemetry

1)Altimeter
2) Attitude indicator
3) Ground Speed indicator
4) Magnetic compass
5) Heading indicator
6) Vertical speed indicator
7) Course deviation indicator
8) Radio magnetic indicator
9) GPS location
10) Fuel consumption and Fuel Left with approximate time.
11) Loiter and circle mode.
12) Auto safety or RTL (Return To Launch)
13) Auto landing technology.

Each UAS weighing less than fourty (40) pounds (far below the maximum 55 pound limit); Including camera(s) with or without gimbal (a camera stabilizer). I, Joshua M Lambeth (Birds Eye Productions, LLC), considers safety as foremost with each flight. My small unmanned aircraft is designed to hover in place, circle in a specific place or loiter(figure 8 flight) via GPS and can be operated in winds up to 30.4 knots (35mph) wind. For safety, stability and fear of financial loss I will not fly in winds exceeding 21.7 knots (25 mph). Built in safety systems include a GPS mode that allows my UAS to hover/circle in place or land when radio controls are released.

With six (6) modes to choose from, I will fly with the modes safest to complete the videos for aerial videography/photography and have the ability to choose the safest, most reliable and stable mode to prevent accident and hazard. When pilot communication from the radio control[4] is lost, UAS is designed slowly descend to point of takeoff and or to land at point of launch after ascending to a pre-set altitude to ensure the UAS will clear any obstacles that may be between the takeoff point and the current position of the UAS. This failsafe altitude will not be set more than 200ft and is determined before each flight.

With an onboard flight controller – Mikrokopter 2.5 (Octocopter) and Pixhawk (Ritewing Fixed Wing)[5], it has the capabilities of geofencing which will prevent the craft from exceeding a set altitude or distance. No matter what causes the craft to breach those boundaries - the craft is forced back within the boundary limits via the on board controller and will take over the craft to keep it within those set boundary lines and allow the pilot to regain control once the craft is within those boundaries.

I, Joshua M Lambeth (Birds Eye Productions, LLC), will not operate my UAS near airports, hospitals nor police heliports, and do not operate near areas where general public is within fifty to one hundred (50-100) yards depending on location, conditions and weather. I am constantly on alert for any manned aircraft (police/medical helicopters, etc.) and prepared to land/abort immediately to the nearest and safest ground point should a manned aircraft approach my location or I suspect manned aircraft may

4 Appendix D – Radio Control Manual 5 Appendix E - Computerized Control Boards

approach near my location. My UAS's are capable of vertical and horizontal operations, and is flown only within my line of sight, as the remote control pilot. My UAS's are also flown with a second operator who aids in watching for any obstacles, including manned aircraft, within the flight zone of the UAS. Utilizing battery power rather than combustible fuels, flights generally last between three (3) to fifteen (15) minutes, with an altitude under one hundred fifty (150) feet. Six (6)Smart Mode includes safe circle for operation, position hold, self-leveling, altitude command, GPS, return home feature, and safety control to return home or land in the event of communication interruption between RC transmitter and UAS.

I, Joshua M Lambeth (Birds Eye Productions, LLC), utilize a fresh fully charged battery with each flight as a safety precaution; full flight time limit for each battery is eight (8) to thirty (30) minutes as tested. I do not operate my UAS at or below manufacture recommend minimum charge levels for operation; preferring to remain well within a safe operating range to insure adequate communication between radio control and UAS to eliminate potential for crash, loss of control or hazard. Reserve batteries are at hand with each exercise to insure replacement for sufficient safe level of operation. I do not believe in taking risk that may cause a crash, that could create hazard to the public/property/manned aircraft, and have no desire to lose an investment. I have clocked numerous practice flights in remote areas as a hobbyist simulating flights for future commercial use to gain familiarization with the characteristics of this specific UAS's performance under different temperature and weather conditions. I also practice computerized simulated flights to maintain adequate skills and response reflex time. All for the sake of safety.

I, Joshua M Lambeth (Birds Eye Productions, LLC), am extremely cautious when operating of my UAS/ultra light weight unmanned aircraft and will not "create a hazard to users of the national airspace system or the public." 112 P.L. 95 § 333 (b). Given the small size and weight of my UAS it falls well within Congress's contemplated safety zone when it promulgated the Reform Act and the corresponding directive to integrate UAS's into the national airspace system. Joshua M Lambeth (Birds Eye Productions, LLC)'s UAS, used in hobby flight, has a demonstrable safety record and does not pose any threat to the general public or national security.

IV. How Joshua M Lambeth (Birds Eye Productions, LLC)'s Request Will Benefit the Public As A Whole: Aerial videography for geographical awareness, education, search and rescue, land management, structure inspections and for real estate marketing has been around for a long time through manned fixed wing aircraft and helicopters. For small budget companies, average homeowners and property owners the expense of such aerial videography is cost prohibitive. Only large companies and high end Realtors or luxury homeowners can afford to absorb such expense; depriving non-luxury owners and lower budget companies from a valuable marketing tool. Manned aircraft pose a threat to the public through potential catastrophic crash that the Phoenix community has experienced in the past with military aircraft, medical helicopters, and news helicopters crashes within the city of Phoenix. Each resulting in loss of life.

Each with combustible fuel that exploded and burned on impact. Police helicopters have made emergency hard landings within city limits. My, Joshua M Lambeth (Birds Eye Productions, LLC)'s, UAS poses no such threat since size and lack of combustible fuel alleviates any potential threat to the public. Congress has already proclaimed that it is in the public's interest to integrate commercially flown UAS's into the national airspace system, hence the passing of the Reform Act. Granting my, Joshua M Lambeth (Birds Eye Productions, LLC)'s, exemption request furthers the public interest through academic/visual awareness of the geographical benefits in and around the metro Phoenix area. My ultra light weight UAS is battery powered and creates no emissions that can harm the environment. The consequence of my ultra light weight UAS crashing is far less than a full size helicopter or fixed wing aircraft; which are heavy, contain combustible fuel and can cause catastrophic devastation to the public. The public's interest is furthered by minimizing ecological and crash threat by permitting aerial video/photo capture through my battery operated ultra lightweight UAS's.

Permitting me, Joshua M Lambeth (Birds Eye Productions, LLC), to immediately fly within national air space furthers economic growth. Granting my exemption request substantially furthers the economic impact for the metro Phoenix and surrounding community for companies looking to relocate or build around the Phoenix metro area as well as individuals looking to relocate for career advancement through academic and geographical awareness. Both of which serve as a stimulus to the community.

V. Reasons Why Joshua M Lambeth (Birds Eye Productions, LLC)'s Exemption Will Not Adversely Affect Safety Or How The Exemption Will Provide a Level of Safety At Least Equal To Existing Rule:

My, Joshua M Lambeth (Birds Eye Productions, LLC)'s, exemption will not adversely affect safety. Quite the contrary, for the reasons stated permitting me, Joshua M Lambeth (Birds Eye Productions, LLC), to log more flight time in FAA controlled airspace, with communication with the FAA, will allow me to contribute to the innovation and implementation of new and novel, as of yet undiscovered safety protocols for Realtors, land and structured owners. For development in cooperation with the FAA. In addition I, Joshua M Lambeth (Birds Eye Productions, LLC), submit the following representations of enhancements to current aerial videography and photography: My UAS's weigh less than forty (40) pounds complete with a small ultra-light weight high quality Canon DSLR, Point and Shoot, and RED Epic camera or similar; I only operate my UAS below 200 feet (well within the 400 foot permissible ceiling set by the FAA Modernization and Reform Act of 2012); My UAS only operate for 3-30 minutes per flight; I land my UAS prior to manufacturer recommended minimum level of battery power; I pilot my UAS through remote control only by line of sight; and have live video feed for a secondary pilot to monitor video recording; I receive a live telemetry feed from my UAS during all flights which include remaining battery voltage, distance, altitude, and any anomalies that may occur during flight;

Joshua M Lambeth (Birds Eye Productions, LLC), Tucson AZ - Section 333 Exemption Petition

My UAS's have a GPS controlled flight controller- a flight safety feature whereby it hovers or circles and then lands at the GPS takeoff point if communication with the remote control pilot is lost; I actively record and analyze flight data through the Mikrokopter and Pixhawk flight controller and other sources of information to constantly update and enhance safety protocols; I only operate in reasonably safe environment that are strictly controlled, are away from power lines, elevated lights, airports and actively populated areas; I conduct extensive preflight inspections and protocol, during which safety carries primary importance; I always obtain all necessary permissions prior to operation; and, I have procedures in place to abort flights in the event of safety breaches or potential danger. My, Joshua M Lambeth (Birds Eye Productions, LLC)'s, safety protocols provide a level of safety equal to or exceeding existing rules. It is important to note that absent the integration of commercial UAS into our national airspace system, helicopters are the primary means of aerial video and photography for community awareness real estate, structured inspections, land management and search and rescue. While the safety record of such helicopters is remarkably astounding, there has been local incident involving loss of life as well as extensive property damage; it is far safer to operate a battery powered ultra lightweight UAS. First, the potential loss of life is diminished because UAS's carry no people on board and I only operates my UAS in specific areas away from mass populations. Second, there is no fuel on board a UAS and thus the potential for fire or explosions is greatly diminished. Third, the small size and extreme maneuverability of my UAS allow me to remotely pilot away from and avoid hazards quickly and safely. Lastly, given its small size and weight, even when close enough to capture amazing images, my UAS need not be so close to the objects they are focused on through the technology and use of post editing software allowing pan and zoom. Accordingly, my UAS has been experimentally operated for familiarization/competency and will continue to operate at and above current safety levels.

VI. A Summary The FAA May Publish in the Federal Register:

14 C.F.R. 21 and 14 C.F.R. 91: Airworthiness Certificates, Manuals and The Like.

14 C.F.R. 21, Subpart H, entitled Airworthiness Certificates, sets forth requirements for procurement of necessary airworthiness certificates in relation to FAR §91.203(a)(1). The size, weight and enclosed operational area of my, Joshua M Lambeth (Birds Eye Productions, LLC)'s, UAS permits exemption from Part 21 because my UAS meets (and exceeds) an equivalent level of safety pursuant to Section 333 of the Reform Act. The FAA is authorized to exempt aircraft from the airworthiness certificate requirement under both the Act (49 U.S.C. § 44701 (f)) and Section 333 of the Reform Act. Both pieces of legislation permit the FAA to exempt UAS's from the airworthiness certificate requirement in consideration of the weight, size, speed, maneuverability and proximity to areas such as airports and dense populations. My, Joshua M Lambeth (Birds Eye Productions, LLC)'s, current and projected UAS's meet or exceed each of the elements.

Joshua M Lambeth (Birds Eye Productions, LLC), Tucson AZ - Section 333 Exemption Petition

14 C.F.R. 91.7(a) prohibits the operation of an aircraft without an airworthiness certificate. As no such certificate will be applicable in the form contemplated by the FARs, this Regulation is inapplicable.

14 C.F.R. § 91.9 (b) (2) requires an aircraft flight manual in the aircraft. As there are no on board pilots or passengers, and given the size of the UAS's, this Regulation is inapplicable. An equivalent level of safety will be achieved by maintaining a safety/flight manual delineating areas of where safety can be defined.

The FAA has previously issued exemptions to this regulation in Exemption Nos. 8607, 8737, 8738, 9299, 9299A, 9565, 9565B, 10167, 10167A, 10602, 10700 and 32827.

14 C.F.R. § 91.121 regarding altimeter settings is inapplicable insofar as my UAS utilizes electronic global positioning systems with a barometric sensor or controlled GPS “geofencing”

14 C.F.R. § 91.203 (a) and (b) provides for the carrying of civil aircraft certifications and registrations. They are inapplicable for the same reasons described above. The equivalent level of safety will be achieved by maintaining any such required certifications and registrations by me, Joshua M Lambeth (Birds Eye Productions, LLC).

B. 14 C.F.R. § 45.23: Marking of The Aircraft. Applicable Codes of Federal Regulation require aircraft to be marked according to certain specifications. My UAS can be marked with the appropriate “N” number once this “N” number has been given.

C. 14 C.F.R. § 61.113: Private Pilot Privileges and Limitations: PIC. Pursuant to 14 C.F.R. §§ 61.113 (a) & (b), private pilots are limited to non-commercial operations. I, Joshua M Lambeth (Birds Eye Productions, LLC), can achieve an equivalent level of safety as achieved by current Regulations because my UAS does not carry any pilots or passengers. Further, while helpful, a pilot license will not ensure remote control piloting skills. The risks attended to the operation of my UAS is far less than the risk levels inherent in the commercial activities outlined in 14 C.F.R. § 61, et seq. Thus, allowing me, Joshua M Lambeth (Birds Eye Productions, LLC), to operate my UAS meet and exceed current safety levels in relation to 14 C.F.R. §61.113 (a) & (b).

D. 14 C.F.R. 91.119: Minimum Safe Altitudes. 14 C.F.R. § 91.119 prescribes safe altitudes for the operation of civil aircraft. It allows helicopters to be operated at lower altitudes in certain conditions. My UAS will never operate at an altitude greater than 200 AGL; safely below the standard of 400 AGL. I, Joshua M Lambeth (Birds Eye Productions, LLC), will however operate my UAS in safe areas away from public and traffic, providing a level of safety at least equivalent to or below those in relation to minimum safe altitudes. Given the size, weight, maneuverability and speed of my UAS, an equivalent or higher level of safety will be achieved.
E. 14 C.F.R. 91.405 (a); 407 (a) (1); 409 (a) (2); 417(a) & (b): Maintenance Inspections.[1,2,]

1 Appendix A – SynDrones x8 Operators Manual 2 Appendix B – Ritewing Fixed Wing Operator Manual

Joshua M Lambeth (Birds Eye Productions, LLC), Phoenix AZ - Section 333 Exemption Petition

The above-cited Regulations require, amongst other things, aircraft owners and operators to “have [the] aircraft inspected as prescribed in subpart E of this part and shall between required inspections, except as provided in paragraph (c) of this section, have discrepancies repaired as prescribed in part 43 of this chapter. . . .”These Regulations only apply to aircraft with an airworthiness certificate. They will not, therefore, apply to my, Joshua M Lambeth (Birds Eye Productions, LLC)'s, UAS. However, as a safety precaution I inspect my UAS before and after each flight.

A Summary The FAA May Publish in the Federal Register: A. 14 C.F.R. 21 and 14 C.F.R. 91: Airworthiness Certificates, Manuals and The Like. 14 C.F.R. 21, Subpart H, entitled Airworthiness Certificates, sets forth requirements for procurement of necessary airworthiness certificates in relation to FAR § 91.203(a)(1). The size, weight and enclosed operational area of my UAS permits exemption from Part 21 because my, Joshua M Lambeth (Birds Eye Productions, LLC)’s, UAS meets an equivalent level of safety pursuant to Section 333 of the Reform Act. The FAA is authorized to exempt aircraft from the airworthiness certificate requirement under both the Act (49 U.S.C. § 44701 (f)) and Section 333 of the Reform Act. Both pieces of legislation permit the FAA to exempt UAS's from the airworthiness certificate requirement in consideration of the weight, size, speed, maneuverability and proximity to areas such as airports and dense populations. My UAS meets or exceeds each of the elements. 14 C.F.R. 91.7(a) prohibits the operation of an aircraft without an airworthiness certificate. As no such certificate will be applicable in the form contemplated by the FARs, this Regulation is inapplicable. 14 C.F.R. § 91.9 (b) (2) requires an aircraft flight manual in the aircraft. As there are no pilots or passengers, and given the size of the UAS's, this Regulation is inapplicable. An equivalent level of safety will be achieved by maintaining a manual. The FAA has previously issued exemptions to this regulation in Exemption Nos. 8607, 8737, 8738, 9299, 9299A, 9565, 9565B, 10167, maintenance program that involves regular software updates and curative measures for any damaged hardware. Therefore, an equivalent level of safety will be achieved. In summary, Joshua M Lambeth (Birds Eye Productions, LLC) seeks an exemption from the following Regulations:14 C.F.R. 21, subpart H; 14 C.F.R. 45.23(b); 14 C.F.R. §§ 61.113 (a) & (b); 14 C.F.R. §91.7 (a); 14 C.F.R. § 91.9 (b)(2); 14 C.F.R. § 91.103(b); 14 C.F.R. § 91.109; 14 C.F.R. §91.119; 14 C.F.R. § 91.121; 14 C.F.R. § 91.151(a); 14 C.F.R. §§ 91.203(a) and (b); 14 C.F.R. § 91.405 (a); 14 C.F.R. § 91.407 (a)(1); 14 C.F.R. § 91.409 (a)(2); 14 C.F.R. § 91.409 (a) (2); and, 14 C.F.R. §§ 91.417 (a) & (b) to commercially operate my, Joshua M Lambeth (Birds Eye Productions, LLC)'s, small unmanned vehicle/lightweight unmanned aircraft vehicle in community awareness, education, structural inspection land management, search and rescue and real estate operations, and to develop economic platforms for the aforementioned to enhance the experience of those seeking to relocate, rebuild, reevaluate and to find in the metro Phoenix area.

Joshua M Lambeth (Birds Eye Productions, LLC), Tucson AZ - Section 333 Exemption Petition

Currently, the aforementioned aerial videography/photography relies primarily on the use of larger aircraft running on combustible fuel. Posing potential risk to the public. Granting my, Joshua M Lambeth (Birds Eye Productions, LLC)'s, request for exemption will reduce current risk levels and thereby enhance safety. My UAS craft do not contain potentially explosive fuel, is smaller, lighter and more maneuverable than conventional video and photographic aircraft with much less flight time.

Further, I operate at lower altitudes and in controlled airspace eliminating potential public risk flying to and from established airfields. I, Joshua M Lambeth (Birds Eye Productions, LLC), have been informally analyzing and recording flight information and will compile safety protocols and the implementation of a flight operations manual for usage that exceeds currently accepted means and methods for safe flight. Formal collection of information shared with the FAA will enhance the FAA's internal efforts to establish protocols for complying with the FAA Modernization and Reform Act of 2012. There are no personnel on board my, Joshua M Lambeth (Birds Eye Productions, LLC)'s, UAS and therefore the likelihood of death or serious bodily injury is significantly diminished. My, Joshua M Lambeth (Birds Eye Productions, LLC)'s, operation of my UAS, weighing less than forty (40) pounds and traveling at lower speeds within limited areas will provide an equivalent level of safety as that achieved under current FARs. Accordingly I, Joshua M Lambeth (Birds Eye Productions, LLC), respectfully request that the FAA grant my exemption request and am willing to cooperate in sharing information to benefit the FAA, safety of manned aircraft, and the general public at large.

Respectfully submitted,

Joshua M Lambeth (Birds Eye Productions, LLC)
1838 E Ellis St
Phoenix, AZ 85042

Appendix A

Syndrones X8 Multirotor

The operation of the SynDrones X8 multirotor system are as follows (the flight controller operation manual is NOT explained in this manual but can be found in Appendix E, Section 1).

1. Build Materials
   I. Carbon Fiber
   II. G10 Composite
   III. Stainless Steel Hardware
2. Motor Configuration
   I. X8 configuration utilizing 8 motors (KDEDirect 5215-435KV) which is powered by the Herkules III motor controller. The motors are configured with 2 motors per arm, one top and one bottom spinning in a counter-rotating direction.
   II. In this configuration the SynDrones x8 can handle up to four (4) motors failing and still be able to fly. We have tested this situation and can confirm it works as described.
3. Payload
   I. The Syndrones x8 will carry the Freefly Systems MoVI M5, M10, or M15 camera gimbal.
   II. The cameras that will be flown on the Syndrones x8 include, but are not limited to, Canon 5DMKIII, Canon 1D-C, RED Epic, RED Dragon, and Sony FS700.
4. Maintaining the SynDrones x8
   I. Before each flight:
      1. Check all hardware to ensure it is securely tightened.
      2. Check that all motors are level and locked in place.
      3. Check all propellers to ensure they are tight and there are no visible signs of cracks, stress, and/or chips. Replace if any propeller is questionable.
      4. Check all wiring to motors, motor controllers, batteries, and flight controller for signs of cuts, fraying, cracks, and/or loose/cold solder connections. Fix before flying.
      5. Check all navigational lighting to ensure it is properly working.
   II. After 45 hours of flight
      1. Remove and check all motors and motor mounts for signs of wear and tear. Replace as necessary.
      2. Remove motor controllers and visually inspect and check for damage. Replace as necessary.
      3. Remove flight controllers and visually inspect and check for damage. Replace as necessary. Check for updates to flight controller firmware. If available, install and perform a minimum of 15 test flights before conducting commercial work.

Appendix B

Ritewing Fixed Wing

The operation of the Ritewing Fixed Wing system are as follows (the flight controller operation manual is NOT explained in this manual but can be found in Appendix E, Section 2).

1. Build Materials
   I. EPP Foam
   II. Fiberglass
   III. Carbon Fiber
   IV. Balsa Wood
2. Motor Configuration
   I. The Ritewing Fixed Wing flies on a single (1) motor, pusher, configuration.
   II. The required motor varies in size depending on the payload (see Section 3).
3. Payload
   I. The Ritewing Fixed Wing is capable of carrying the following cameras, including but not limited to, Canon S100, S110, Sony NEX-5T, and FLIR A35; which can be used for NDVI (Normalized Difference Vegetation Index), IR (Infrared), Full Spectrum, and FLIR (Thermal Imaging)
4. Maintaining the Ritewing Fixed Wing
   I. Before each flight:
      1. Check all hardware to ensure it is securely tightened.
      2. Check that the motor is level and locked in place.
      3. Check the propeller to ensure it is tight and there are no visible signs of cracks, stress, and/or chips. Replace if propeller is questionable.
      4. Check all wiring to motors, motor controllers, batteries, and flight controller for signs of cuts, fraying, cracks, and/or loose/cold solder connections. Fix before flying.
      5. Check all navigational lighting to ensure it is properly working.
   II. After 45 hours of flight
      1. Remove and check all motors and motor mounts for signs of wear and tear. Replace as necessary.
      2. Remove motor controllers and visually inspect and check for damage. Replace as necessary.
      3. Remove flight controllers and visually inspect and check for damage. Replace as necessary. Check for updates to flight controller firmware. If available, install and perform a minimum of 15 test flights before conducting commercial work.

Appendix C

Personal Protocols/Controls/Flight Manual

Protocols and Controls

Joshua M Lambeth , Birds Eye Productions, LLC, Phoenix Arizona

Safety for public on the ground as well as manned aircraft above is an essential and utmost consideration for aerial videos and photography. As such, safety protocols and controls must be implemented through pre‐flight preparation and during flight. Pre‐Flight Protocol:

Check batteries with voltage meter to insure fully charged and ready for use.

Inspect batteries for damage or leakage that may affect proper operation.

Inspect propellers for cracks, chips or damage that may cause sudden loss of propulsion or

unmanageable/uncontrolled flight.

Check all GPS and Telemetry connections prior to flight

Check weather forecasts for wind advisory or other conditions that my impact flight.

Consult Sky Vector aeronautical Charts (Skyvector.com)for airport vicinity and flight paths of possible air traffic.

Contact respective airport to advise of estimated flight time, estimated flight duration, estimated elevation of flight, and any other pertinent information.

Inspect flight area for

- vicinity of public safety helipads/heliports
- vicinity of medical helipads/heliports
- vicinity of light poles
- vicinity or utility wires
- vicinity of trees
- flocks of birds that may cause interference and potential flight impact
- vicinity of any elevated obstructions that may pose potential flight hazard
- vicinity of roadways with moderate to heavy traffic that can be distracted
- public gatherings that may attract viewers
- optional point of control for best visual site of UAS while in flight
- Emergency landing areas

Takeoff and landing

- inspect area for best and safest point of takeoff and landing
- if in a subdivision or area that is within 150 feet of a residential street, post warning
- sign(s)/stand(s) "Attention Aerial Photography In Progress ‐ Remain Back 150 Feet "

Flight Protocol: takeoff and land from same location (have alternate landing areas in case of emergencies) remain alert to birds, sound or aircraft, curious public, and approaching vehicles do not allow anyone to engage in conversation or distract the remote control pilot restrict flight to minimal elevation sufficient to acquire desired results remained prepared for emergency landing at all times pay attention to flight time – warning meter for low voltage.

Set voltage meter alarm for low voltage and flight timer as a safety alert land UAS and shut down propulsion

immediately following landing – priority of disconnecting batteries

Post flight:

1. a) disconnect battery to prevent accidental activation of propulsion system
2. b) secure UAS in a safe location

c)

remove all warning signs from public access areas Emergency or Suspected Hazard:

Immediate land UAS at safest and closet ground location in the event

manned aircraft is heard or seen in vicinity of flight

there is a public gathering within established safety boundary wanting to observe flight

pilot is being distracted from focusing on flight and safety

sudden change in weather (wind bursts)

sudden increase in vehicular traffic in vicinity of flight

birds enter into proximity of flight

any sudden unsafe event that can cause collision, distraction or interruption of control

Safety for public on the ground as well as manned aircraft above is an essential and utmost consideration for aerial videos and photography.

Maintaining a record of safe flight for FAA request and for determining future UAS safety protocols is imperative.

Date:_____ Location: _____

pre-flight Inspection:

○ Yes ○ No

Comment: _____

Elements

Proximity to airport: _____ (see attached map pinpointing approximate location of flight)

Airport notified ○ Yes

○ No Date:_____ Time: _____

Phone Number: _____ Contact Name: _____
Nearest major intersection: _____
Proximity to medium traffic road: _____
Proximity to heavily traveled roadway road: _____
Proximity to congested population: _____
Approx. Takeoff Time : GMT:

Weather	Good	Fair	Poor	Comment :
Visibility	Good	Fair	Poor	Comment :
Wind Speed	___mph	___Gusts/MPH	___avg/MPH	Comment :

Approx. Landing Time: GMT: Estimated Elevation Ground level: Safety Concerns: Additional Comments:

sea level:

Appendix D

Radio Control Manual

Graupner/SJ HoTT

HOPPING.TELEMETRY.TRANSMISSION

No. S1006

mz-24 HoTT

HOPPING.TELEMETRY.TRANSMISSION

OPERATING INSTRUCTION

Prior to use, please read this manual thoroughly.
Keep this manual in a convenient place for quick and easy reference.

www.Graupner-SJ.com

Contents

BASE MENU (Helicopter, Airplane, Gilder)

FUNCTION MENU (Helicopter)

FUNCTION MENU (Airplane, Gilder)

SYSTEM(Helicopter, Airplane, Gilder)

• BEFORE USE

Thank you for purchasing mz-24 HoTT 2.4GHz Radio System. This system is extremely versatile and may be used by beginners and pros alike. In order for you to make the best use of your system and to fly safely, please read this manual carefully. If you have any difficulties while using your system, please consult the manual, our online Frequently Asked Questions (on the web pages referenced below), your hobby dealer, or the SJ Service Center.
Due to unforeseen changes in production procedures, the information contained in this manual is subject to change without notice.

• INTRODUCTION

Graupner/SJ mz-24 HoTT radio system is used to airplane, helicopter and glider and should be a perfect choice for anyone who needs a high quality radio. This HoTT radio system gives user real-time information on various useful data such as user model's RPM, voltage, temperature, user programmable warning, and so on which are directly obtained from telemetric speed controllers equipped with this HoTT system without having to install separate sensor devices. Of course, all of those telemetric data can be also transmitted from separate sensor devices.

⚠ WARNING : Read the ENTIRE instruction manual to become familiar with the features of the product before operating. Failure to operate the product correctly can result in damage to the product, personal property and cause serious injury.

• SUPPORT AND SERVICE

• Customer support

Please feel free to ask any question by e-mail or phone. We've been trying to deal with your question. We are open from nine to six, Monday to Friday in Korea. We may respond to your question by e-mail as soon as possible when we are close.

• Internet sales site

Please feel free to contact "www.openhobbby.com" to get all information on product features, specifications, running events and the newest product line up..

• A/S regulation

Only when the product is faulty after normal operation within the warranty period, we will repair the product for free based on our regulations. The repair is paid for by the consumer when the damage is due to use in improper ways or beyond the warranty period..

• Warranty regulation

Refer the WARRANTY Card in a Package

• OPENHOBBY A/S CENTER

8F, 202 Dong, Chunui Techno-Park II, 18, 198 street, Bucheon-ro, Wonmi-Gu, Bucheon-Shi, Gyungki-Do KOREA 420-857
Phone: 82-32-623-0706 FAX: 82-32-623-0720
Customer Service E-mail: service@openhobby.com

1. BOX CONTENTS

- mz-24 Transmitter
- GR-24 receiver
- Manual
- Transmitter charger
- Warranty Card
- 1x 4000mAh LiPo Battery
- USB PC interface set
- SD Card adapter
- SD Card case
- USB Cable
- Micro SD Card
- USB adapter wire
- Transmitter strap
- USB interface adapter wire

2. FLYING SAFETY

This is a sophisticated hobby product and NOT a toy. It must be operated with caution and common sense and requires some basic mechanical ability. Failure to operate this product in a safe and responsible manner could result in injury or damage to the product or other property. This product is not intended for use by children without direct adult supervision. Do not attempt disassembly, use with incompatible components or augment product in any way without the approval of Graupner/SJ. This manual contains instructions for safety, operation and maintenance. It is essential to read and follow all the instructions and warnings in the manual, prior to assembly, setup or use, in order to operate correctly and avoid damage or serious injury.

1. Do not fly your model near spectators, parking areas or any other area that could result in injury to people or damage of property.
2. The radio system is affected by signal environment and the electronic jamming signals can cause disorientation and loss of control of your aircraft.
3. Since models are hazardous when operated and maintained incorrectly, install and operate a radio control system correctly and always pilot a model so the model is kept under control in all conditions
4. Ensure that all channels are working in the proper manner.
5. Do not fly during adverse weather conditions. Poor visibility can cause disorientation and loss of control of your aircraft. Strong winds can cause similar problems
6. When working with a model, always power on the transmitter first and power off the transmitter last.
7. After a model is bound to a transmitter and the model is set up in the transmitter, always bind the model to the transmitter again to establish failsafe settings.
8. When working with a model, always power on the transmitter first and power off the transmitter last.
9. Ensure all batteries are full charged before flying.
10. Only to use the recommended adapter when charging the battery of the transmitter and receiver
11. The transmitter shouldn't be switched off at any time during flight
12. Perform a range check of the transmitter and the model before flying the model
13. Make sure all control surfaces correctly respond to transmitter controls before flying.
14. Perform the programming setup of the transmitter after removing a power battery from a model or stopping an engine of a model.
15. Don't move or touch the transmitter antenna during flight

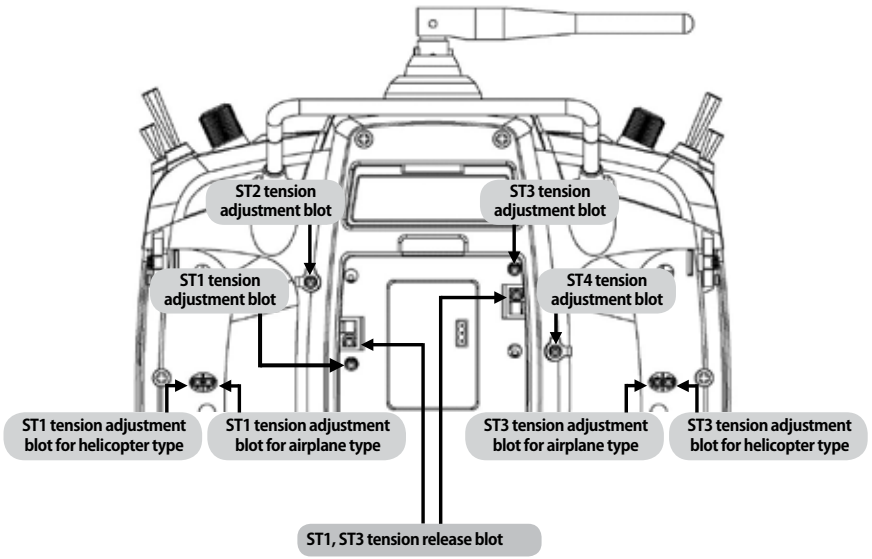
3. FEATURES

1. HoTT (Hopping Telemetry Transmission)
   The use of up to 75 hopping channels provides advanced reliable operation while keeping from any external interference.
2. This HoTT radio system gives user real-time information on various useful data such as user model's RPM, voltage, temperature, user programmable warning, and so on.
3. All telemetry data are directly obtained from telemetric speed controllers equipped with this HoTT system without having to install separate sensor devices.
4. Future-proof update capability using data interface of USB or Data pin.
5. Advanced HoTT wireless trainer system makes Teacher and Pupil system more enjoyable and gives user convenience for the teaching/learning.
6. Simple, ultra-fast binding of transmitter and receiver.

4. SPECIFICATION

	Transmitter mz-24	Receiver GR-24
Frequency band	2.4~2.4835GHz	2.4~2.4835GHz
Modulation	FHSS	FHSS
Output power	100mW	-
Current drain	approx 125mA	approx 70mA
Operating voltage	3.4V~6V	3.6V~8.4V

5. STICK TENSION ADJUSTMENT



You may release the stick tension with ST1 or ST3 tension release bolts. Turn the bolts clockwise then the stick tension is released

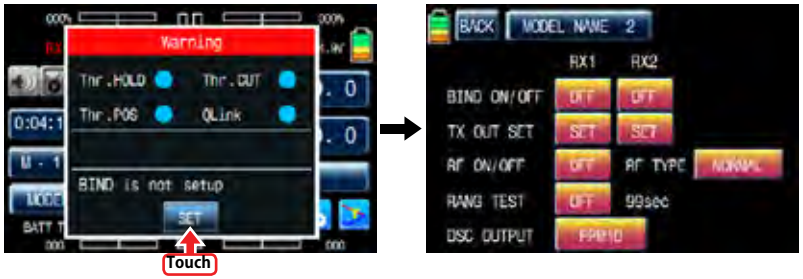
- Mode 1: ST1 tension release bolt is used
- Mode 2: ST3 tension release bolt is used

The other can be adjusted for your purpose

6. TRANSMITTER CONTROL IDENTIFICATION

7. BINDING

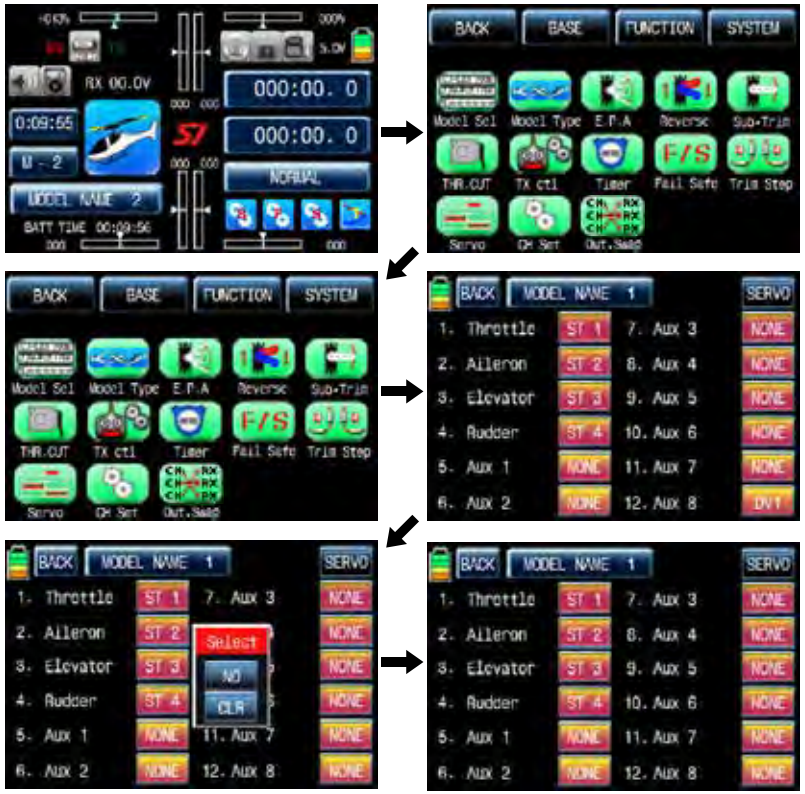
1. You must bind the receiver to the transmitter before the receiver will operate. Binding teaches the receiver the specific code of the transmitter so that it will only connect to it's corresponding transmitter. If you turn on transmitter's power before binding, the warning message appears on transmitter LCD page, which announce transmitter is not bound. Touch SET icon on warning pop up to access to Tx ctl (BIND)



2. After accessing to Tx ctl(BIND), Turn on receiver's power and touch Bind button on receiver for over 3 sec to enter binding mode. Touch OFF icon in the cross line of BIND ON/OFF and RX1 then OFFs in the cross line of BIND ON/OFF and RX1, RF ON/OFF and RX1 are changed to ONs indicating the system has been connected. If the binding process has failed, repeat the whole procedure.

⚠ CAUTION

We strongly recommend to unlock the throttle limit function when you control Helicopter. Throttle limit function restrict the travel amount of throttle with DV1 volume and this function is set by default.Touch "BASE" icon at the main page to call "BASE" page and touch "CH set" icon to call "CH set" setup page. Touch DV1 in channel 12 to call "Select" message popup and touch CLR in popup then DV1 is switched to NONE. Now, throttle limit function is unlocked.



8. TRANSMITTER PROGRAMMING SETUP

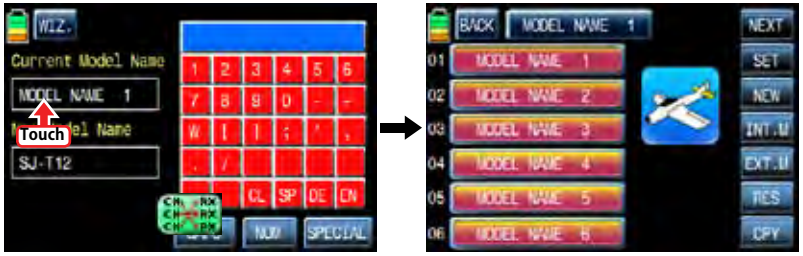
BASE MENU

Turn on transmitter's power and touch B icon on the main page to access to BASE menu.

BASE MENU (Helicopter, Airplane, Gilder)

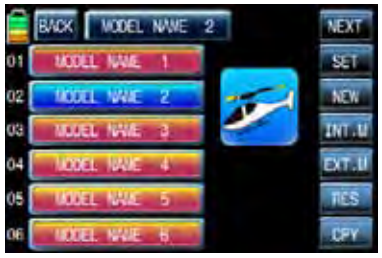
1. Model select

It is used to add or select model.
Touch Model Sel icon in base menu to access Model sel menu



1-1. SET

Touch the desired MODEL NAME icon then it is activated in blue. Touch SET icon, Pop up message “Please Wait !!” appears. About 1 sec later, the desired MODEL NAME is selected and MODEL NAME at top is also changed.



1-2. NEW

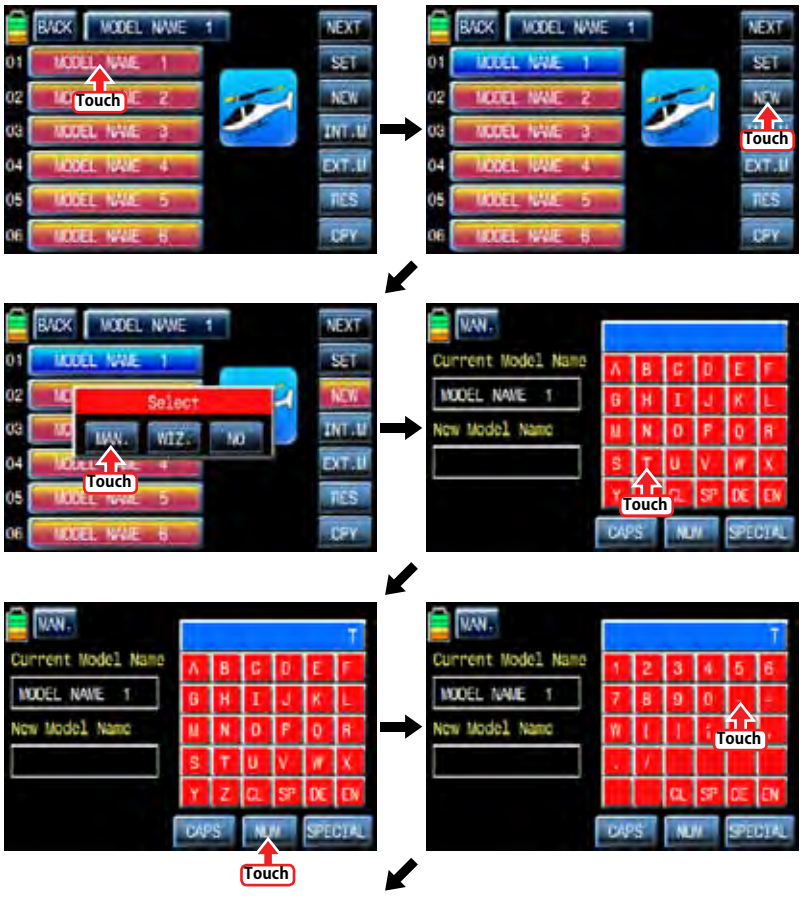
This function is use to create the new model or exchange the current model to others. There is 2 methods of Manual setting and Wizard setting. You may program the basic function sequentially in Manual setting. Here is the example for airplane

Touch the desired MODEL NAME icon and touch NEW icon on the right then the pop up message
“ Select” appears. Touch MAN to start Manual setting. The first function of Manual setting is MODEL NAME. Tap model name in blank of New Model Name using keypad on the right. Touch EN icon on the right bottom and touch MAN icon on the left top then the model is named and stored and then the next function, model type, is accessed.

- Alphabet keyboard explanation.

- CL(Clear):it is used to erase every letter you typed at a time.
- SP(SPACE):it is used to make a space between words
- DE(DELETE):it is used to erase a letter you typed
- EN(ENTER):it is used to save every letter you typed.
- CAPS:it is used for capital letters or small letters
- NUM:it is used for numbers.
- SPECIAL:it is used for special character.

In accordance with model type that you selected, swash type function or wing type function is accessed. Below picture shows the example for wing type in airplane. Select the desired wing type, tail type and power type in turn. If all procedures have been done correctly, all types that you selected appear on the page. Touch ENT icon on the right bottom after checking the selected types, Manual setting is completed and returned to base menu

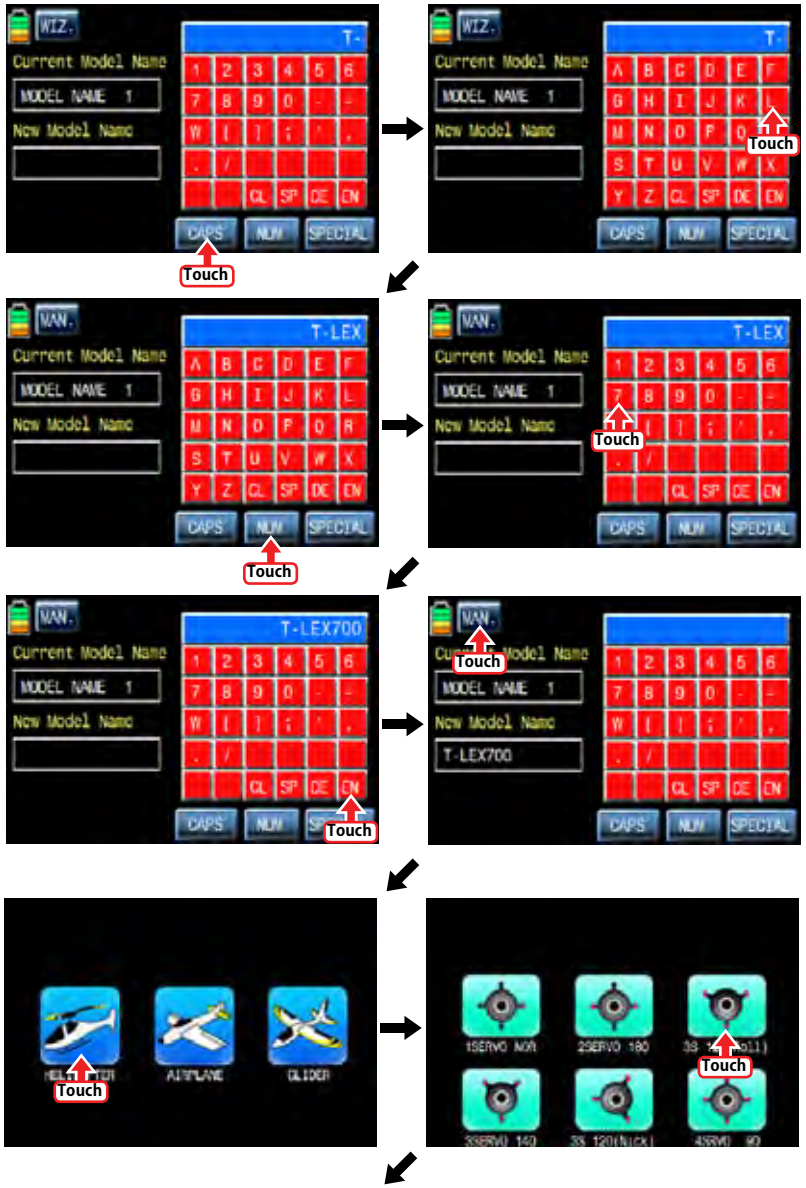


"Wizard setup" is used to set the basic function of a model and the essential function of flight one by one. Please refer
to the example of helicopter type as below.

Touch the icon of desired model you want to program Wizard setup in the model list and touch "NEW" icon then the "Select" message is popped up. If you touch "WIZ" icon, WIZARD function is ready to set. The first function of wizard setting is MODEL NAME. Tap model name in blank of New Model Name using keypad on the right. Touch EN icon on the right bottom and touch WIZ icon on the left top then the model is named and stored and then the next function, model type, is accessed.

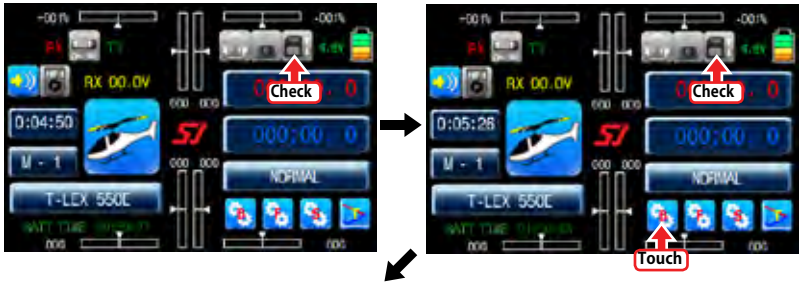
• Alphabet keyboard explanation.
- CL(Clear):it is used to erase every letter you typed at a time.
- SP(SPACE):it is used to make a space between words
- DE(DELETE):it is used to erase a letter you typed
- EN(ENTER):it is used to save every letter you typed.
- CAPS:it is used for capital letters or small letters
- NUM:it is used for numbers.
- SPECIAL:it is used for special character.

In accordance with model type that you selected, swash type function or wing type function is accessed. Below picture shows the example for swash type in helicopter. Select the desired swash type, power type and set reverse function, EPA function, D/R EXP function, Pit CRV function, Thr.CRV function, GYRO function, Thr.HOLD function, FAILSAFE function in turn. When you touch WIZ icon after completing to program each function, the next step is accessed in turn. When you touch WIZ after FAILSAFE function is programmed finally, "Model type", "Swash type", and "Power type" that you selected appear on the page. Touch ENT icon on the right bottom after checking the selected types, Manual setting is completed and returned to base menu


WIZ.
Current Model Name
MODEL NAME 1
New Model Name
CAPS
NUM
SPECIAL
Touch
WAN.
T-LEX
T-LEX700
T-LEX700
AIRPLANE
GLIDER
REVERSE
E.P.A
D/R EXP
Pit.CRV
Thr.CRV
GYRO
Thr.HOLD
ELECTRIC POWER
GAS POWER
NOR
NEXT
INC
RES
DEC
ACT
Curve
IN -100%
OUT -100%
POINT L -100%
ENT
Gyro Supression
Gyro Gain
SET
CTL

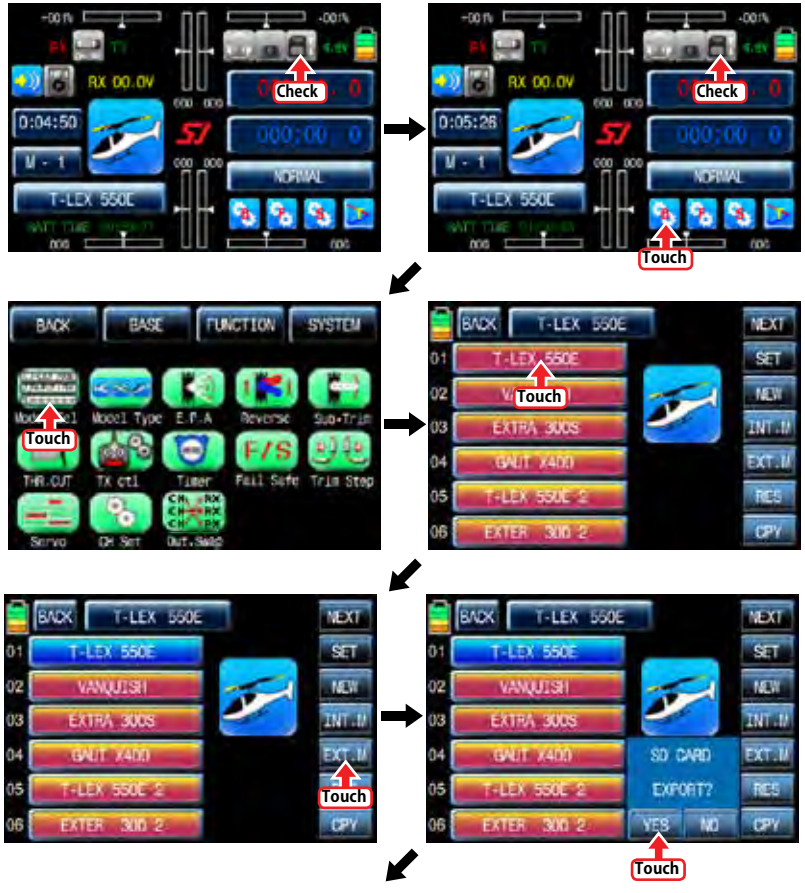
1-3. INT.M (Internal Model)

It is used to copy the model memory in SD Card into the model list of transmitter. To make use of INT.M function, you need SD Card that has the programmed model file. If you put SD Card into SD Card slot on the back of transmitter, “SD Card” icon is lighted in the transmitter main page. When the icon is lighted, touch the base setup icon to call the base setup page. In the page, touch “Model Select” icon to call the “Model Sel” setup page and touch the copy destination then it is activated in blue. Touch “INT.M” icon then the model list in SD Card appears and then select the source model to copy. The popup message indicating the destination and source appears. Touch YES, if they are correct, then “Please wait” message is displayed and a few seconds later, the model data in SD Card is copied to the model list in transmitter.



1-4. EXT.M (External Model)

This function is used to copy the model in transmitter into SD Card. In order to use EXT.M function, you need to plug SD Card into SD Card slot on the back of transmitter. When it is plugged into the slot, “SD Card” icon is lightened in the transmitter main page. Touch Base setup icon to call the base setup page. In the page, touch “Model Select” icon to call the “Model Select” setup page and touch the source model to copy in transmitter then it is activated in blue. Touch “EXT.M” icon then the popup message “SD Card EXPORT?” appears. Touch YES then “Please wait” message is displayed and a few seconds later, the model data in transmitter is copied to SD Card now



1-5. RES(RESET)

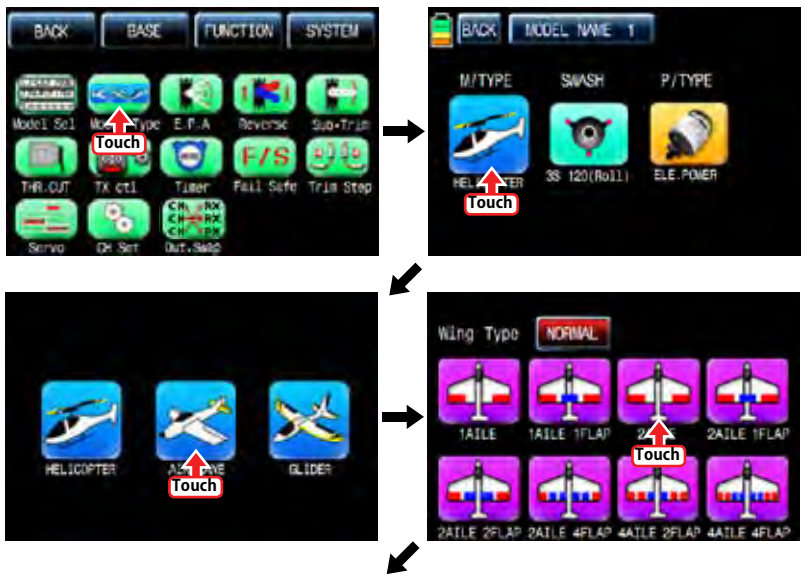
It allows you to remove the selected models in model list. Refer to the example of Model 01 as shown below. At first, you need to select the desired model that you want to remove then the model icon is activated in blue. “Please wait” message is popped up when you touch “YES” icon. All the data of the corresponding model is removed within a few second.

1-6. CPY(Model Copy)

The Copy function is used to copy the programmed values of a model into the other model. Touch the source model to copy, it is activated in blue. Now touch “CPY” icon on the right bottom and touch the copy destination then it is activated in blue as well. The popup message indicating the destination and source appear. Touch YES, if they are correct, then “Please wait” message is displayed and a few seconds later, the source data is copied to the copy destination.
transmitter.

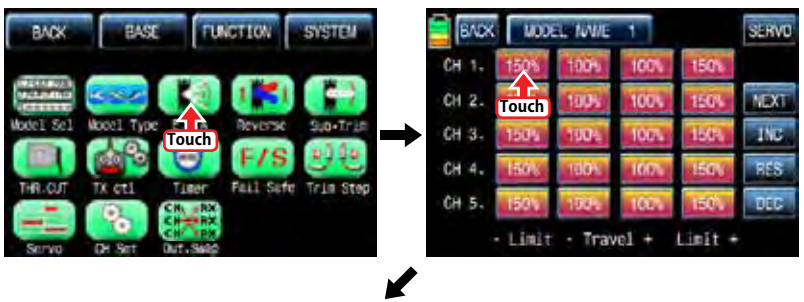
2. Model type

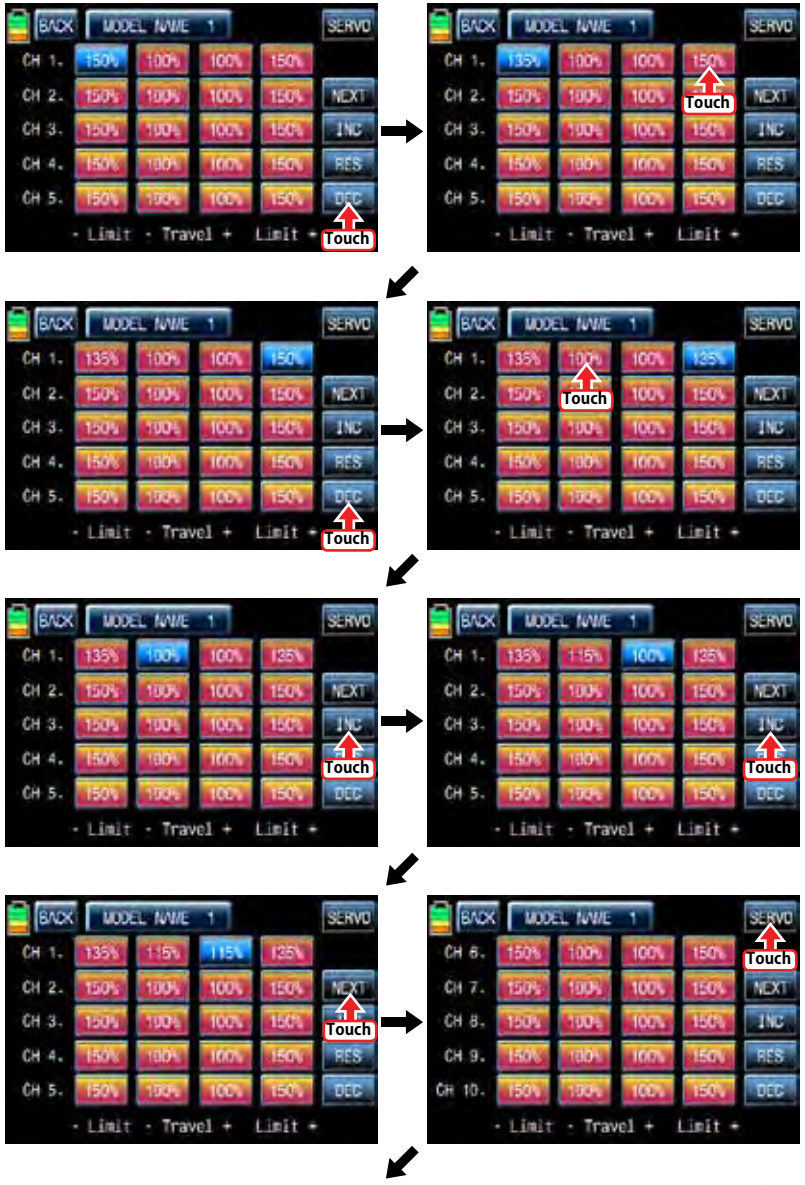
It is used to reset the model type. Please note that all the value, excepting for model name, is reset when “Model type” is reset. Touch “Model type” icon on base menu page to call the model type setup page, the preset “model type”, “swash type” and “power type” is displayed. The below example tells you how to change from the heli type to air type. If you touch M/TYPE icon, you may select airplane form preset Helicopter at M/TYPE page again. In accordance with the selected model type, ”Swash type” or “Wing type” appear. Since the airplane type is selected, the wing type is shown in the example below. Select the desired wing type, tail type and power type in turn. If all procedures have been done correctly, all types that you selected appear on the page. Touch ENT icon on the right bottom after checking the selected types, Manual setting is completed and returned to base menu

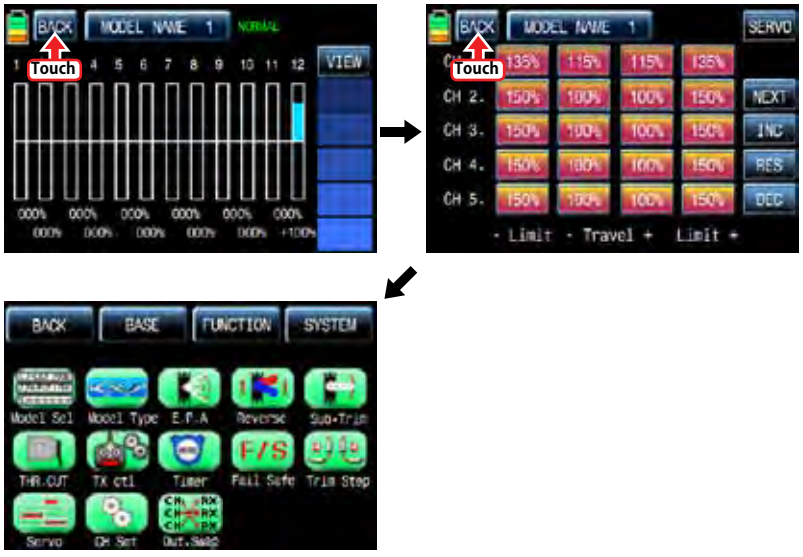


3. E.P.A

E.P.A is used to adjust Servo operation angle and limitation for each channel. Touch “E.P.A” icon on the base menu page to call E.P.A setup page. “Limit” and “travel” can be set individually. When you touch each icon, it is activated in blue and you may adjust the values with “INC” and “DEC” buttons. Touch NEXT icon on the right to go and set more channels’ E.P.A. after setting each channel’s E.P.A, touch “SERVO” icon to call “SERVO VIEW” page. By moving each channel’s stick, you may check E.P.A value in the graph. When “BACK” icon in the “SERVO VIEW” page is touched, you may return to the base menu page.

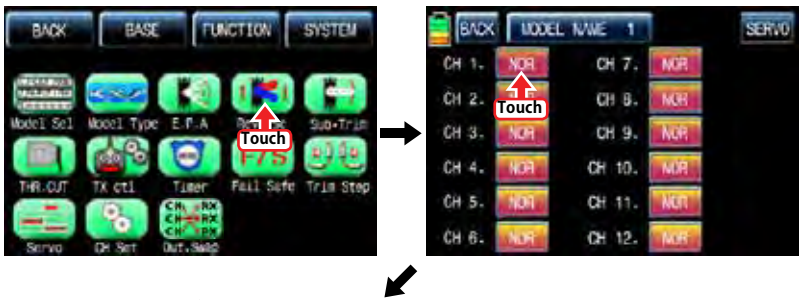


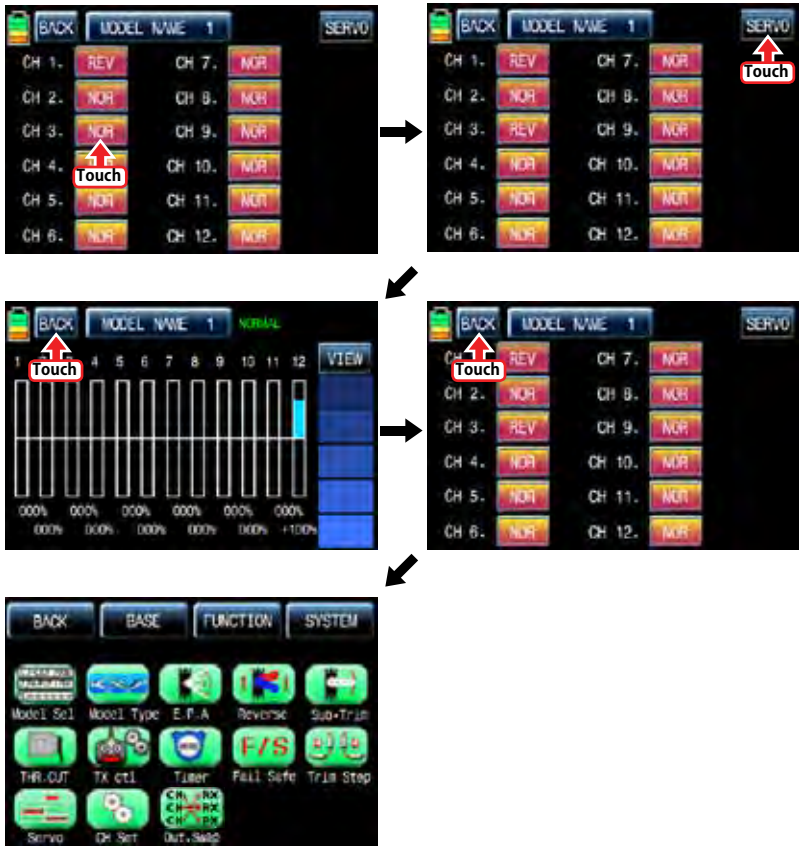




4. Reverse

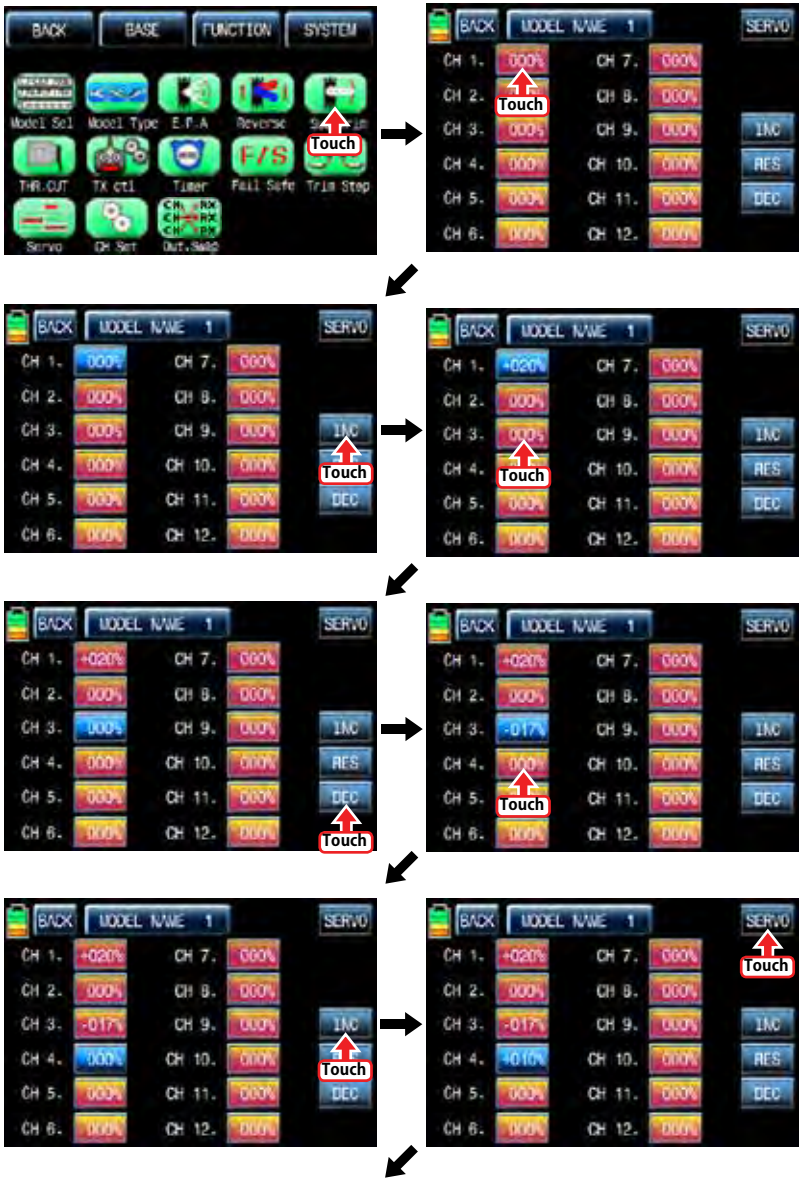
It is used to reverse the operation of an individual servo. Touch the “Reverse” icon in the base menu page to call the Reverse setup page. In “Reverse” page, you are able to reverse the operation of a servo. When you touch the “NOR” icon, “NOR” is changed to REV” and the operation of an individual servo is reversed. Touch “Servo” icon on the left top to call the “Servo View” page after setting “Reverse” function. When each channel’s stick is controlled, “Reverse” setting status can be seen in a graph. Now, touch “Back” icon in the servo view page to call the reverse setup page. When Reverse function setting is completed, touch “Back” icon on the top left page to call the Base menu page.

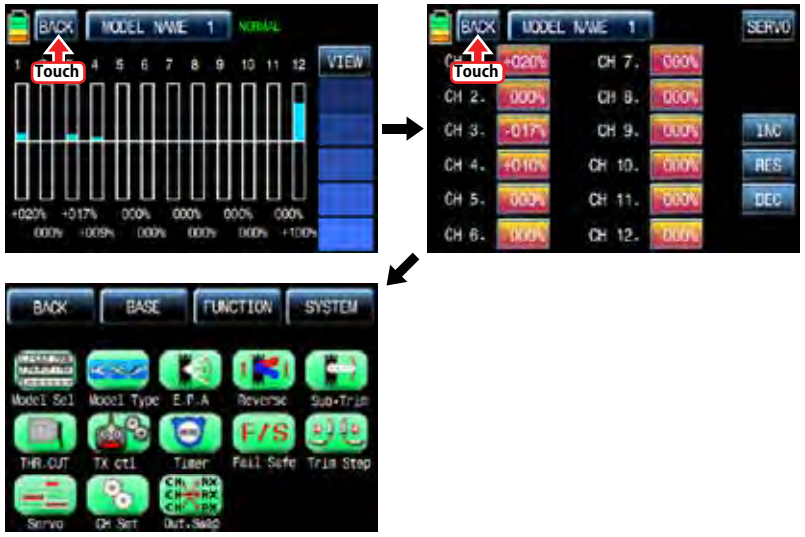




5. Sub-Trim

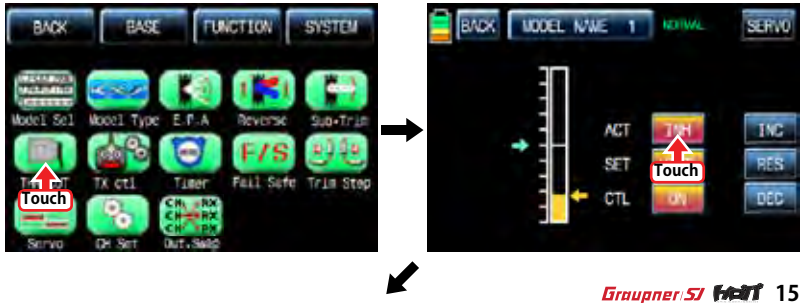
It is used to set the servo neutral position, and may be used to make fine adjustments to control surface without hooking linkages and pushrods up. When Sub-Trim function is used, make sure that the servo trims are set to their center position. Touch “Sub-Trim” icon in the base menu to call the “Sub-Trim” setup page. In the base menu, touch “000%” icon then it is activated in blue. “Sub-Trim” values can be adjusted with the “INC”, “DEC” icons. When the setting for “Sub-Trim” is completed, touch “Servo” icon to call “Servo View” page in which you may check “Sub-Trim” value in a graph. Touch “Back” icon to call “Sub-Trim” setup page and touch “Back” icon again to call “Base” menu page after setting “Sub-Trim” for every channel.

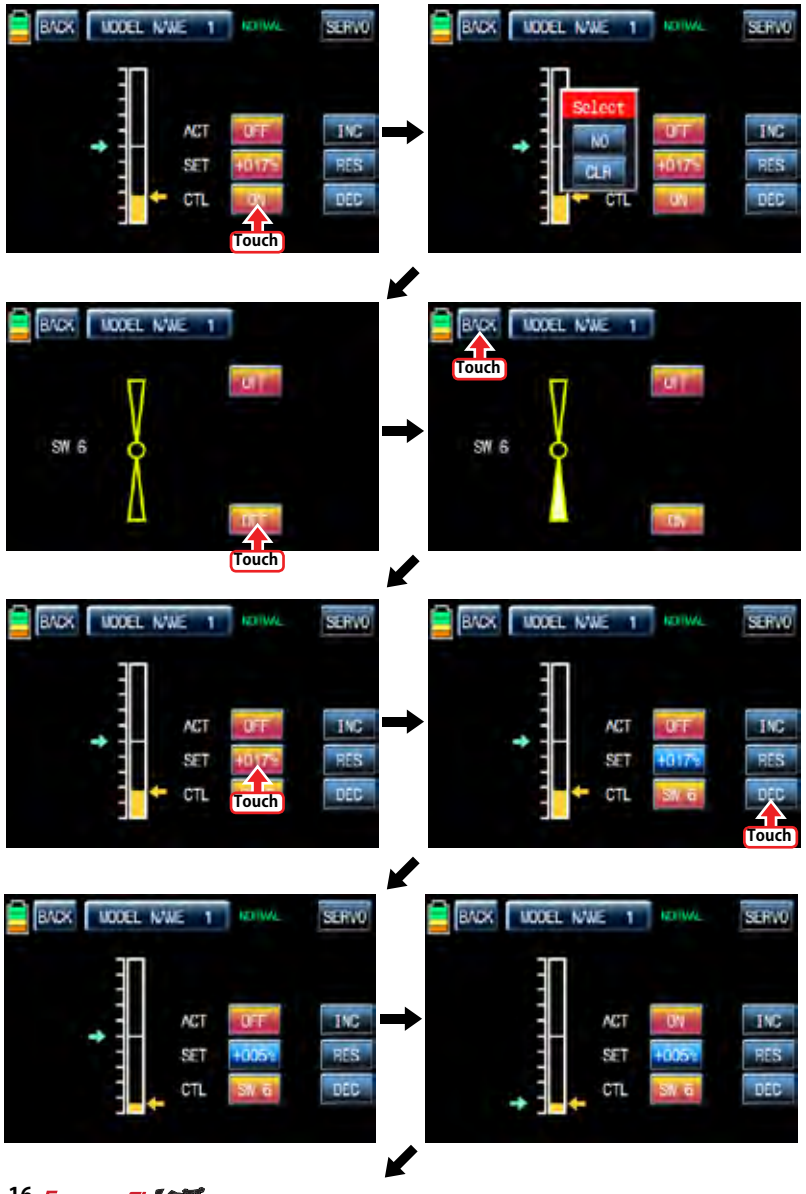




6. THR.CUT

This function is used to stop the operation of engine. THR.CUT function works from below one-third position of the full movement range of throttle stick. Touch “THR.CUT” icon in the base menu page to call the “THR.CUT” setup page. When touching “INH” icon in “ACT” line, you may change the value to “OFF”. When touching “On” icon in “CTL”, the message “Select” is popped up. Now, move the switch with your choice then this switch is set to on/off switch for “THR.CUT” and the switch setup page appears. You may change ON/OFF by touching icons. When the switch is moved to the direction of ON, the function is operated. After the switch setup is completed, touch “BACK” icon on the left top to return “THR.CUT” setup page then set the value in “SET” line. Touch “017%” icon to activate it in blue and touch “INC” and “DEC” icons to decide the throttle position when “THR.CUT” is on. Now the servo of throttle channel is operated to the corresponding position. Touch “Back” icon to return the base menu page.





7. TX ctl

It consists of the multiple functions for a transmitter. It includes “BIND ON/OFF”, “TX OUT SET”, “RF ON/OFF”, “RF TYPE”, “RANG TEST”, and “DSC OUTPUT” functions. Touch “TX ctl” icon to call the “TX ctl” setup page.

- BIND ON/OFF

It is used to bind a transmitter to a receiver. In “TX ctl” setup page, turn on a receiver and press “Setup” icon of a receiver for over 3 seconds until a receiver is entered the binding mode. If you touch “Off” icon in “BIND ON/OFF” of “RX1” then the transmitter is bound to a receiver in a few seconds and “OFF” of “RX1” is changed to the product name of the bound receiver. “RF ON/OFF” is set to “ON” as well. Rx2 can be bound as the same as explained above.

- TX OUT SET

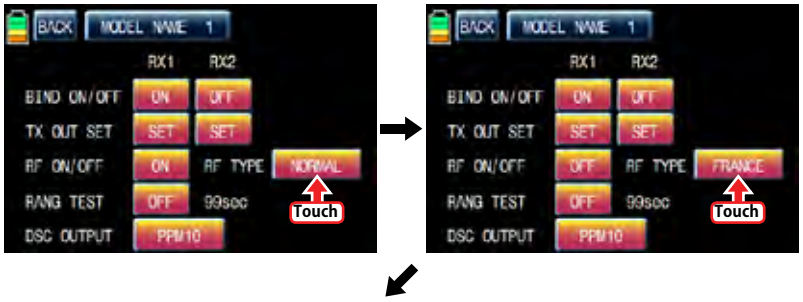
It is used to edit the receiver's "out-channel" connected to each channel of transmitter as you want. For example, when "2 Elevator" function is used, the "CH3" and "CH8" out pins of receiver are used in the traditional channel setup, however, if the receiver's CH4 pin is set for the transmitter's CH3 using "TX OUT SET" function, the CH4 and CH3 pin are operated for the "2 ELEVATOR" function. To make use of this function, a receiver should be bound first. When you bind the receiver to RX1 and RX2 and then touch "Set" icon in "TX OUT SET" to call "TX OUT SET" setup page. "TX OUT SET" page is differently shown according to the number of receiver's channel which is bound to a transmitter. Basically, the order of transmitter's channel is set as the same as the order of receiver's out-pin. Touch the desired channel number to activate in blue and change it to the channel that you want to match with "INC" and "DEC" button and then touch "STO" icon to transmit the setup data to the receiver. The other channels are set as the same as explained above.
NOTE: Since "TX OUT SET" function is set the receiver by transmitter, you should touch the "STO" icon to transmit the setup data to the receiver and to save the data on a receiver for operation.

- RF ON/OFF

It is used to turn on or off transmitter's "RF" function. If you are not flying a model but programming transmitter only, you are able to save the battery of the transmitter by setting RF to turn off. Under "OFF" status, transmitter is disconnected with the receiver. Touch "ON" icon in "RF ON/OFF" to change to "OFF"

- RF TYPE

mz-12 offers 2 RF types, NORMAL and FRANCE, to comply with country regulation. "NORMAL" type is usually used in most countries, but you need France RF setting to comply with France regulations in FANCE. France RF setting should only be turned on when operating your transmitter in France outdoors. "NORMAL" type can be changed into "FRANCE" type by touching "NORMAL" icon. If the "FRANCE" icon is touched again, it can be changed into "NORMAL" icon.



- RANGE TEST

"Range Test" function reduces the power output. This allows for a range test to confirm the RF link is operating correctly. Perform a range check at the beginning of each flying session to confirm system operation.
If the servo connected to receiver is operated normally within 50m or 70m of the distance from the receiver, you may fly a model, if not, you need do range test again. If it doesn't operate normally even after the test, please send mz-12 for repair.
Touch "OFF" icon in "RANGE TEST" to change to "ON", transmitter beeps indicating "Range test" setup begins. This function is available for 99sec. you may touch "ON" icon if you want to stop the function.

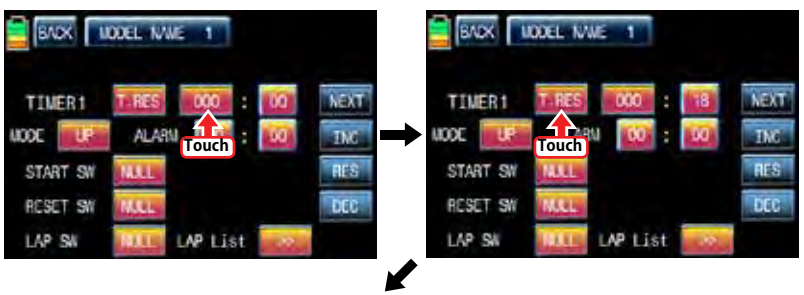
- DSC OUTPUT

It is used to set the number of channel when Trainer function is used with DSC jack. If 5 channels are used, PPM5 is recommended to use. To use more than 5 channels, choose the appropriate PPM for each condition. PPM10, PPM16, PPM18, PPM24 are selectable. Whenever you touch the value icon in DSC OUTPUT, You can select "PPM10", "PPM16", "PPM18", and "PPM 24" in turn. Default value is "PPM 10".

8. TIMER

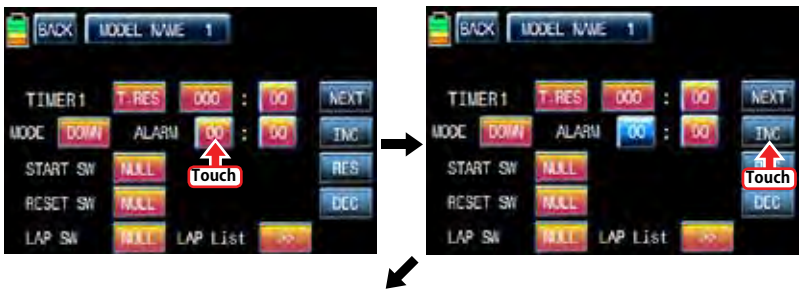
Timer function may be set for any desired time ,i.e. model time, date, time, etc. Two independent timers, TIMER1 and TIMER2, are provided for each model. Touch “Timer” icon in base menu page to call the timer setup page.

In the “Timer” setup page, set “TIMER 1” first. The timer in the first line is used when to save the flight data on SD card. Bind transmitter and receiver and Insert SD card into SD card slot in the rear of transmitter. Touch the value in minute or second to operate or stop timer. The flight data starts to be saved on SD card when timer starts to operate and stop to save when timer stop to operate. Touch “T.RES” icon to reset timer. Since the timer in TIMER 1 is operated with ALARM timer at a time, you need to operated ALARM timer to use it

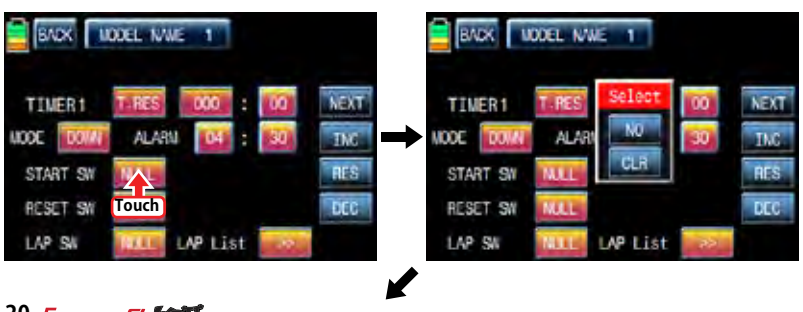


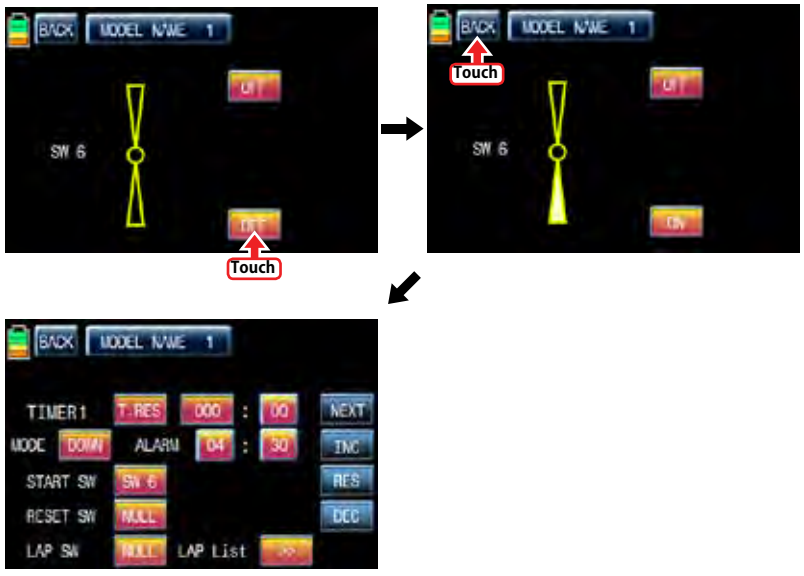
To set the model time, touch “MODE” icon and then select “UP” or “DOWN”. The default value is UP. Timer may be set count-down or count-up operation with your choice. Count-up timer continues counting from zero to the setup time and Count-down timer keeps counting from the setup time to zero.

After “MODE” setup, you need to set “ALARM”. The alarm sounds from the last 20 seconds in the setup time. It has the 2 seconds intervals for the first 10 seconds and has the 1 second interval for the next 10 seconds.

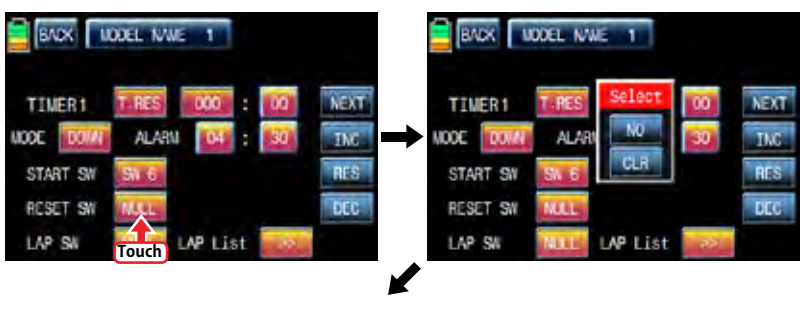


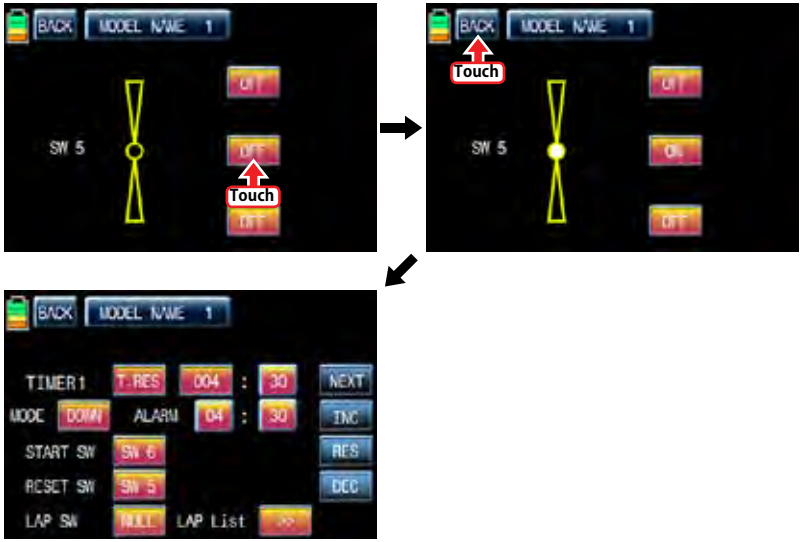
After “ALARM” setup, you may set “START SW”. Touch “NULL” icon in “START SW” to call “Select” message popup. Now, move the switch with your choice then this switch is set on/ off switch for “START SW” and the switch direction setup page appears. You may change ON/OFF by touching icons. When the switch is moved to the direction of on, the function is operated. Touch “Back” icon to return TIMER setup page



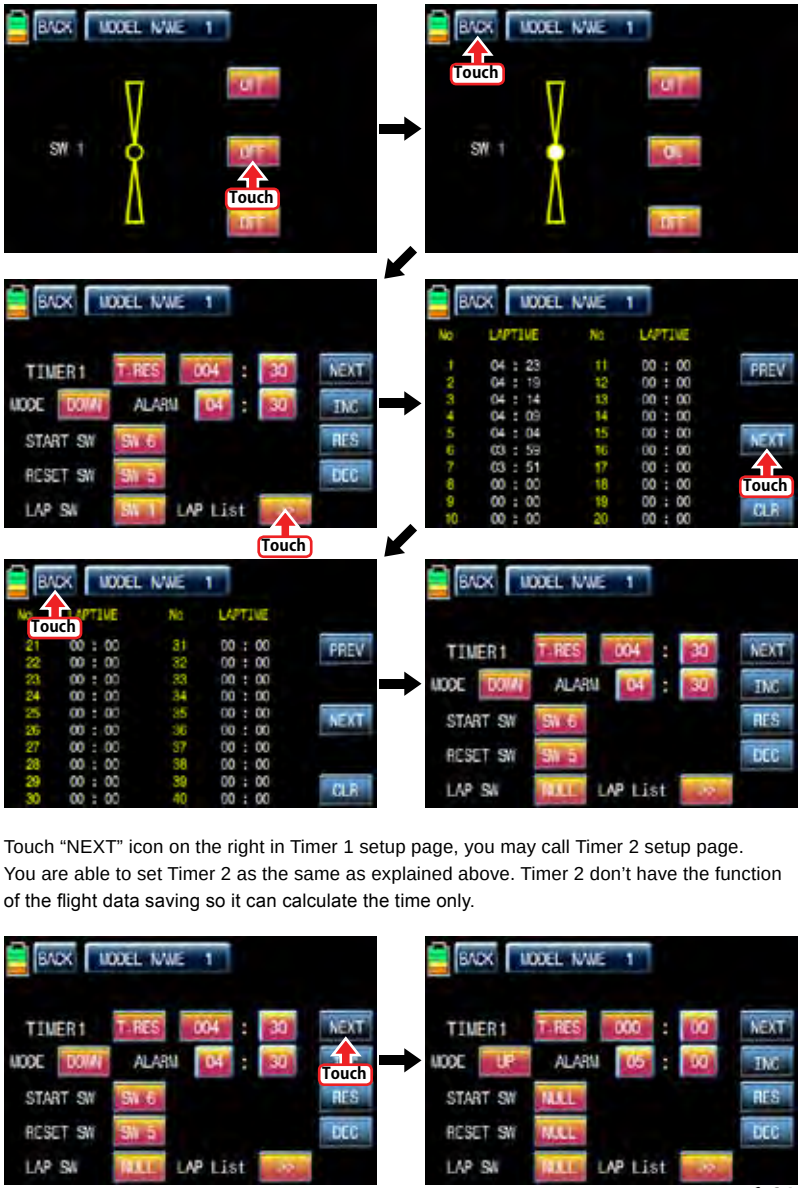


When START SW setup is completed, you may set RESET SW function. Touch the “NULL” icon in “RESET SW” to call “select” message popup. Now, move the switch with your choice then this switch is set to on/ off switch for “RESET SW” and the switch direction setup page appears. You may change ON/OFF by touching icons. When the switch is moved to the direction of ON, the function is operated. Touch “Back” icon to return TIMER setup page



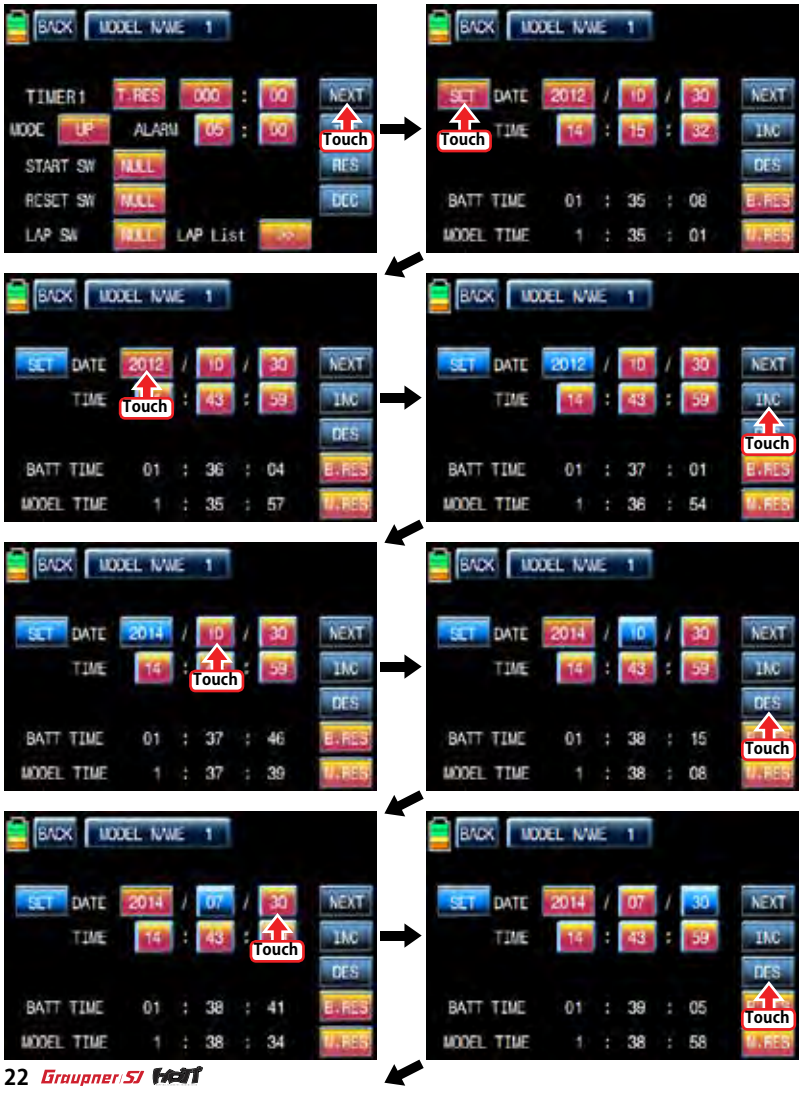


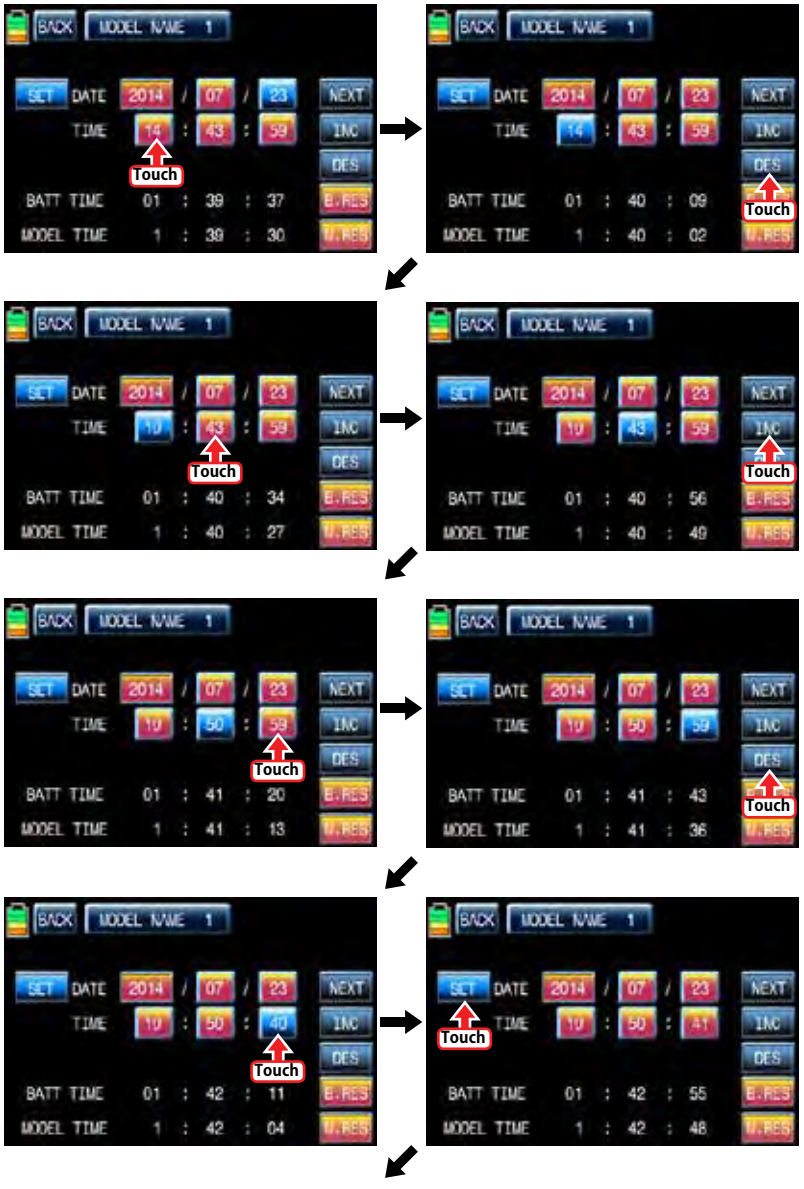
After RESET SW is set, you may set “LAP SW” function. Touch “NULL” icon in “LAP SW” to call “select” message popup. Now, move the switch with your choice then this switch is set on/ off switch for “LAP SW” and the switch direction setup page appears. You may change ON/OFF by touching icons. When the switch is moved to the direction of ON, the function is operated. Whenever the LAP SWITCH is on, Lap time is saved into LAP list. Touch “BACK” icon on the left top to call Timer setup page. In order for you to check the LAP list, Touch “>>” icon in LAP List to call LAP list page. Up to 100 ea of Lap time can be saved and only 20ea is displayed in the page. For the next LAP list, touch “NEXT” icon. If touching “CLR” icon on the right top, LAP list is deleted. Touch “BACK” icon to call Timer setup page.



Touch “NEXT” icon on the right in Timer 1 setup page, you may call Timer 2 setup page. You are able to set Timer 2 as the same as explained above. Timer 2 don’t have the function of the flight data saving so it can calculate the time only.

After Timer 2 setup, touch “NEXT” icon on the right. You may call the page of the date/ time setup. Touch “SET” icon to activate it in blue and touch the desired value to activate in blue. With “INC” and “DEC” buttons, you may adjust the values for the date and time as the picture shown below. BATT TIME and MODEL TIME can be reset by touching the corresponding B.RES and M.RES icons.



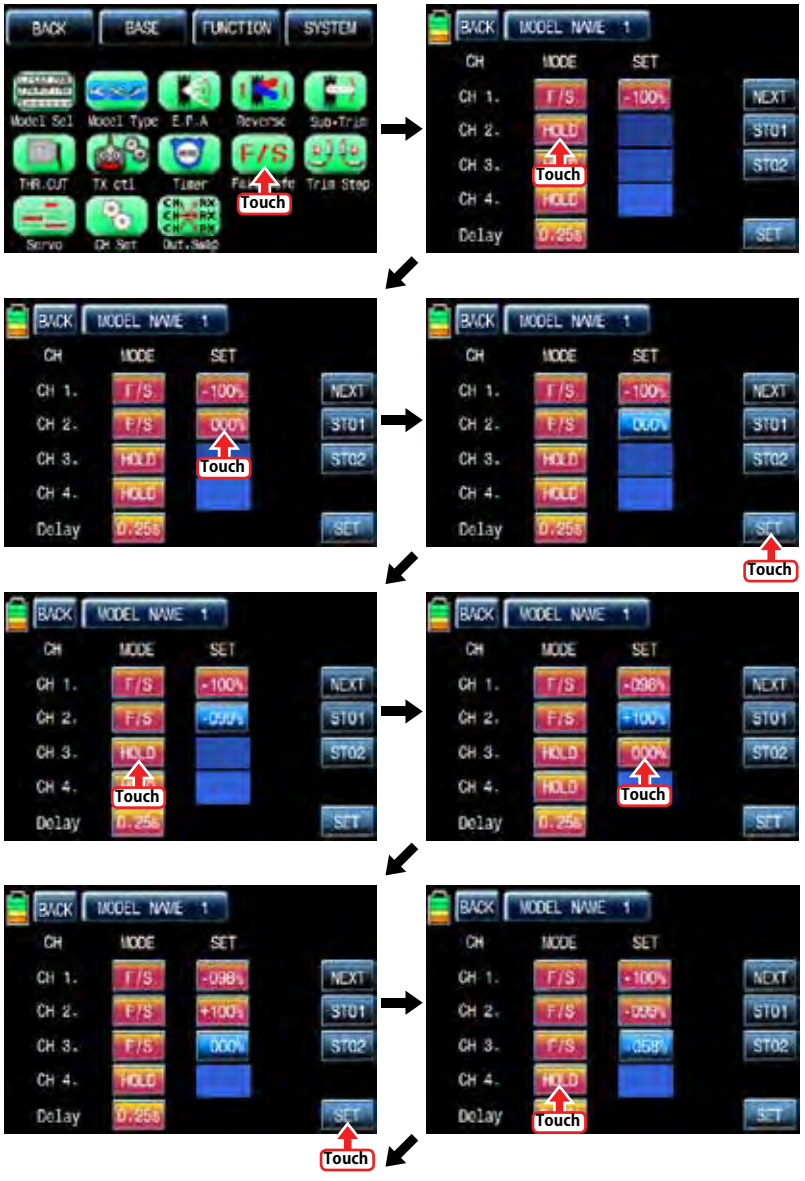


9. FAILSAFE

When you bind your transmitter, you are programming the receiver with failsafe defaults. If connection is lost between the transmitter and receiver, the receiver immediately operates in those preprogrammed default positions.
The default value is “Hold” and you may select “Hold” or ”F/S” for up to six channels.
CAUTION: Fail safe function should be operated when the transmitter and receiver are switched on.

Hold: If you lose connection between the transmitter and the receiver, the preset channels hold the last given command.
F/S: If the signal is lost, the preset channels are driven to their failsafe preset position.

In the base page, touch “Fail Safe” icon to call “Fail Safe” setup page. All channels’ default values excepting for throttle channel are set in “Hold”. Touch “Hold” icon in the channel to set to “F/S” and then touch the “SET” value to activate in blue. After that, move transmitter stick to the desired position and touch “Set” icon in the right bottom then the position of transmitter stick is displayed in percentage. Every channel can be set in the same and when touching NEXT icon in the right, you may call the next setup page.
You may set “Delay” function after all channels setup, 0.25s is set by default, and may select any of 3 types (0.5s, 0.75s, 1.0s) by touching the delay mode icon. After “Delay” setup, be sure to touch “STO1” and “STO2” icons in the right to transmit Failsafe setup data to a receiver. Now failsafe setup is completed.

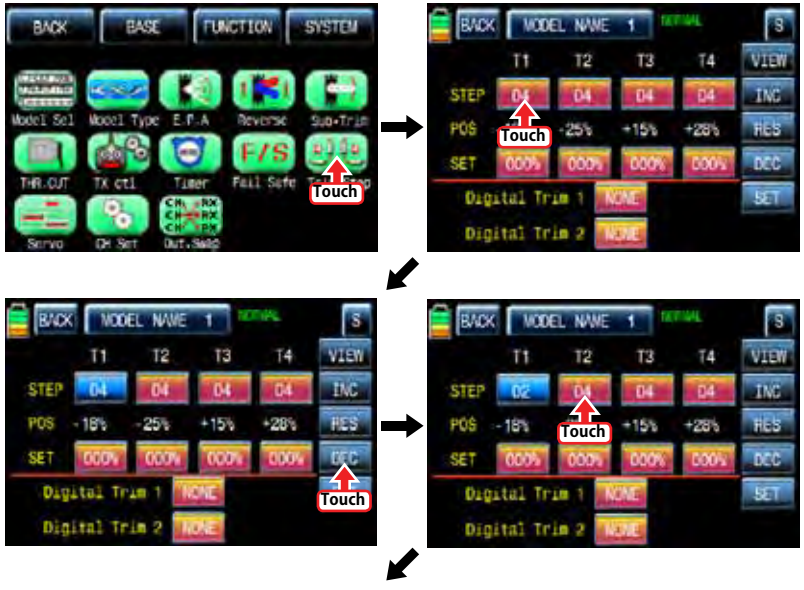


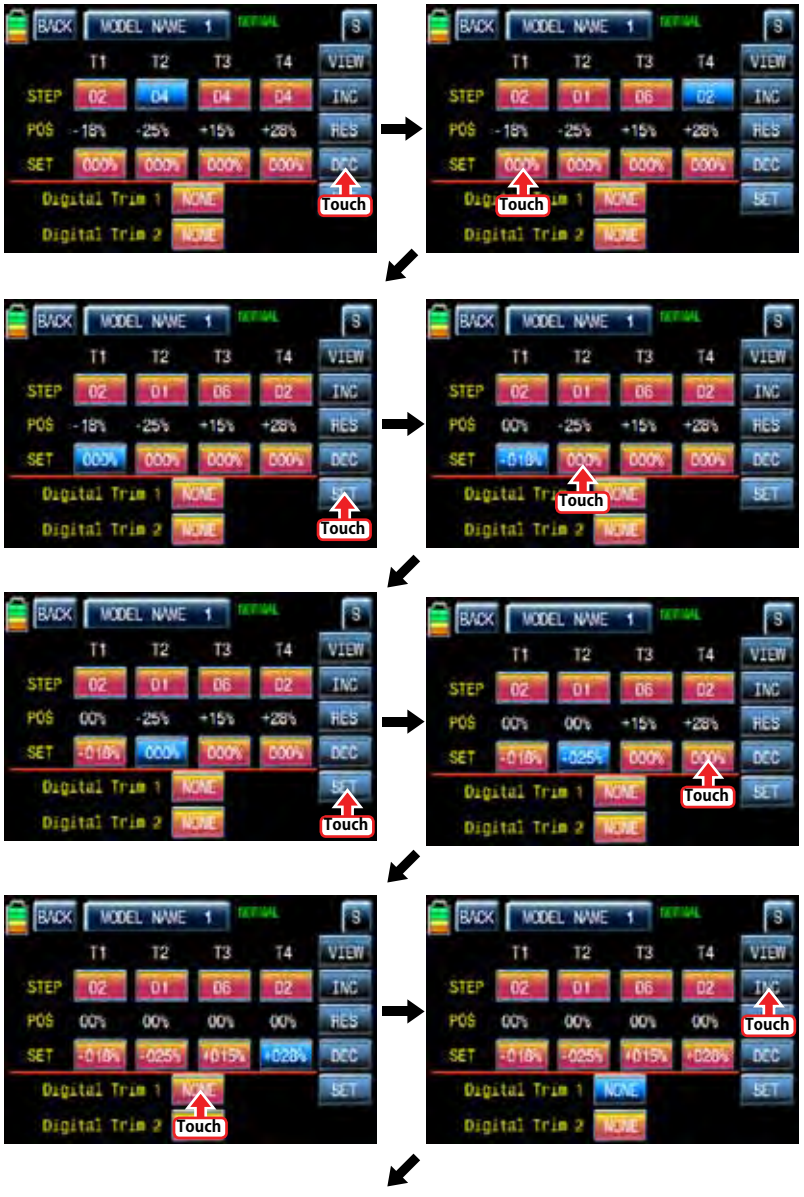
10. TRIM STEP

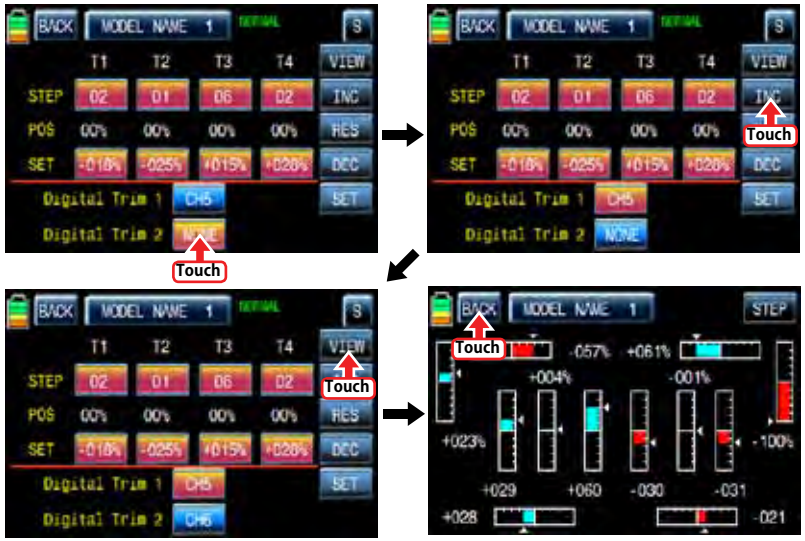
It allows you to check all function values of “Digital trim step”, “DT1”, “DT2”, ‘Digital volume”, and “Side slide”. Touch “Trim Step” icon in base menu page to call Trim Step setup page. The step value indicates the amount that the trim is moved in the range, 100, when operating trim key one time. “4” is set by default and it means that the trim is moved as much as “4” by operating trim key one time.

Touch and activate the values in STEP line and adjust the values with INC” and “DEC” buttons. The programmed trim values are displayed in “POS” line and can be saved on transmitter. If you save the programmed trim, the value is reset to the natural, 00%, and it can be verified in “POS” line as well. Touch and activate the values, 000%, in SET line and touch “SET” icon in the right bottom then the value in POS line is switched to 000%, the programmed trim value is saved in SET line.

After Trim STEP and SET setup, you may adjust the function value of “Digital trim 1” and ‘Digital trim 2”. Their default value is set as “None”. Touch any of options for ‘DT1” and “DT2” to activate in blue. You may adjust the function value with “INC” and “DEC” buttons. Touch “View” icon in the right to call the next page that you can see all setup data such as Trim position, DT1, DT2, Digital volume and Side slide. Touch “BACK” icon to return the previous page.

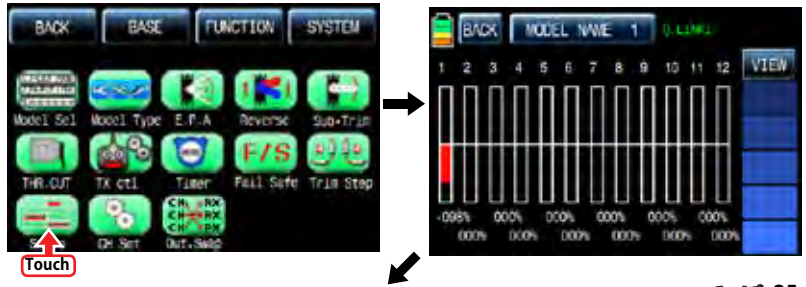


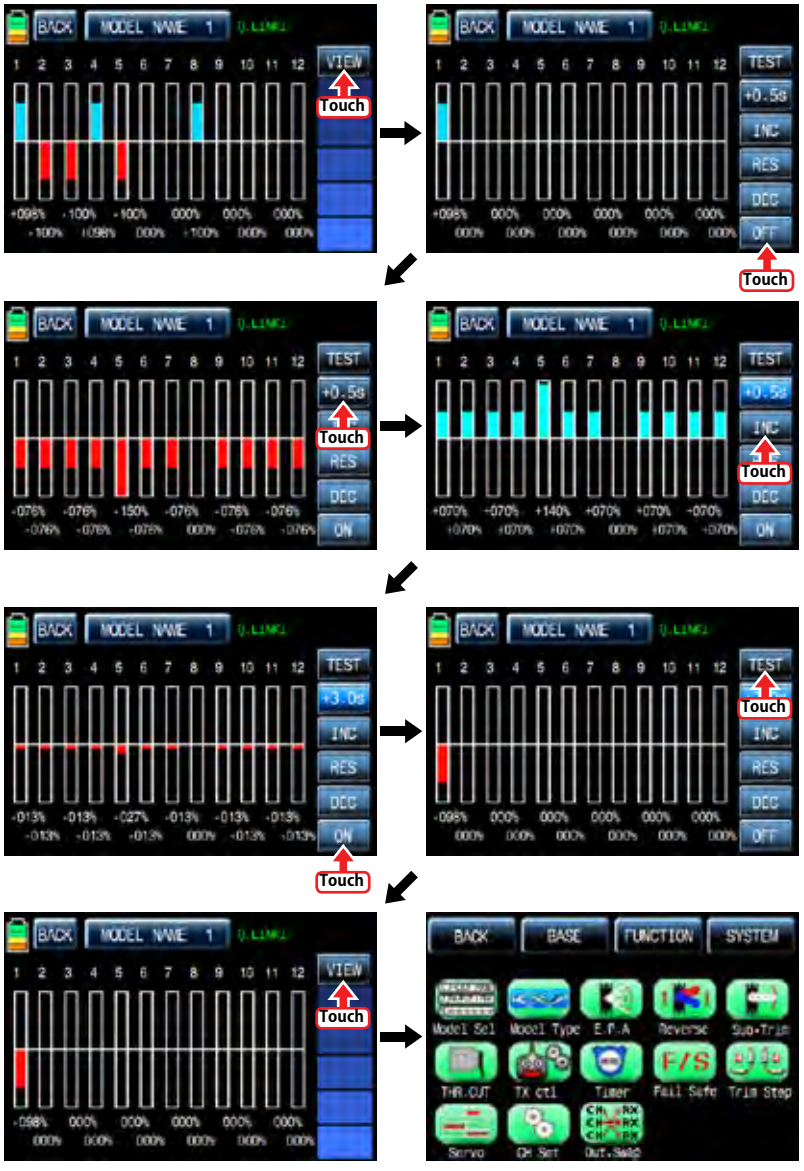




11. SERVO

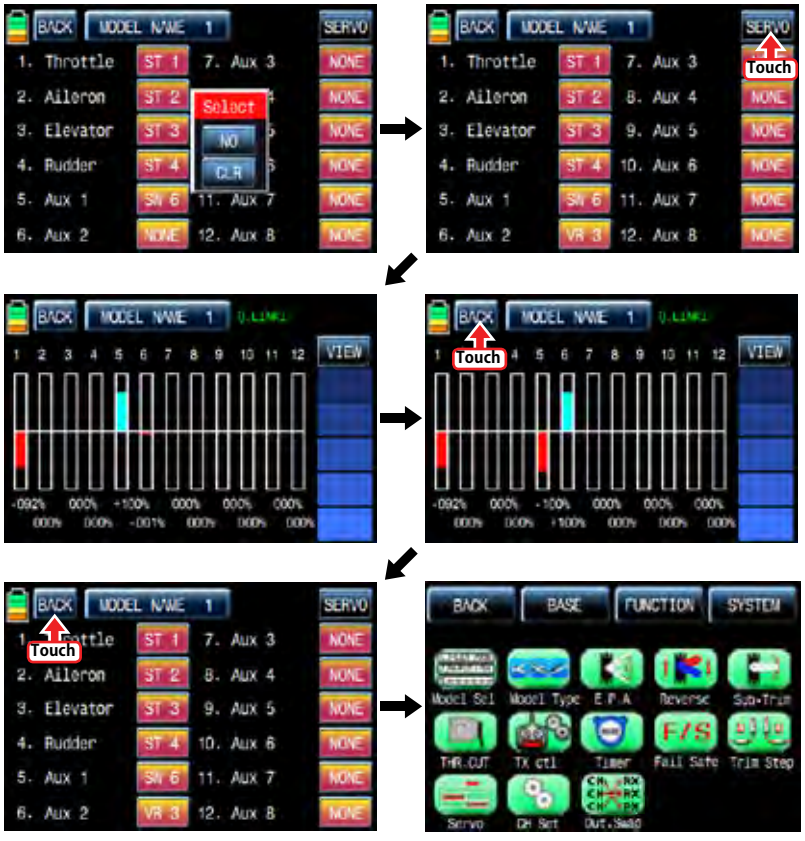
It is used to test a servo and check the servo movement in a graph. You are able to test the servo movement from 0.5sec to 5 sec with your choice. Touch “Servo” icon in the base page to call the servo setup page. In the servo setup page, the servo movement of every 12 channels is displayed in graph and figure when transmitter is operated. Touch “View” icon in the right bottom to call “Test” function page. Touch “Off” icon in the right bottom then “Off” is changed to “On” and then “Test” function is activated. During the operation of “Test” function, touch “0.5s” icon to activate in blue. With INC and DEC buttons, you may select from 0.5sce to 5sec of operation speed. Touch “ON” icon to change to “OFF” then “Test” function is terminated. When “TEST” icon is touched, you may return VIEW function page.





12. CH Set

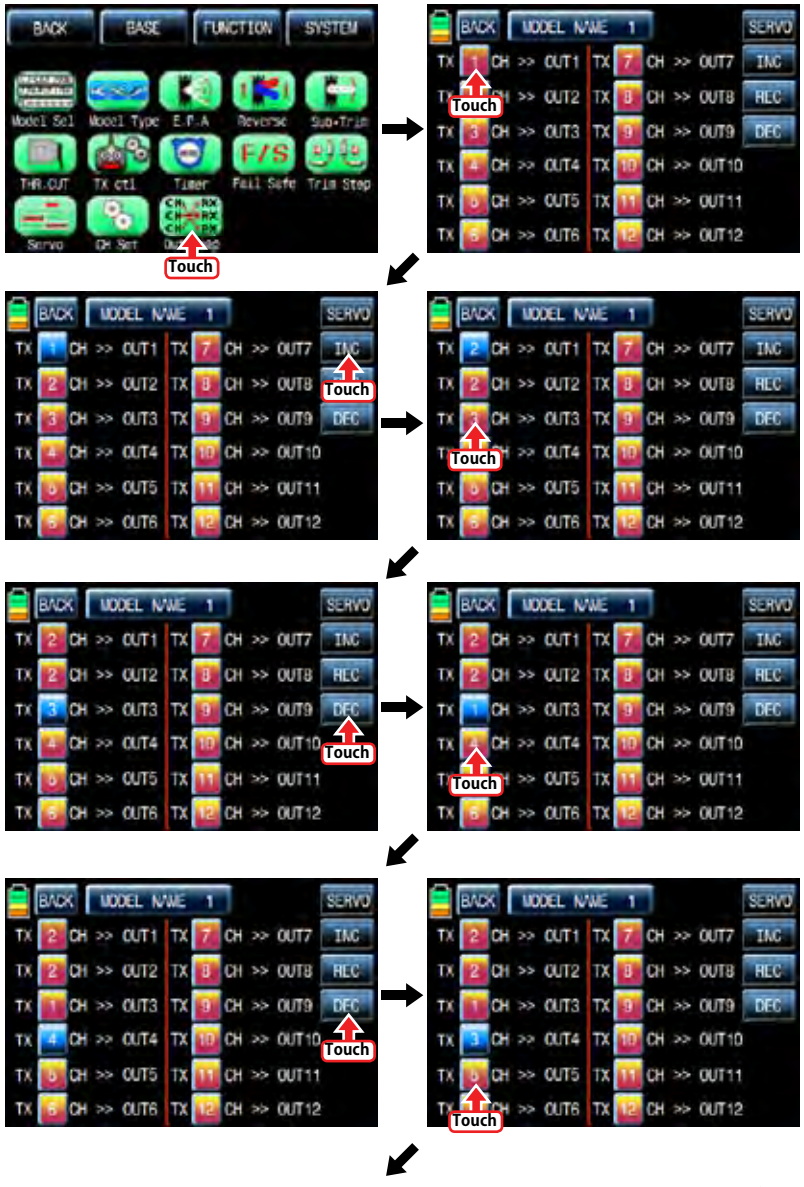
It is used to set the channel of a transmitter. The basic setup of the transmitter's channel is set differently depending on 3 different types ("model type", "wing type", and "swash type") and mz-12 offers AUX channel to set the switch, volume, and side lever for your purpose. Touch "CH set" icon on base menu page to call to "CH set" setup page. In "Ch Set" setup page, the basic functions of the transmitter which is connected individually to every channel are displayed. AUX channels are displayed as NONE when they are not connected to a servo. To connect AUX channel to a servo, touch "NONE" icon to call the "select" message popup and move the switch, volume or side lever with your choice then the selected switch, volume or side lever is set to AUX channel and the connected servo is controlled. Touch "SERVO" icon on the right to call the "SERVO VIEW" page, you may check the operating status of servo connected AUX channel in this page. Touch "BACK" icon to return the previous page.

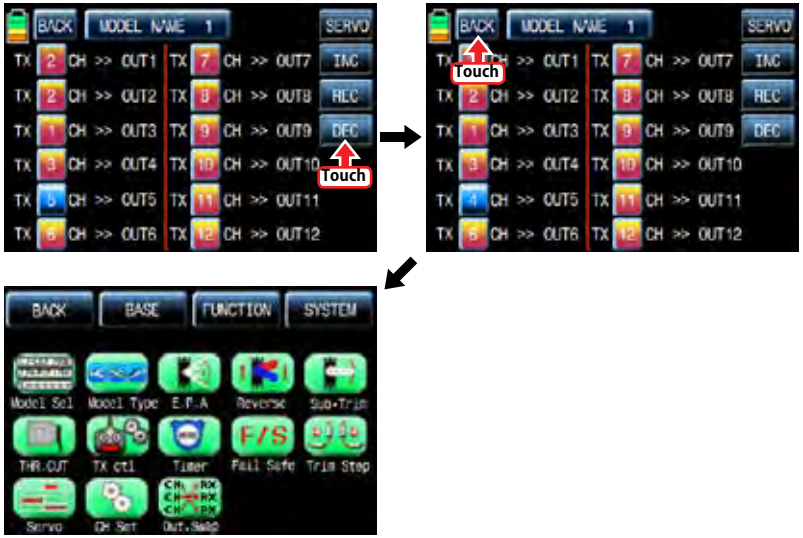


13. Out Swap

This function is used to edit the channel connection between transmitter and receiver. (It is similar to TX OUT SET function in TX ctl, but Out Swap function is operated without transmitting the setup data to a receiver unlike TX OUT SER function. Even if receiver channels are more than transmitter channels, you are able to set receiver channel in “TX OUT SET” function, but “Out Swap” function allows you to edit only twelve channels connected to the transmitter.)

In base menu page, touch “Out.Swap” icon to call “Out. Swap” setup page. The channel order of transmitter is set as the same as the order of receiver. Touch the channel number to activate in blue and decide the desired channel number with “INC” and “DEC” button. Every channel is set in the same way. After setup, touch “BACK” icon to return to the base menu page.



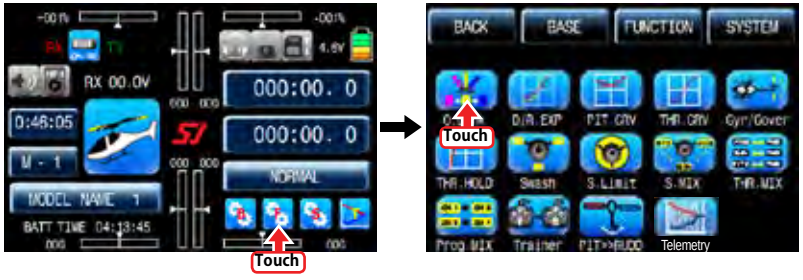


FUNCTION MENU (Helicopter)

1. Q.LINK

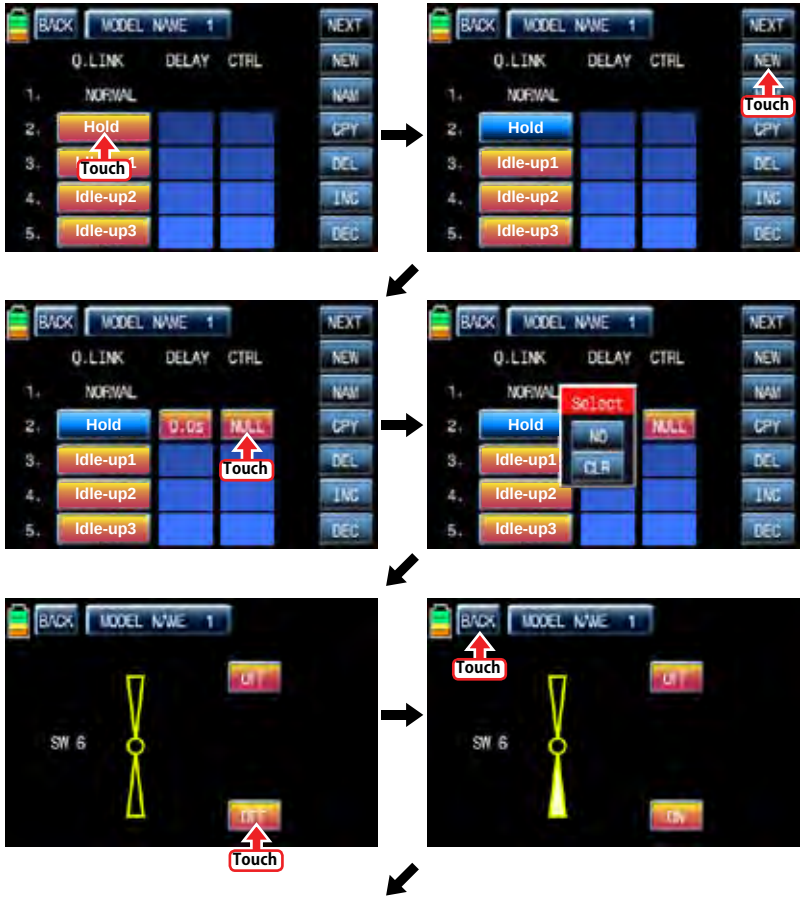
This function is used to set Q.LINK and assign the corresponding switch to cope with the un-expected trouble situation. Since the adjusted value is activated by moving the switch and you can cope with the crisis with just one switch. It makes you operating the flight much easier. Q.LINK for helicopter type consists of 6 types. (NORMAL, HOLD, IDEL UP1, IDEL UP2, IDEL UP3, Q. link5) Normal type is set as a default value.

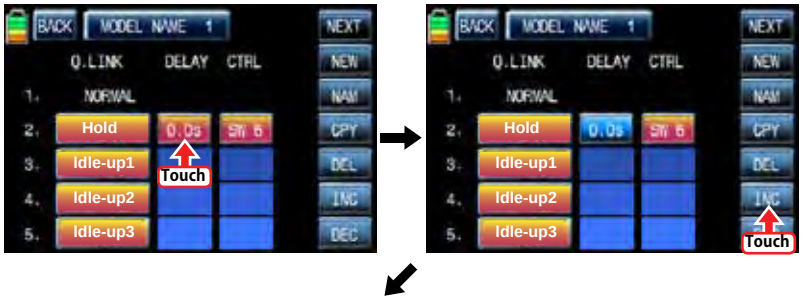
In the transmitter main page, touch “Function” icon to call the Function page and touch “Q.LINK” icon to call Q.LINK setup page. Q.LINK list is displayed. “1.NORMAL” is the default value and it cannot be changed.



1-1 NEW

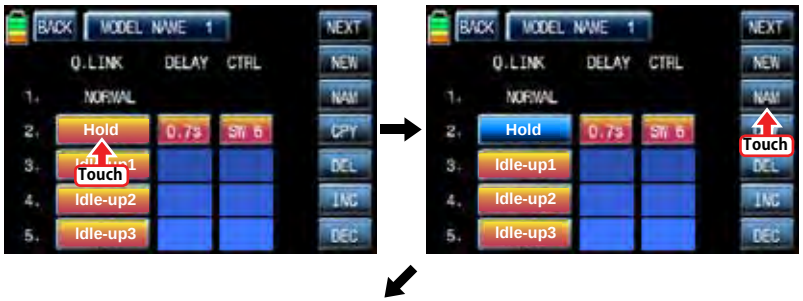
This function is used when you wish to create new Q.LINK. If you may want to set for new Q.LINK, touch the value in “Q.LINK” line to activate it in blue and touch “NEW” icon in the right to call “CTRL” and “DELAY” options. In “CTRL” setup, touch “NULL” icon to call “Select” message popup and move the switch or stick with your choice then the switch or stick is set to Q.LINK switch. To set “DELAY” function, touch “0.0s” icon to activate in blue and set the delay time with “INC” and “DEC” buttons. DELAY indicates the time till Q.LINK start to work after Q.LINK is switched on

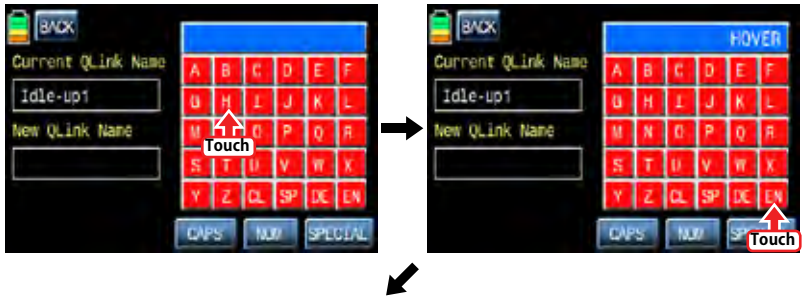




1-2 NAM

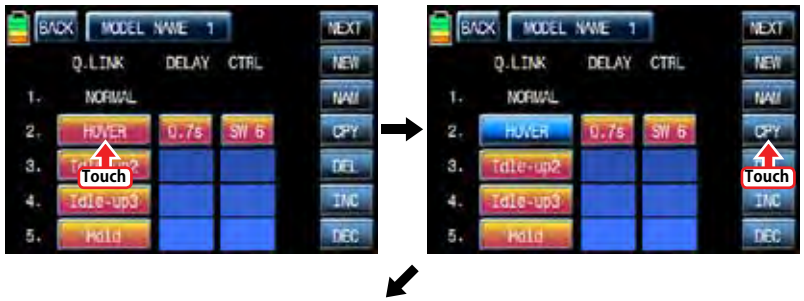
It is used when to revise the name of “Q.LINK”. Touch the target value in “Q.LINK” to activate in blue. Now touch “NAM” icon to call NAM setup page. In the page, enter the desired name using the keypad. After that, touch “EN” icon then the revised name is displayed in “New Q.LINK Name”. Now, touch “BACK” icon on the left top left to call “Q.LINK” setup page and the revised name is stored at the corresponding Q.LINK.





1-3 CPY

CPY function is used to copy the preset Q.LINK setup data into another Q.LINK. Touch the desired entry in “Q.LINK” line to activate in blue. Touch “CPY” icon to call “COPY” message popup. Touch the entry in TARGET then all entry in TARGET are displayed in turn. Now, select the desired Q.LINK entry and touch “YES” icon then the preset data is saved into the selected Q.LINK entry and return to Q.LINK setup page.

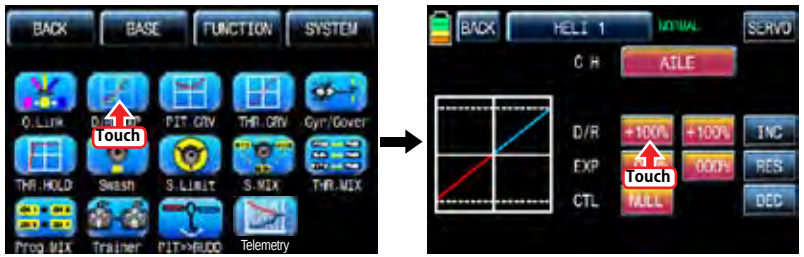


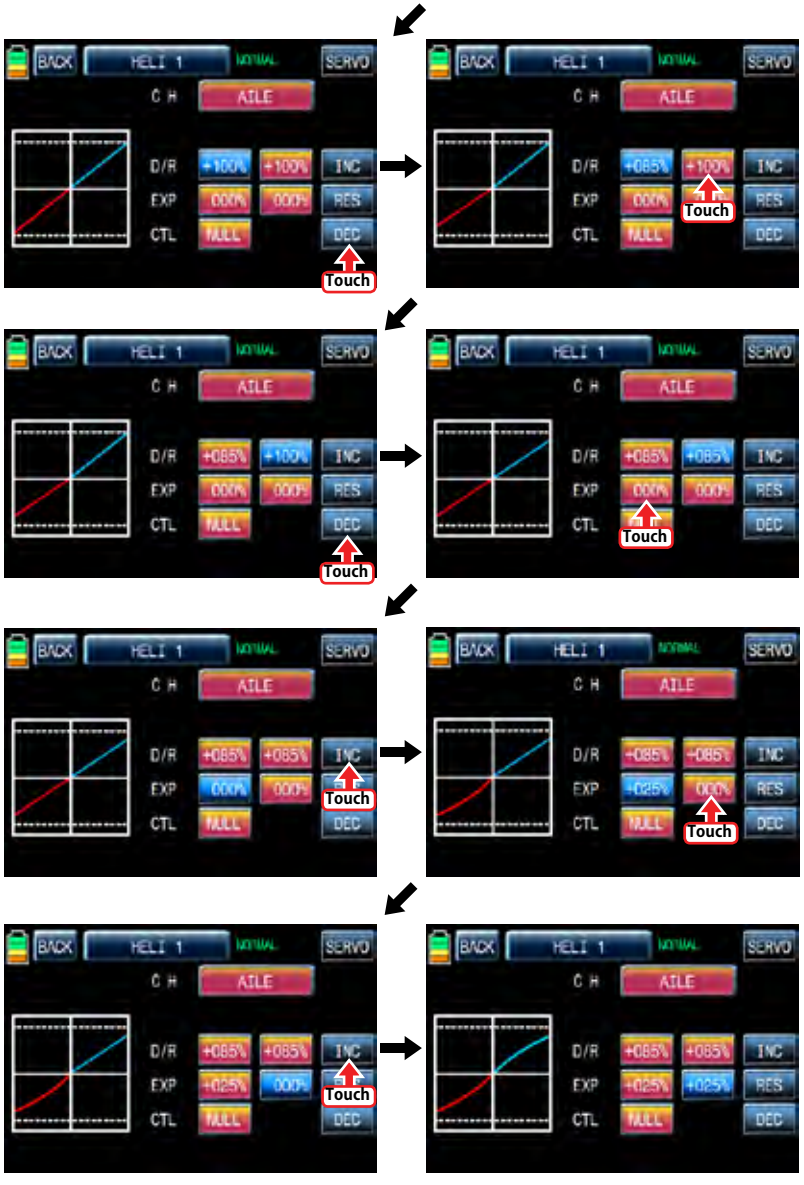
1-4 Del

It is used to delete the unused Q.LINK. Touch the entry in Q.LINIK line that you want to delete to activate in blue and touch “DEL” icon. Now, the selected Q.LINK entry is deleted in Q.LINK list. If you touch “NEXT” icon, you may call the next page

2. D/R, EXP

D/R function is used to adjust the operation range of servos that is connected to all channels including aileron, elevator and rudder channels. You can assign them to numerous switches and sticks EXP function is used to set D/R function to aileron, elevator and rudder channels and adjust the sensitivity of natural position of every channel. Positive Exponential reduces the control sensitivity of neutral position for more precise control and negative exponential increase the control sensitivity of neutral position D/R, EXP function can be operated with the assigned switch or connected to Q.LINK for purpose In the function page, touch “D/R, EXP” icon to call D/R, EXP setup page. Touch D/R or EXP icon to activate in blue and perform D/R or EXP programming setup with “INC” and “DEC”.

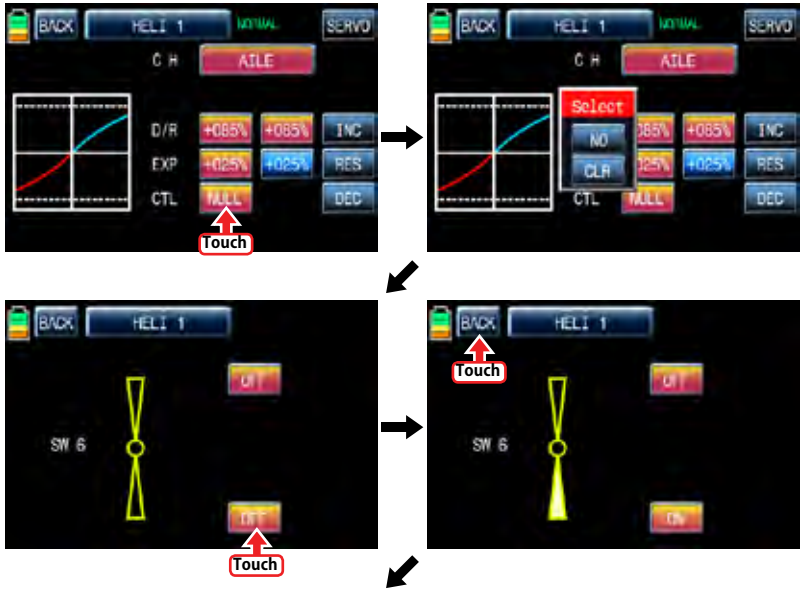


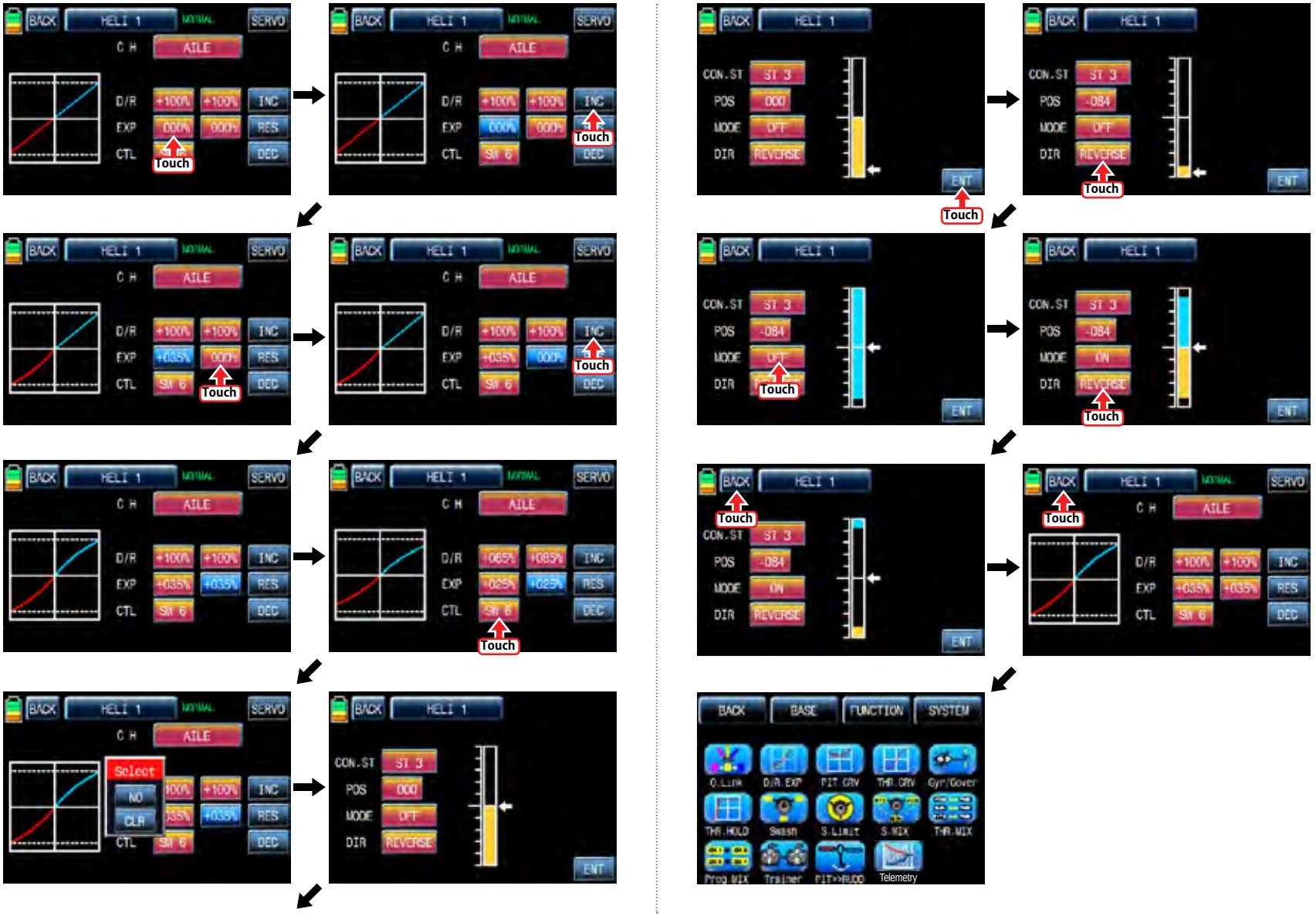


After “D/R”, “EXP” setup, perform CTL setup. It is used to assign the switch to D/R, EXP function Touch “NULL” icon in CTL line to call “Select” message popup and move the switch that you want to use then that switch is set on/ off to switch and the switch direction setup page appears. You may select ON or OFF by touching icons. When the switch is moved to the direction of ON, the function is operated. Touch “Back” icon to return D/R, EXP setup page. When D/R, EXP switch is off, D/R, EX is returned to the default setup.

If you want to use stick instead of switch for “D/R”, “EXP” function, Touch SW6 in CTL line to call “Select” message popup and move the stick with your choice then that stick is selected as on/ off stick and the stick direction setup page appears. In the direction setup page, move the stick to the “ON” position that you can comfortably reach, when the stick reach this position, D/R, EXP function is off. Touch “ENT” icon on the right bottom then the designated position is marked with the red or blue bar in the graph and the value of set position is displayed in POS. If you touch REVERSE in “DIR” line, all setup is reversed.

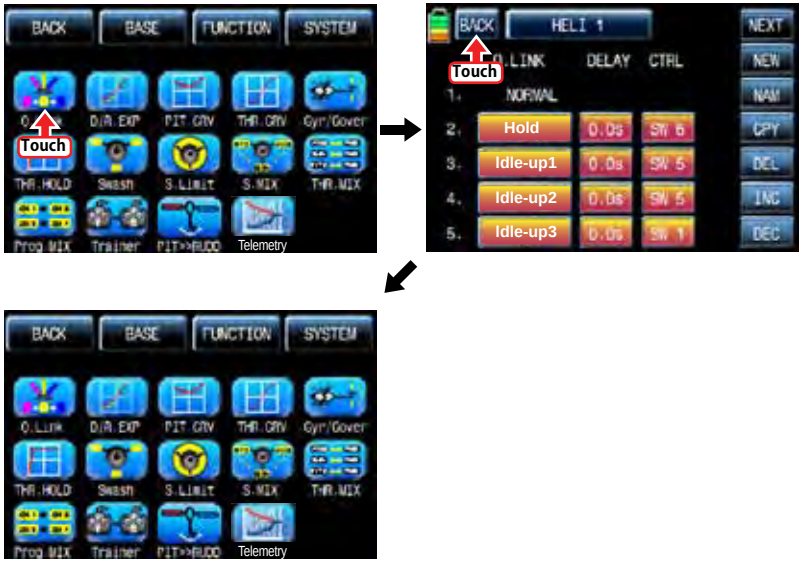
To set “ON” or “OFF” at the both end of stick operation range, touch “SINGLE” icon to change to “DUAL” then D/R, EXP function is on or off at the both end of stick operation range. You may set ELEV and RUDD channel in the same way. We recommend to set 5~12 channels to Q.LINK since they don’t have on/off setup in D/R, EXP. When the setting is completed, touch “BACK” icon to return the function page.



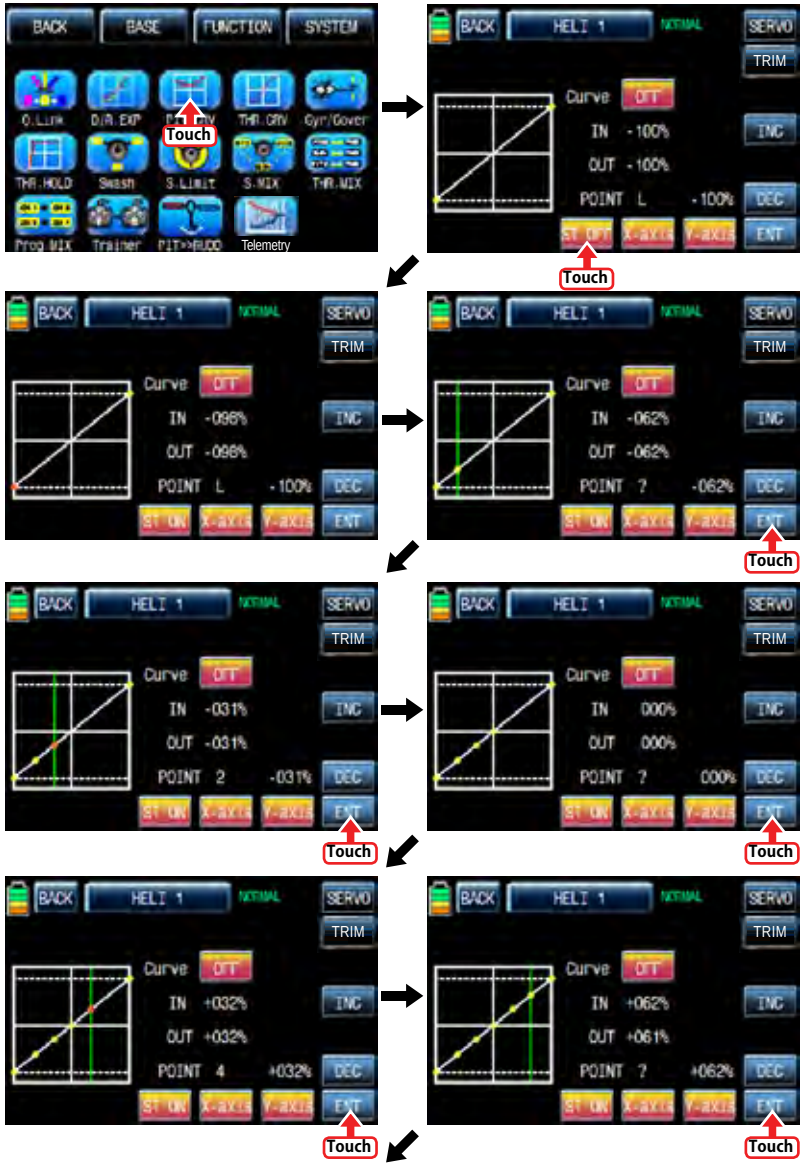

BACK
HELI 1
NORMAL
SERVO
C H
AILE
D/R
EXP
CTL
+100%
000%
+035%
INC
RES
DEC
SW 6
Touch
CON.ST
ST 3
POS
000
-084
MODE
OFT
ON
DIR
REVERSE
ENT
Select
NO
CLR
BASE
FUNCTION
SYSTEM
Q.Link
D/R.EXP
PIT.CRV
THR.CRV
Gyr/Gover
THR.HOLD
Swash
S.Limit
S.MIX
THR.MIX
Prog.MIX
Trainer
PIT>>RUDD
Telemetry

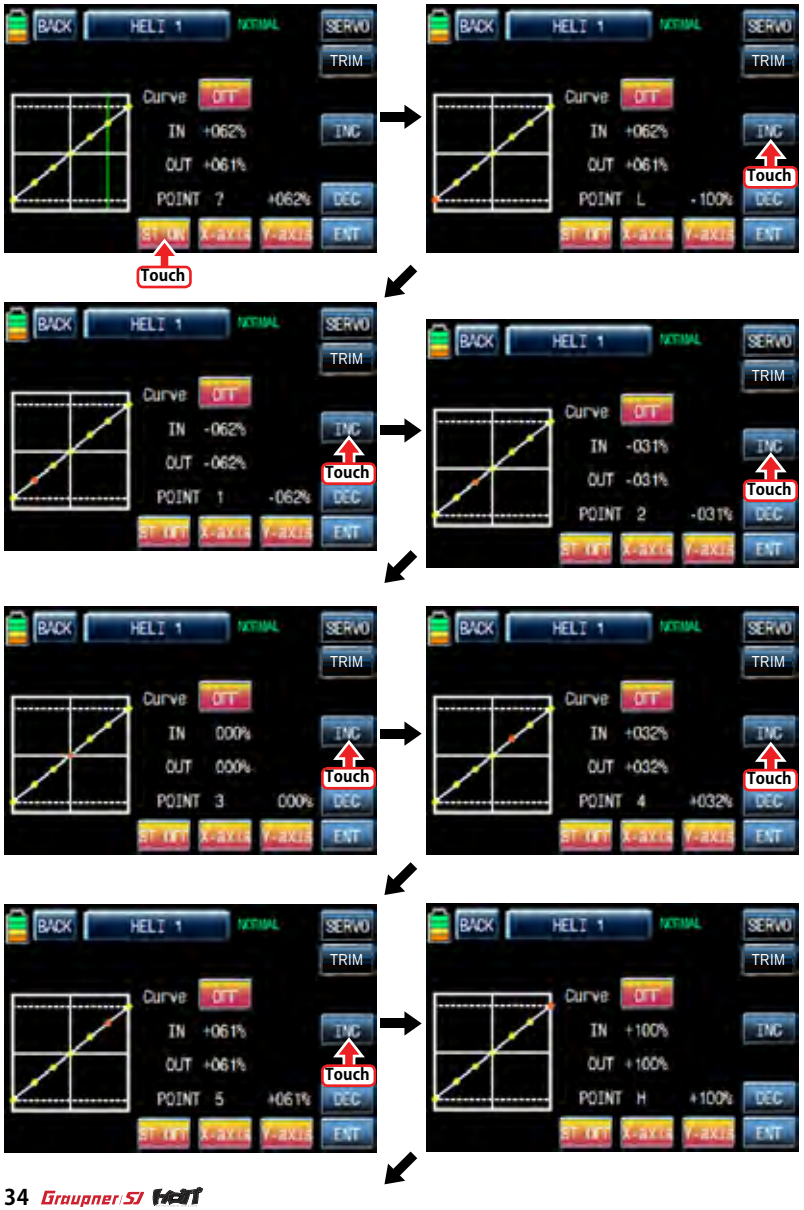
3. PIT.CRV

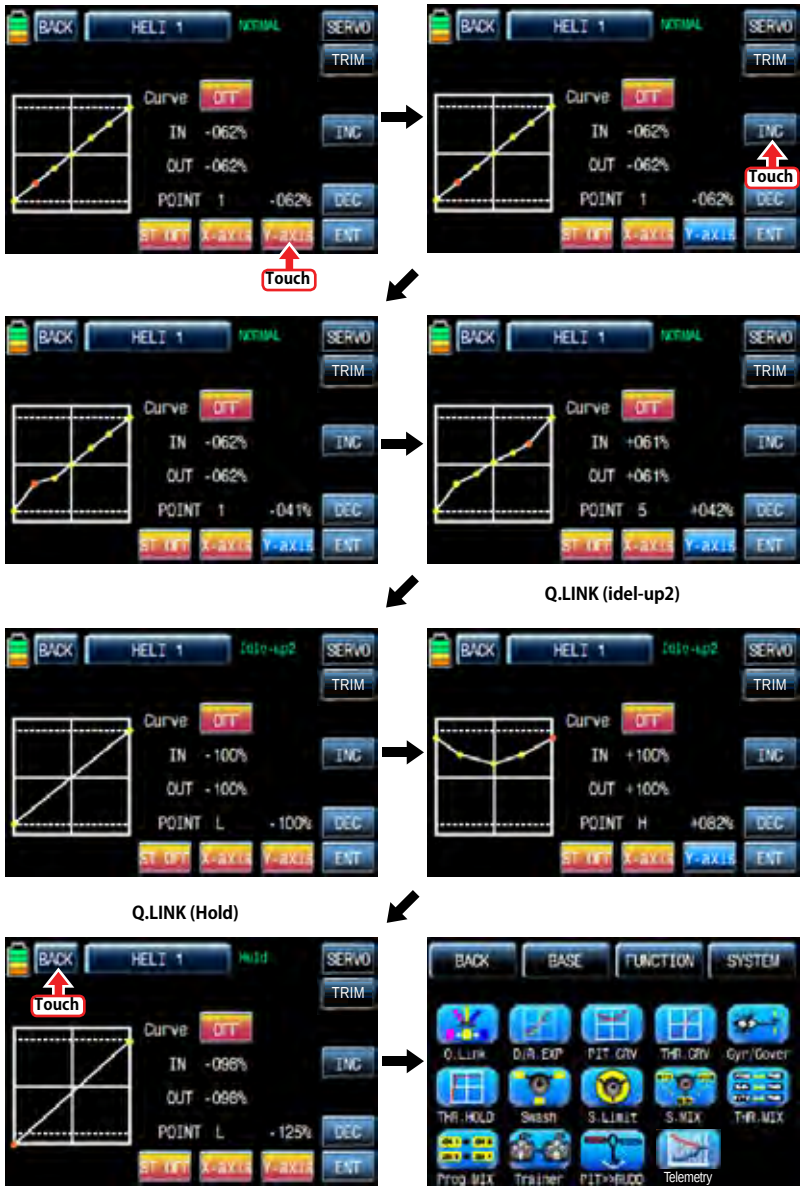
This function adjusts the pitch operation curve in relation to the movement of the throttle stick for each condition Since pitch curve is closely related with Q.LINK setup, Q.LINK setup should precede PIT.CRV setup. Call Q.LINK setup page and check Q.LINK setup is completed correctly and touch “BACK” icon to return FUNCTION page. (Refer to the manual on Q.LINK setup)



In FUNCTIOPN page, touch “PIT.CRV” icon to call PIT.CRV setup page. You need to mark the point on graph first and then adjust the operation curve with “DEC”, “INC”, X-axis and Y-axis buttons. Touch “ST OFF” to change to “ST ON” then the throttle position line appears on graph. Move throttle stick and place the line at the desired position between point “L” and “H” then touch “ENT” icon on the bottom right. Now the new point is marked in graph. You can mark five points between point “L” and “H” in the same way. Touch ST ON” to change to “ST OFF” and complete the point setup. Now touch “DEC” or “INC” button to select point and touch X-axis or Y-axis to activate and then touch DEC” or “INC” button to adjust the operation curve. Turn on the preset Q.LINK switch then you may adjust the operation curve of every Q.LINK as well.

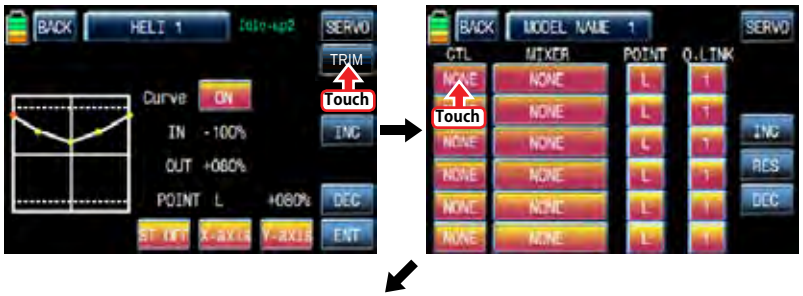


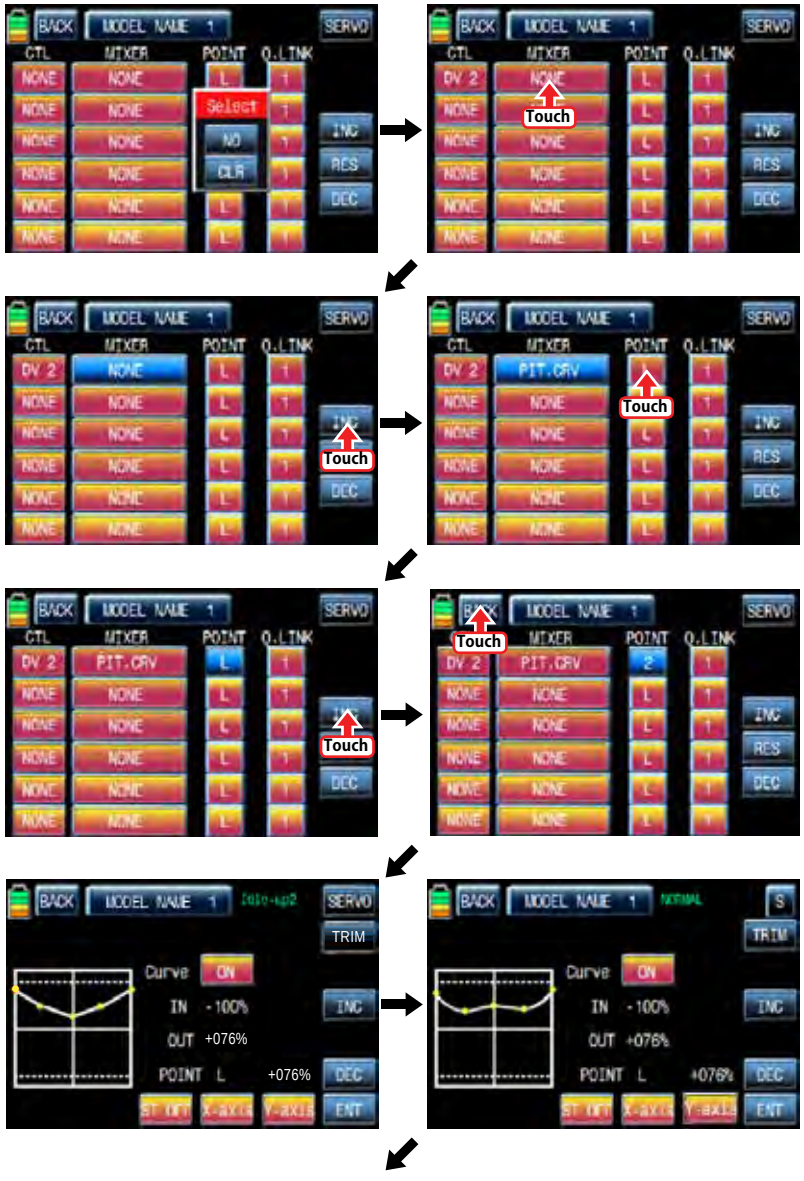

BACK
HELI 1
SERVO
TRIM
INC
DEC
ENT
Curve
OFT
IN +062%
OUT +061%
POINT 2 +062%
IN -062%
OUT -062%
POINT 1 -062%
IN -031%
OUT -031%
POINT 2 -031%
IN 000%
OUT 000%
POINT 3 000%
IN +032%
OUT +032%
POINT 4 +032%
IN +061%
OUT +061%
POINT 5 +061%
IN +100%
OUT +100%
POINT H +100%
POINT L -100%
Touch


BACK
HELI 1
SERVO
TRIM
INC
DEC
ENT
Curve
OFT
IN -062%
OUT -062%
POINT 1 -062%
IN -041%
POINT 1 -041%
IN +061%
OUT +061%
POINT 5 +042%
Idle-up2
IN -100%
OUT -100%
POINT L -100%
IN +100%
OUT +100%
POINT H +082%
Hold
IN -096%
OUT -096%
POINT L -125%
Touch
Q.LINK (idel-up2)
Q.LINK (Hold)
BASE
FUNCTION
SYSTEM
Q.Link
D/R EXP
PIT CRV
THR.CRV
Gyr/Gover
THR.HOLD
Swash
S.Limit
S.MIX
THR.MIX
Prog.MIX
Trainer
PIT>RUDD
Telemetry

If you touch OFF icon in Curve line, it is changed to ON and the operation curve is smoother. To set the pitch, throttle curve trim, touch “TRIM” icon in the top right to call the pitch, throttle curve trim setup page.

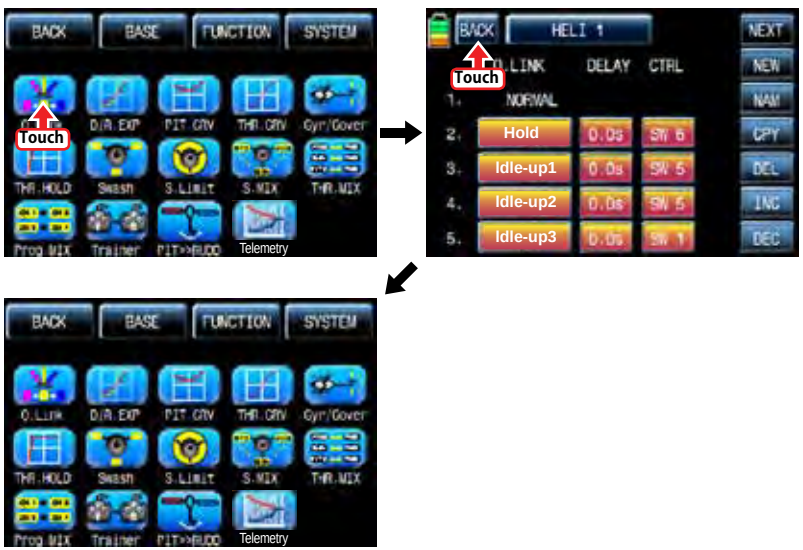
You may designate throttle curve key with DV1, DV2, DV3, DV4, SL1 and SL2 to set the section curve for the hovering in normal Q.Link and IDLE 1, IDEL 2 Q.Link.
Touch “NONE” icon in CTL line to call “Select” message popup then move the switch that you want to use then that switch is designated to the pitch, throttle curve trim switch. After CTL setup, touch and activate “NONE” icon in MIXER line to select the pitch curve or the throttle curve. Touch and activate “L” icon in POINT line to select the point number with INC and DEC buttons. Now, if you move the designated switch, the selected point follows the switch’s movement. After POINT setup, touch and activate the value, “1”, in Q.LINK line to set Q.LINK number then the pitch, throttle curve trim is activated within the setup Q.LINK. Touch “BACK” icon to return to FUNCTION page.



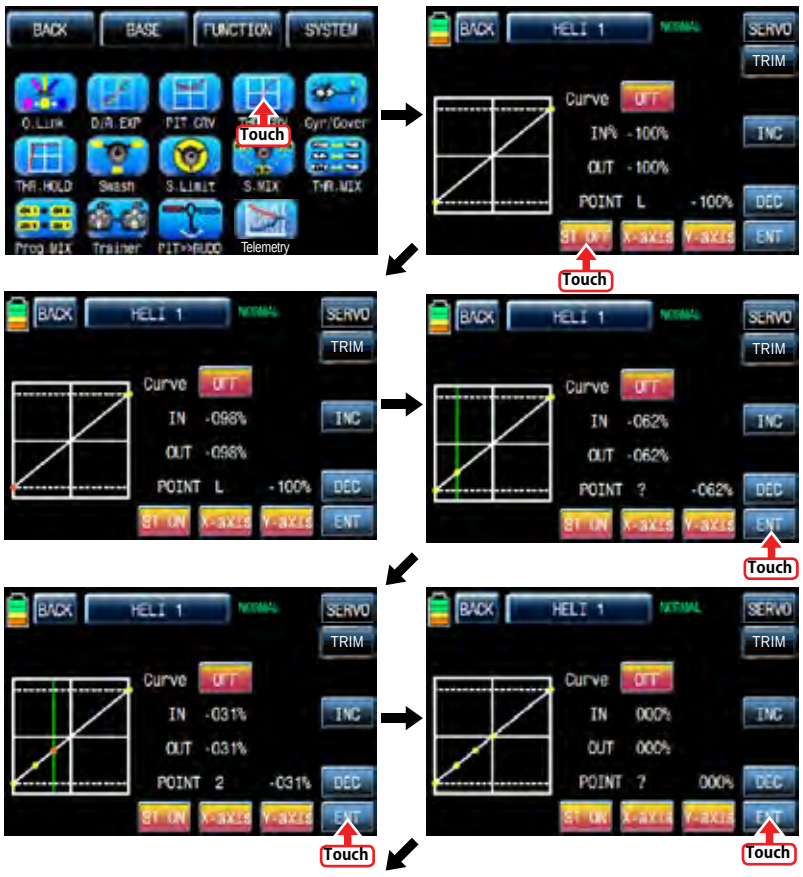


4. THR.CRV

This function adjusts the throttle operation curve in relation to the movement of the throttle stick for each condition Since the throttle curve is closely related with Q.LINK setup, Q.LINK setup should precede THR.CRV setup.
Call Q.LINK setup page and check Q.LINK setup is completed correctly and touch “BACK” icon to return FUNCTION page. (Refer to the manual on Q.LINK setup)

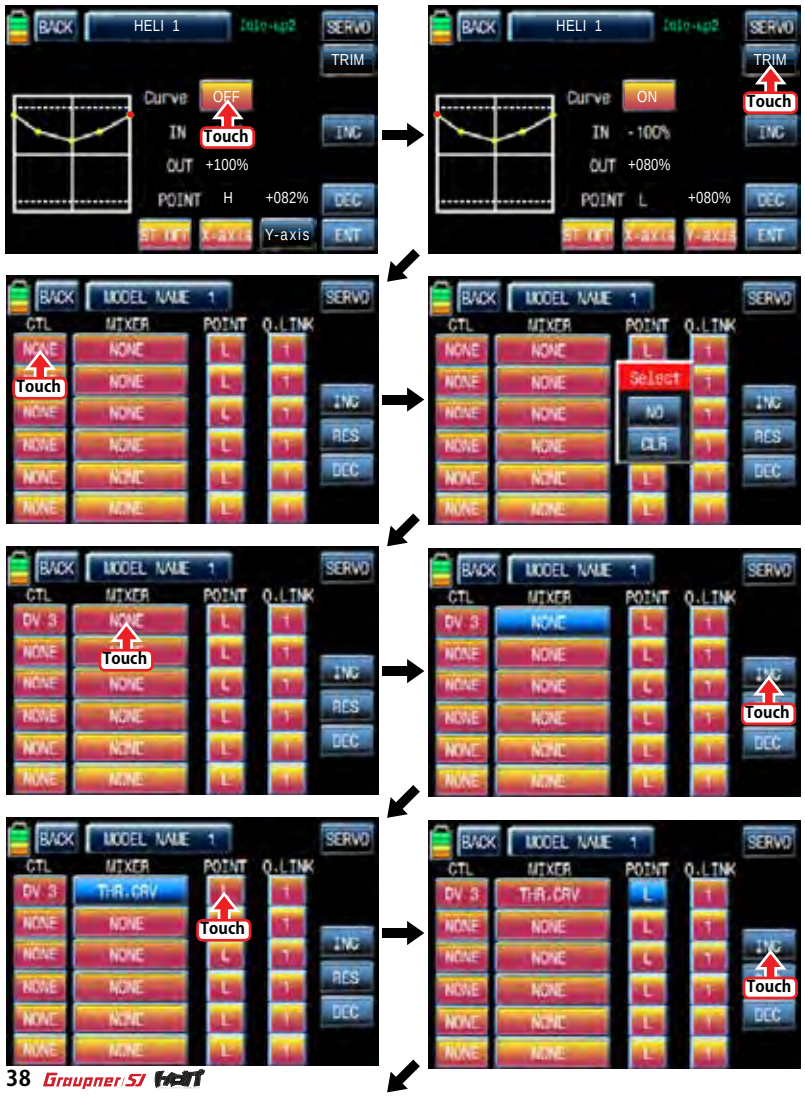


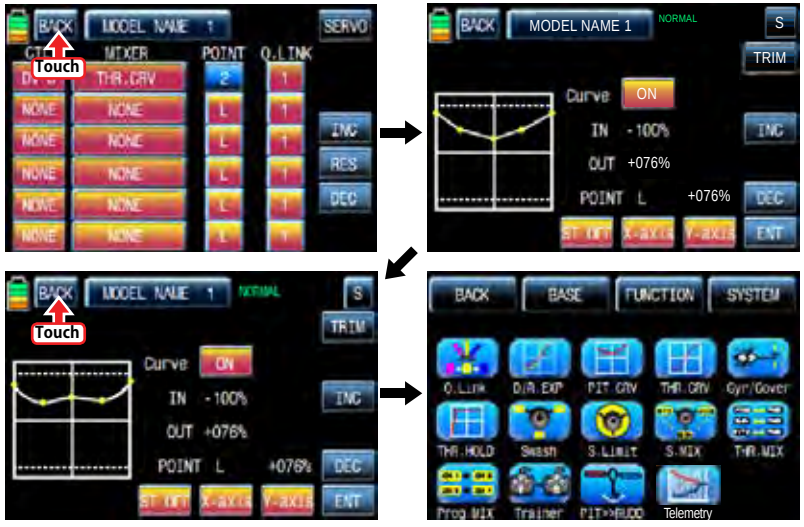
In FUNCTIOPN page, touch “THR.CRV” icon to call THR.CRV setup page. You need to mark the point on graph first and then adjust the operation curve with “DEC”, “INC”, X-axis and Y-axis buttons. Touch “ST OFF” to switch to “ST ON” then the throttle position line appears on graph. Move throttle stick and place the line at the desired position between point “L” and “H” then touch “ENT” icon on the bottom right. Now the new point is marked in graph. You can mark five points between point “L” and “H” in the same way. Touch ST ON” to switch to “ST OFF” and complete the point setup. Now touch “DEC” or “INC” button to select point and touch X-axis or Y-axis to activate and then touch DEC” or “INC” button to adjust the operation curve. Turn on the preset Q.LINK switch then you may adjust the operation curve of every Q.LINK as well.




BACK
HELI 1
NORMAL
SERVO
TRIM
INC
DEC
ENT
Curve
OFT
IN +032%
OUT +032%
POINT 4 +032%
ST ON
X-axis
Y-axis
Touch
IN +062%
OUT +061%
POINT 7 +062%
POINT L -100%
IN -062%
OUT -062%
POINT 1 -062%
POINT 1 -041%
IN +061%
OUT +061%
POINT 5 +042%
IN -031%
OUT -031%
POINT 2 -031%
Idle-up2
IN -100%
OUT -100%
POINT L -100%
IN +100%
OUT +100%
POINT H +082%
Hold
IN -098%
OUT -098%
POINT L -125%
BASE
FUNCTION
SYSTEM
Q.Link
D/R.EXP
PIT CRV
THR.CRV
Gyr/Gover
THR.HOLD
Swash
S.Limit
S.MIX
THR.MIX
Prog.MIX
Trainer
PIT>>RUDD
Telemetry

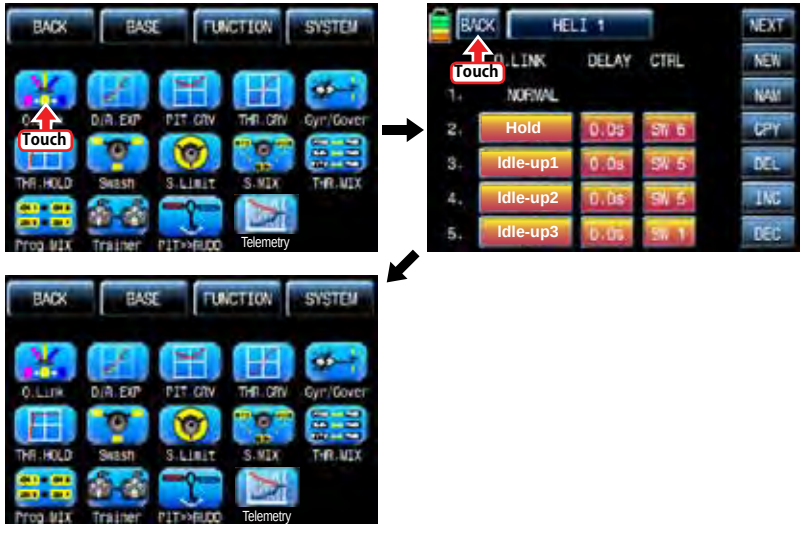
If you touch OFF icon in Curve line, it is changed to ON and the operation curve is smoother. You may set the pitch, throttle curve trim by touching “TRIM” icon in the top right. The setup method is explained at PIT.CRV





5. Gyr/Gover

This function is utilized to adjust the mixing of Gyro” and “Governor” for each condition. Since Gyr/Gover is closely related with Q.LINK setup, Q.LINK setup should precede Gyr/Gover setup.



Gyro Gain, Governor, Governor RATE, Gyro Suppression are available in this function

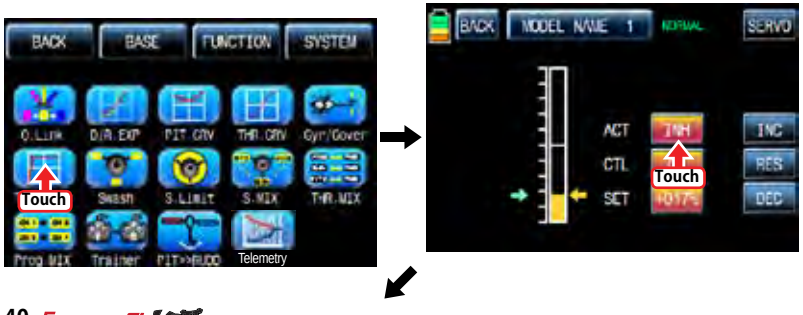
- Gyro Gain is used to adjust the sensitivity of gyro. “00%” is basically set and heading lock gyro is operated at over 40% of sensitivity. You may adjust sensitivity for each condition of Q.LINK.
- Governor ACT is used to select “INH” or “ON” for Governor function. The default value is “INH” and it should be set to “ON” to use Governor ACT by touching “INH” icon.
- Governor RATE is used to set the rate of Governor Function. You may adjust Governor “RATE” for each condition of Q.LINK.

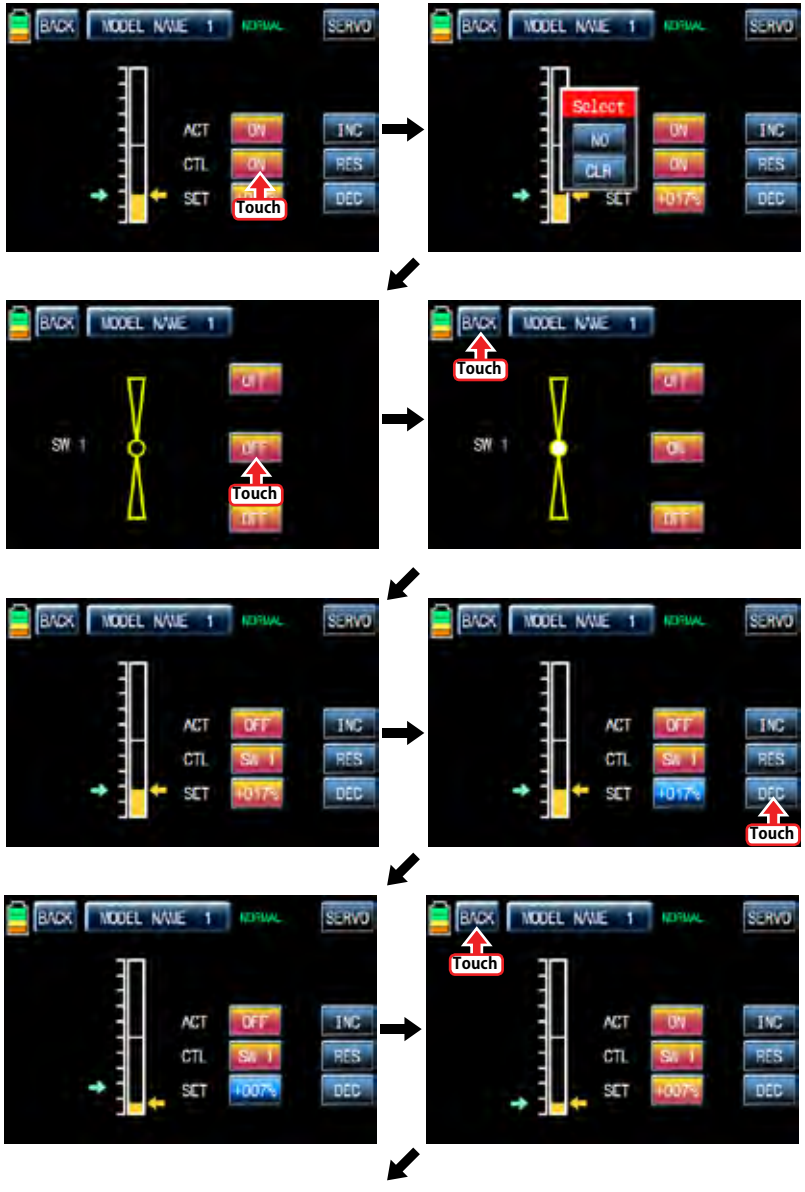
Touch “Gyr / Gover” icon to call the Gyr / Gover setup page. Touch the value in Gyro Gain to activate in blue then adjust the value with “INC” and “DEC” buttons. Touch “INH” icon in Governor ACT to switch it ON and then touch the value in Governor RATE to activate in blue. Adjust the function value with “INC” and “DEC” buttons. We recommend you to adjust Governor RATE for each condition of rotor RPM while a helicopter is hovering. Gyro Suppression function is used to offset Rudder by adjusting the value of Piezo gyro, it is not used when to use Head lock gyro Touch “BACK” icon on the left top to return FUNCTION page.

6. THR.HOLD

This function is for powering down an engine or motor using a designated switch. Throttle hold has higher authority than any other flight mode. When you activate THR.HOLD, the throttle channel is driven to its programmed value. It is usually used to turn off an engine or hold in idle position when helicopter's auto rotation flight

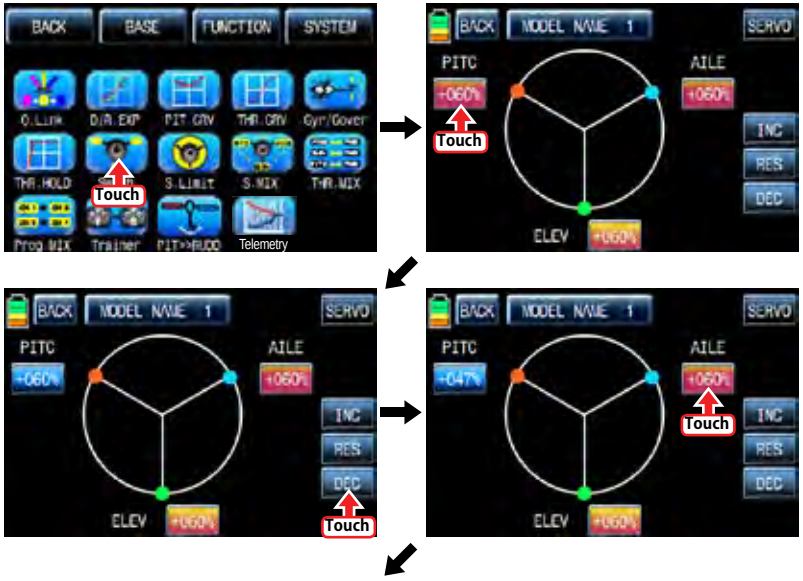
In function page, touch "THR.HOLD" icon to call "THR.HOLD" setup page. Touch "INT" icon in ACT line to switch it on and touch "NULL" icon in CTL line to call "Select" message popup. Move the switch with your choice then that switch is designated as on/ off switch and the switch direction setup page appears. You may select ON or OFF by touching icons. When the switch is moved to the direction of ON, the function is operated. Touch "BACK" icon to return to "THR.HOLD" setup page again. Touch the default value, 17%, to activate in blue and adjust it with "INC" and "DEC" buttons. The red arrow indicates the value for each value. When "THR.HOLD" function is on, the green arrow is positioned in the setup value. After setup, touch "BACK" icon to return FUNCTION page.

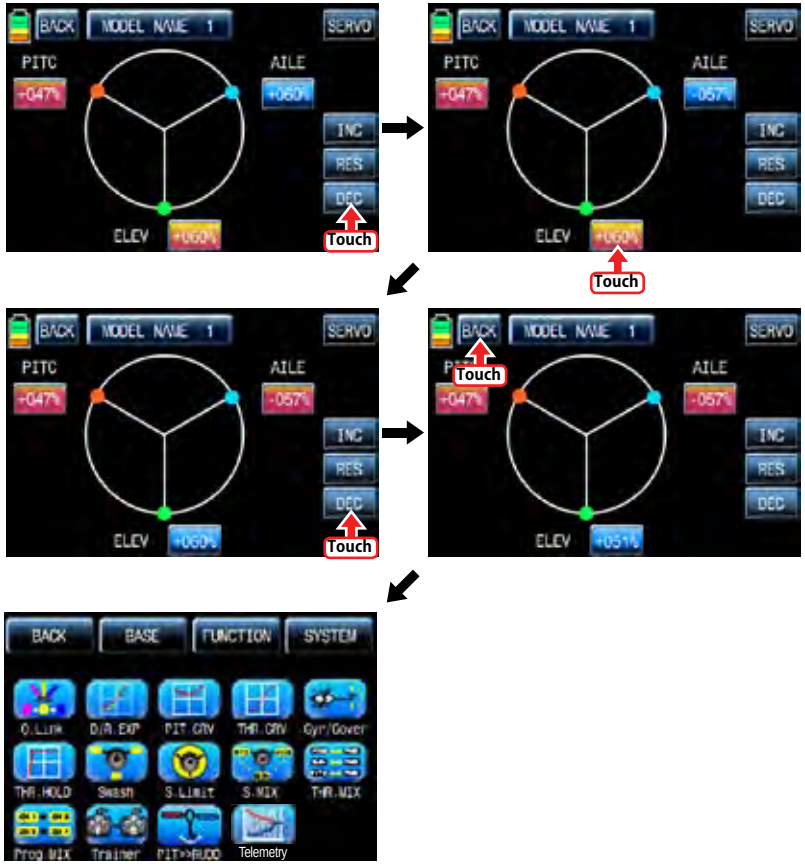




7. SWASH

The swash function supports adjustment of the travel amount and direction of the aileron, elevator and pitch in Helicopter mode. Bind a helicopter to a receiver and set the travel amount and direction of the swash channels desirably Touch “SWASH” icon to call “SWASH” setup page. When touching the values in PITC, AILE and ELEV, they are activated in blue. You may adjust the values with INC and DEC buttons. The default value is 60%. If the minus value is programmed, the travel direction of the swash channel is reversed. You may watch the servo operation by touching “ SERVO” icon in the right top. Touch “BACK” icon to return to the function page.





Graupner/SJ HoTT 41

8. S.Limt (Swash Limit)

It is used to have the channels of PITCH, AILE and ELEV operated for the circle movement of the stick and the channels of PITCH, AILE and EL have the travel limits according to the circle setup size. Servo EPA should be set over 100%, if the circle size is over 100%

The Swash rotation function in the bottom is used to make the swash that mz-12 doesn't support available by rotating the swash angle
In the Function page, touch "S.Limit" icon to call "S.Limit" setup page. Touch "INH" icon in "ACT" line to switch to "ON" then the default value, 100% sized circle appears.
Now, touch "100%" icon in SET line to activate in blue. Adjust the cirvle size with "INC" and "DEC" buttons. Touch "00'" icon in "Swash rotation" in the bottom to activate in blue then the swash angle is set with "INC" and "DEC" buttons. Touch "BACK" icon to return to "FUNCTION" page.

9. S.MIX (Swash mixing)

S.MIX typically corrects swash plate timing issues by mixing AILE>>ELEV, ELEV>>AILE, PITC>>AILE, PITC>>ELEV.
This function can be adjusted for each condition of Q.LINK.

AILE>>ELEV: It is used when a helicopter tends to be UP or DOWN while controlling aileron.
ELEV>>AILE: It is used when a helicopter tends to bank to left or right while controlling elevator.
PITC >>AILE: It is used when a helicopter tends to bank to left or right while controlling pitch.
PITC >>ELEV: It is used when a helicopter tends to be UP or DOWN while controlling pitch.

In function page, touch "S.MIX" icon to call S.MIX setup page. Touch "INH" icon in ACT line to switch to "ON" and touch >> icon to call the mixing setup page. Touch and activate the values in LEFT and RIGHT line and adjust the mixing value with "INC" and "DEC" buttons. The programmed values are indicated in the left graph. The soft or rough movement can be adjusted by touching the values in EXP line, (+) value will make it smoothly and (-) value will make it roughly. You may watch the servo operation by touching " SERVO" icon in the right top. Touch "BACK" icon to return to S.MIX setup page. Now, you need to set CTL function. Touch "On" icon to call "Select" message popup then move the switch with your choice then that switch is designated as on/ off switch and then the switch direction setup page appears. You may select ON or OFF by touching icons. When the switch is moved to the direction of ON, the function is operated. Touch "BACK" icon to return to S.MIX setup page and confirm the setup data. Touch "BACK" icon to return to FUNCTION page

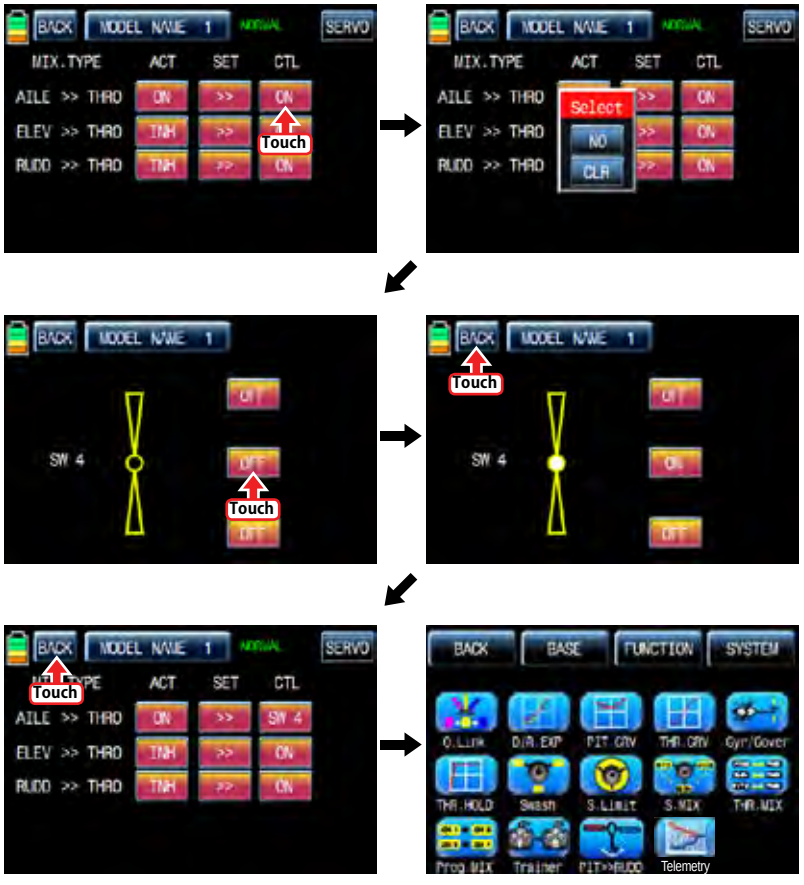

BACK
BASE
FUNCTION
SYSTEM
Q.Link
D/R.EXP
PIT CRV
THR.CRV
Gyr/Gover
THR.HOLD
Swash
S.Limit
THR.MIX
Prog.MIX
Trainer
PIT>RUDD
Telemetry
Touch
MODEL NAME 1
NORMAL
SERVO
MIX.TYPE
ACT
SET
CTL
AILE >> ELEV
ELEV >> AILE
PITC >> AILE
PITC >> ELEV
INH
ON
A
(RATE)
B
EXP
INC
RES
DEC
+020%
-013%
000%
+011%
Select
NO
CLR
SW 4
OFF

10. THR.MIX

THR.MIX function prevents RPM decay when PITCH, AILE and ELEV inputs are given. This mix advances the throttle position with mix control to maintain RPM. This function can be adjusted for each condition of Q.LINK and three types is available (AILE>>THRO, ELEV>>THRO, RUDD>>THRO)

AILE>>THRO: It can prevent RPM decay and maintain flight altitude of a helicopter while controlling aileron.
ELEV>>THRO: It can prevent RPM decay and maintain flight altitude of a helicopter while controlling elevator.
RUDD>>THRO: It can prevent RPM decay and maintain flight altitude of a helicopter when the rudder pitch is changed by controlling rudder

In FUNCTION page, touch “THR.MIX” icon to call THR.MIX setup page. Touch “INH” icon in ACT line to switch to “ON” and touch >> icon to call the mixing setup page. Touch and activate the values in LEFT and RIGHT line and adjust the mixing value with “INC” and “DEC” buttons. The programmed values are indicated in the left graph. You may watch the servo operation by touching “ SERVO” icon in the right top. Touch “BACK” icon to return to THR.MIX setup page. Now, you need to set CTL function. Touch “On” icon to call “Select” message popup then move the switch with your choice then that switch is designated as on/ off switch and then the switch direction setup page appears. You may select ON or OFF by touching icons. When the switch is moved to the direction of ON, the function is operated. Touch “BACK” icon to return to THR.MIX setup page then confirm the setup data. Touch “BACK” icon to return to FUNCTION page



11. Prog.MIX

Prog.MIX function is used to mix the different channels for diverse purpose. We recommend you to use the same “On” switch with the one of Q.LINK. You may set the different program mix function for each Q.LINK condition.
8 MIXs are available. The mixing method introduced here is divided into 2 type, liner mixing type and curve mixing type. 1~6 MIXs are liner mixing type and 7~9 MIX is curve mixing type. The curve mixing method is the same with the pitch, throttle curve setup as explained above

11-1. Liner mixing type

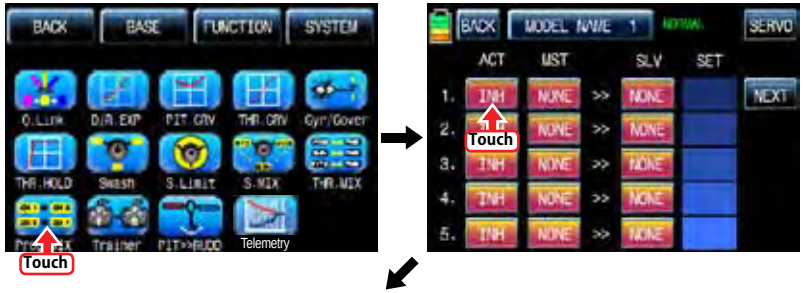
In FUNCTION page, touch “Prog.MIX” icon to call the prog.mix page. Touch “INH” icon in ACT line to switch to “ON” and touch “NONE” in MST line to call the mixing channel setup page. Touch and activate “NONE” icon and select the desired channel for the master by touching. Now, touch and activate the left “NONE” icon, it is for Slave channel, and select the desired channel for the slave by touching. Touch “BACK” icon to return to Prog.MIX setup page. Touch >> icon in SET line to call the program mixing setup page. Now, you need to set CTL function.

- CTL setup with a switch

Touch “NULL” icon in CTL line to call “Select” message popup then move the switch with your choice then that switch is designated as on/ off switch and then the switch direction setup page appears. You may select ON or OFF by touching icons. When the switch is moved to the direction of ON, the function is operated. Touch “BACK” icon to return to Prog.MIX setup page.

- CTL setup with a stick

Touch “SW6” icon in CTL line to call “Select” message popup then move the stick with your choice then that stick is designated as on/ off stick and then the stick direction setup page appears. Move the stick to the position that you can comfortably reach, when the stick reach this position, Prog.MIX function is off. Touch “ENT” icon on the right bottom then the designated position is marked with the red or blue bar in the graph and the value of set position is displayed in POS. If you touch REVERSE in “DIR” line, all setup is reversed. To set “ON” or “OFF” at the both end of stick operation range, touch “SINGLE” icon to switch to “DUAL” then Prog.MIX function is on or off at the both end of stick operation range. Touch “BACK” icon to return to the program mixing setup page.
After CTL setup, you need to set the program mix operation value. Since the throttle channel is designated to the master channel, the operation value is displayed in A and B. Touch and activate the values in blue to adjust the value with “DEC” and “INC” buttons, the setup value is displayed in graph. OFFSET X/Y can be set in the same method and the setup value is displayed as well.




BACK
MODEL NAME 1
NORMAL
SERVO
ACT
MST
SLV
SET
NEXT
Touch
NONE
CH1
CH2
CH3
CH4
CLR
CH5
CH6
CH7
CH8
CH9
CH10
CH11
CH12
SW 1
OFF
ON
CH3 >> CH2
ACT
CTL
A
B
OFFSET X
OFFSET Y
INC
RES
DEC
Select
NO
CLR
HELI 1
CON.ST
POS
MODE
DIR
REVERSE
ENT


BACK
HELI 1
CON.ST
ST 3
POS
-084
MODE
ON
DIR
REVERSE
ENT
Touch
MODEL NAME 1
NORMAL
SERVO
CH3 >> CH2
ACT
CTL
OFF
A
B
ST 3
INC
OFFSET X
OFFSET Y
000%
RES
DEC
+050%
+035%
SW 1
BASE
FUNCTION
SYSTEM
Q.Link
D/R.EXP
PIT.CRV
THR.CRV
Gyr/Gover
THR.HOLD
Swash
S.Limit
S.MIX
THR.MIX
Prog.MIX
Trainer
PIT>RUDD
Telemetry

11-2. Curve mixing type

In the prog.mix page, touch “NEXT” icon to call the next page and touch “INH” icon in the cross line of NO7 and ACT to switch to “ON”. Touch “NONE” in MST line to access the channel selection page and touch and activate “NONE” icon to select the desired channel of MST and SLV. Touch “BACK” icon to return to the prog.mix page. Touch “>>” icon to call the program mixing setup page. Now, you need to set CTL function.

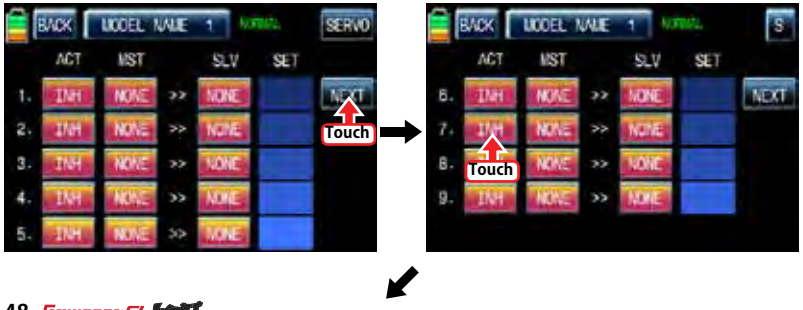
- CTL setup with a switch

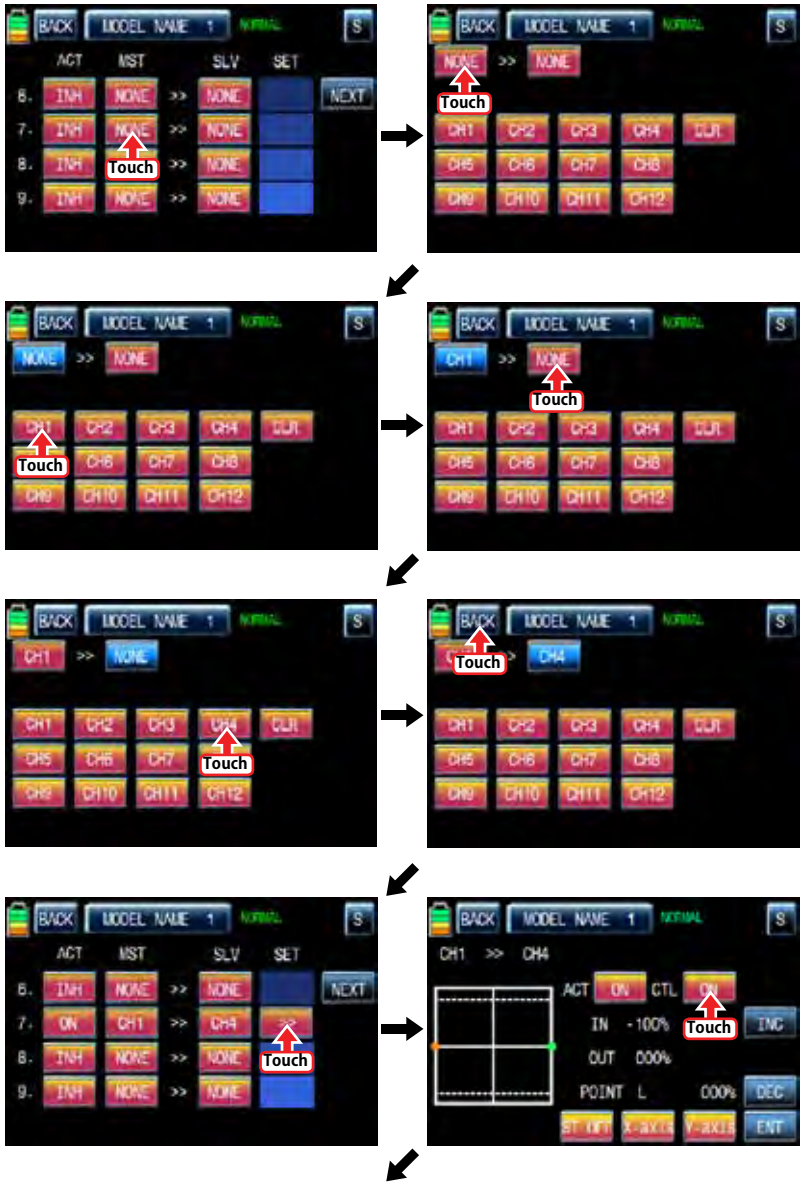
Touch “ON” icon in CTL line to call “Select” message popup then move the switch with your choice then that switch is designated as on/ off switch and then the switch direction setup page appears. You may select ON or OFF by touching icons. When the switch is moved to the direction of ON, the function is operated. Touch “BACK” icon to return to the program mixing setup page.

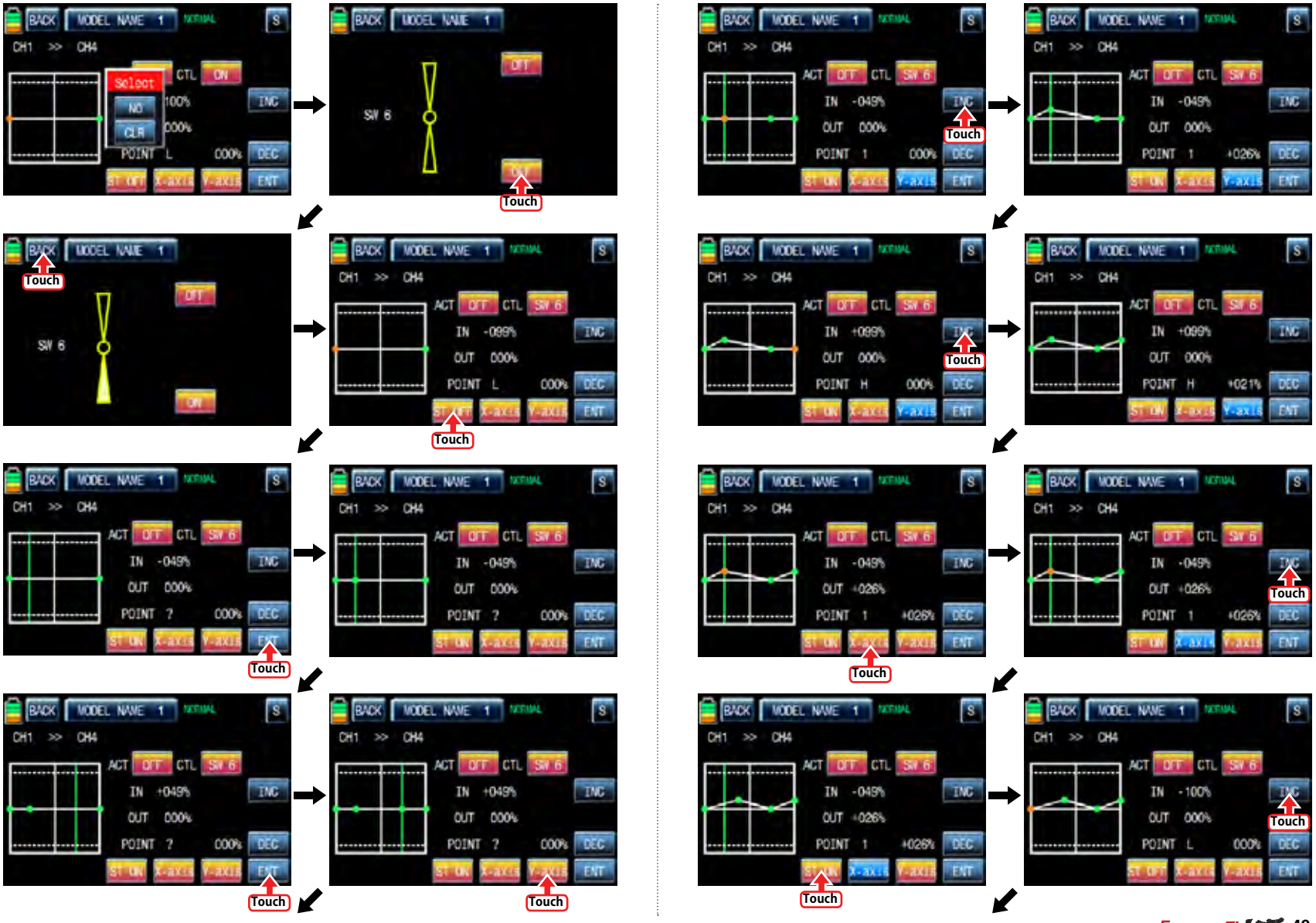
- CTL setup with a stick

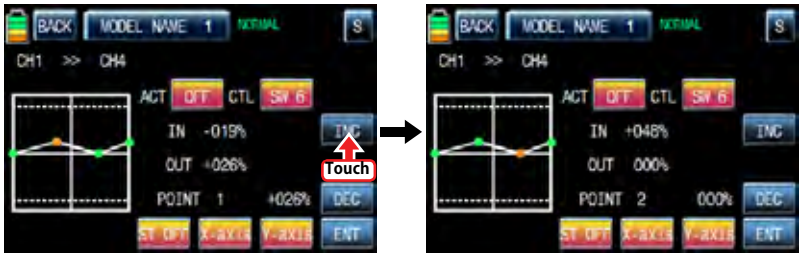
Hoping that you would refer the explanation as explained above

Here, you need to set the operation value, “L” and “H” points are set by default and you need to mark 5 points between “L” and “H” on graph first and then adjust the operation curve with “DEC”, “INC”, X-axis and Y-axis buttons. Touch “ST OFF” icon to switch to “ST ON” then the blue line appears on graph. Move the designated switch or stick to place the line at the desired position then touch “ENT” icon on the bottom right. Now the new point is marked in graph. You may set five points in your favorable position.
Touch “PITT >> RUDD” icon in the function page to call PIT >> RUDD setup page. You need to mark the point on graph first and then adjust the operation curve with “DEC”, “INC”, X-axis and Y-axis buttons. Touch “ST OFF” icon to switch to “ST ON” then the pitch position line appears on graph. Move throttle stick and place the line at the desired position between point “L” and “H” then touch “ENT” icon on the bottom right. Now the new point is marked in graph. Touch ST ON” to switch to “ST OFF” and complete the point setup. Now touch “DEC” or “INC” button to select point and touch X-axis or Y-axis to activate and then touch DEC” or “INC” button to adjust the operation curve.





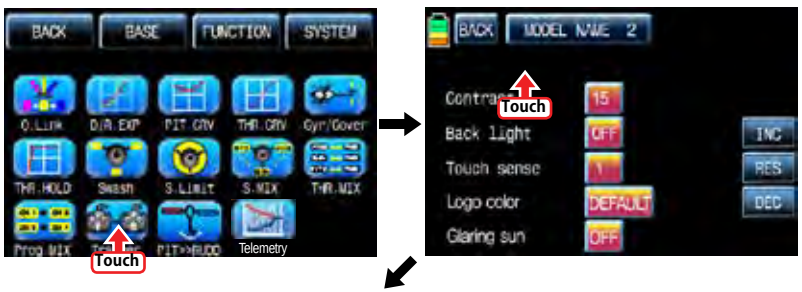

BACK
MODEL NAME 1
NORMAL
S
CH1 >> CH4
Select
NO
CLR
CTL
ON
OFF
SW 6
INC
DEC
ENT
ACT
IN
OUT
POINT
Touch

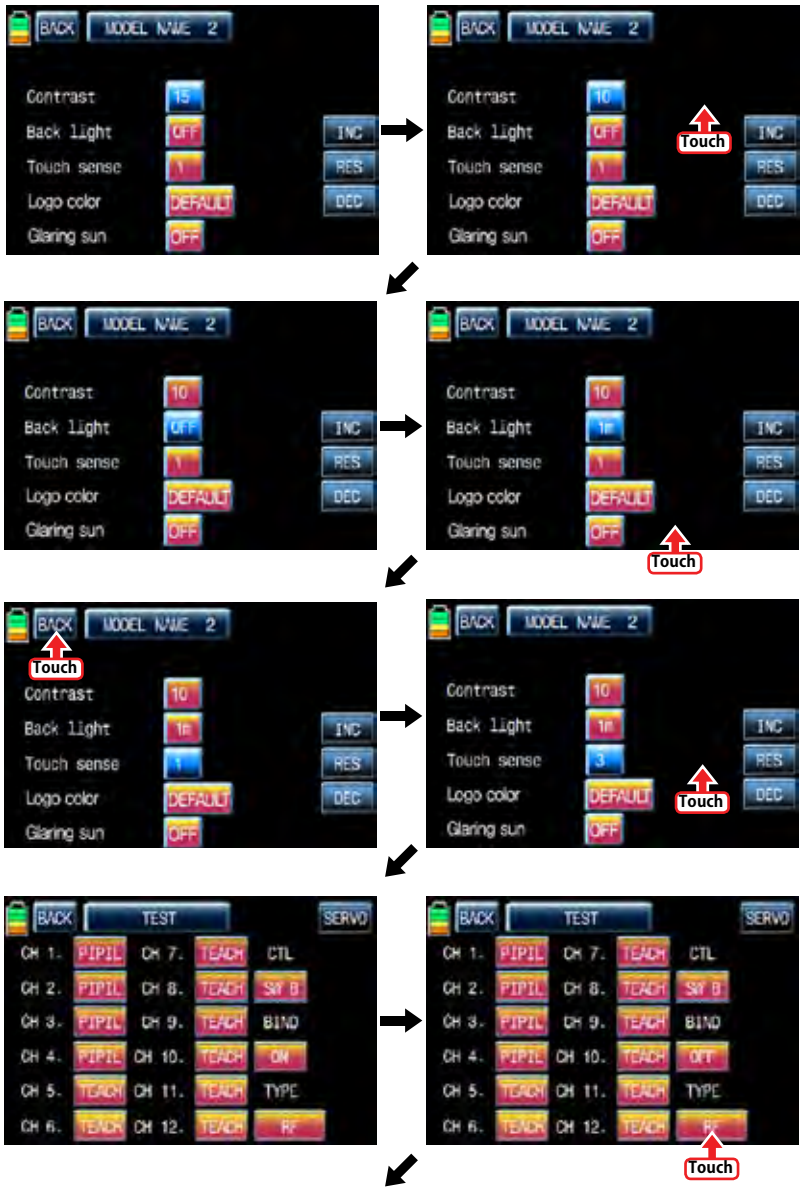


12. Trainer (Helicopter, Airplane, Gilder)

mz-12 features a programmable trainer function. Two transmitters must be connected by Wireless or an optional DSC code. This function makes it possible for the instructor to choose which functions and channels are to be used for instruction.
In FUNCTION page, touch “Trainer” icon to call the trainer setup page. The default value, TEACH, is set in all channels which means that this transmitter is Teacher transmitter. If touching TEACH icon, it is switched to PUPIL.
Assigned the desired channel to Pupil transmitter by touching “TEACH” icon to switch to PUPIL and touch “NULL” icon in CTL line to call “Select” message popup. Move the switch with your choice then that switch is designated as on/ off switch, but we recommend to use S8 as the trainer switch. When the switch direction setup page appears, you may select ON or OFF by touching icons. When the switch is moved to the direction of ON, the function is operated. Now, you need to bind teacher transmitter and pupil transmitter. Turn on pupil’s transmitter and receiver and touch “OFF” icon in BIND line to switch to ON then this transmitter is bound to pupil transmitter. Pupil transmitter can control the channels only if the trainer switch is on. You may select trainer type by touch the value in TYPE line.

- RF : Teacher and pupil transmitters are connected by wireless
- DSC T & S : When teacher and pupil transmitters are connected by optional DSC code, teacher transmitter should be set to DSC T and pupil transmitter should be set to DSC S



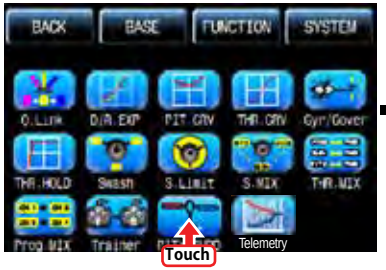


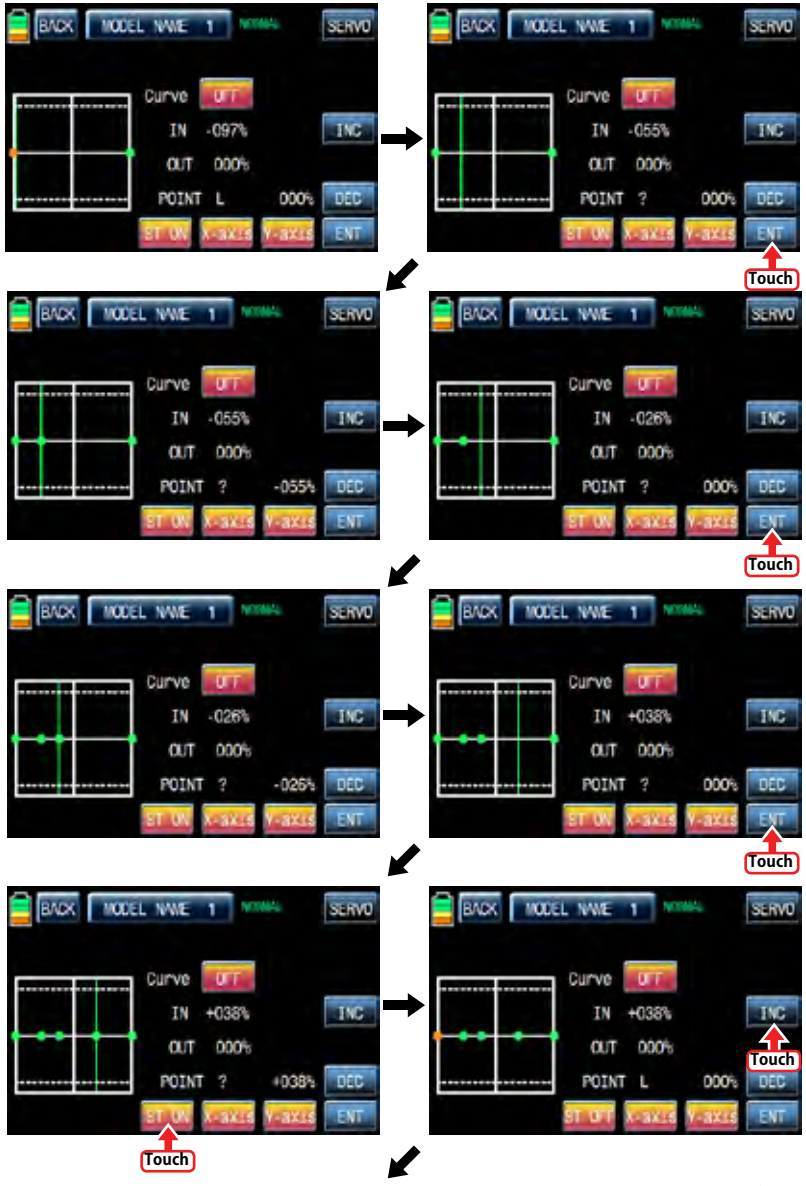
13. PIT >>RUDD

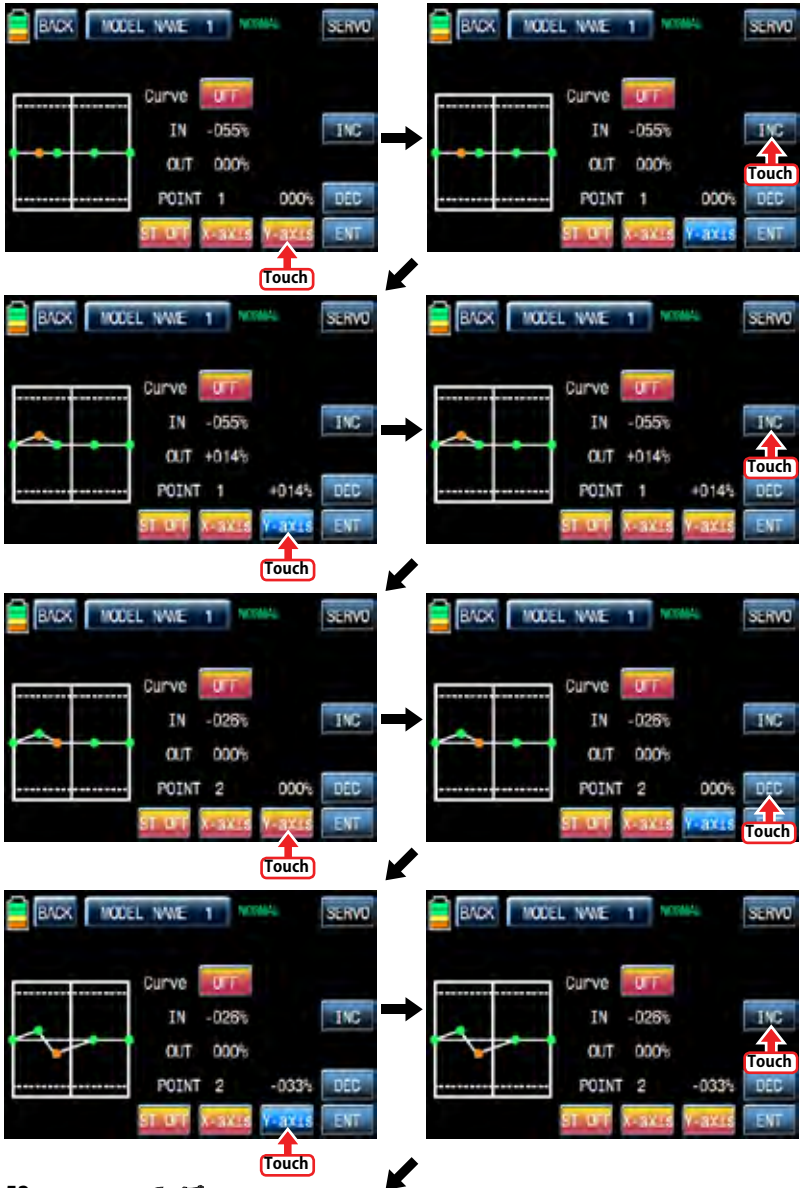
This function is used to correct the unintended movement of rudder during the flight of a helicopter. It is not necessary when you make use of heading lock gyro
Touch “PITT >> RUDD” icon in the function page to call PIT >> RUDD setup page. You need to mark the point on graph first and then adjust the operation curve with “DEC”, “INC”, X-axis and Y-axis buttons. Touch “ST OFF” icon to switch to “ST ON” then the pitch position line appears on graph. Move throttle stick and place the line at the desired position between point “L” and “H” then touch “ENT” icon on the bottom right. Now the new point is marked in graph.

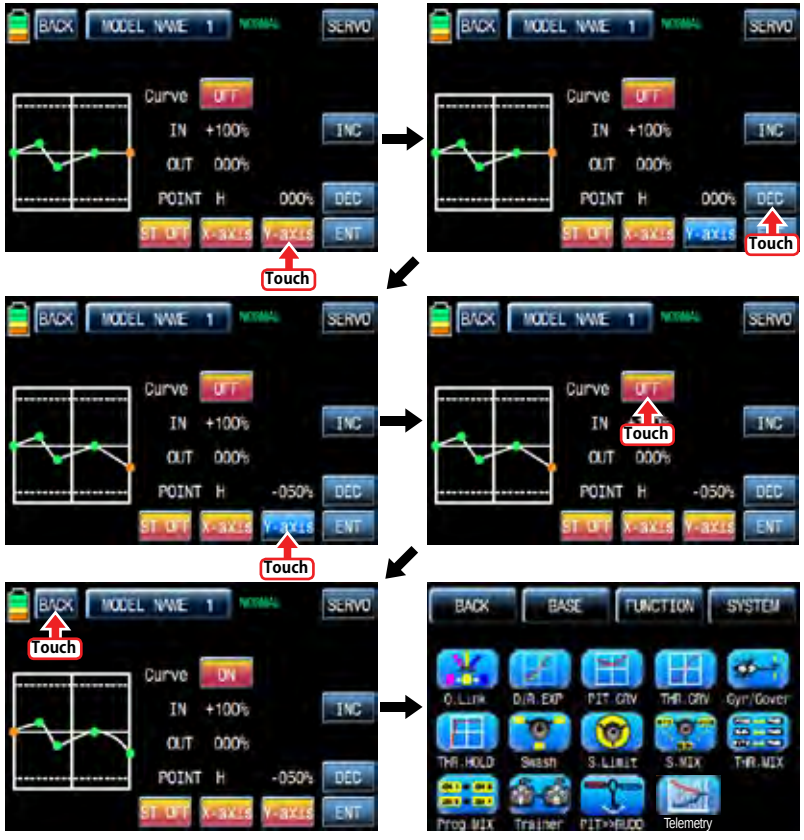
By moving the pitch bar with the throttle stick, you should fix the bar in the desired position between L and H point. Now, touch the “ENT” icon on the bottom right side and then the new point will appear. You may set five points in your favorable position.

You need to mark the point on graph first and then adjust the operation curve with “DEC”, “INC”, X-axis and Y-axis buttons. Touch “ST OFF” to change to “ST ON” then the throttle position line appears on graph. Move throttle stick and place the line at the desired position between point “L” and “H” then touch “ENT” icon on the bottom right. Now the new point is marked in graph. You can mark five points between point “L” and “H” in the same way. Touch ST ON” to switch to “ST OFF” and complete the point setup. Now touch “DEC” or “INC” button to select point and touch X-axis or Y-axis to activate and then touch DEC” or “INC” button to adjust the operation curve. Turn on the preset Q.LINK switch then you may adjust the operation curve of every Q.LINK as well.









14. Telemetry

It is used to perform the programming setup and check HoTT telemetry functions. Touch “Telemetry” icon to call the Telemetry page. You may program 5 types of “RX SELECT”, “SETTING & DATA VIEW” “SENSOR SELECT”, ”RF STATUS VIEW”, and “VOCIE TRIGGER”.

14-1. RX SELECT

It is used to select a receiver that would transmit the telemetry data to mz-12 when 2 receivers are bound to mz-12. All of the telemetry sensors should be connected to the selected receiver. RX1” is set in RX SELECT line as a default and “RX1” and “RX2” can be switch by touching.

14-2. SETTING & DATA VIEW

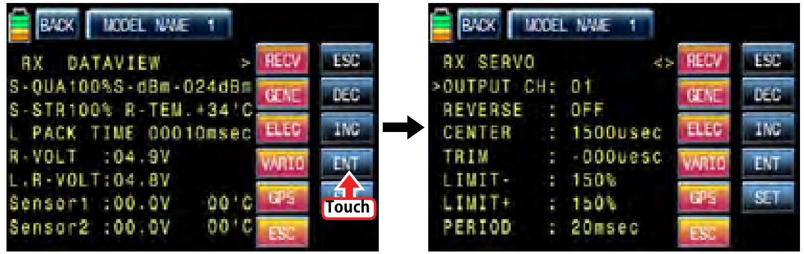
It is used to program or check telemetry data of a receiver and telemetry sensors. Only if transmitter and receiver are bound, SETTING & DATA VIEW function is activated. Touch ">>" icon in the telemetry setup page to call "RX DATA VIEW" setup page

- RX DATA VIEW

You may check telemetry data of a receiver in this page. Touch "ENT" icon to access to the next function, "RX SERVO" page.

- RX SERVO

The servo functions, "REVERSE", "CENTER", "TRIM"," LIMIT-", LIMIT+, and "PERIOD", can be programmed throughout receiver when servo is connected to each channel of receiver.
In "RX DATA VIEW" page, touch "ENT" icon to call RX SERVO page. You may move the cursor ">" to other category with INC button and select the category that you want to program. After deciding the desired category, touch "SET" icon to activate in red and adjust the value with INC and DEC buttons.



• OUTPUT CH

The receiver's out channel is programmed in OUTPUT CH line. Touch "SET" icon to activate the value in red and select the desired channel with INC and DEC buttons. Touch "SET" icon again to deactivate the value and touch INC button to move the cursor to "Reverse".

• REVERSE

It is used to reverse the operation of an individual servo. Touch “SET” icon to activate “OFF” in red and touch INC and DEC buttons to switch to “ON”. Touch “SET” icon again to deactivate the value and touch INC buttons to move the cursor to “CENTER”.

• CENTER

It is used to set the “center position” of servo.
Touch “SET” icon to activate the value in red. Move and hold the throttle stick to the desired position for the servo center and touch “SET” icon then that position is assigned to the servo center and the relevant value is displayed. Touch INC button to move the cursor to “Reverse”

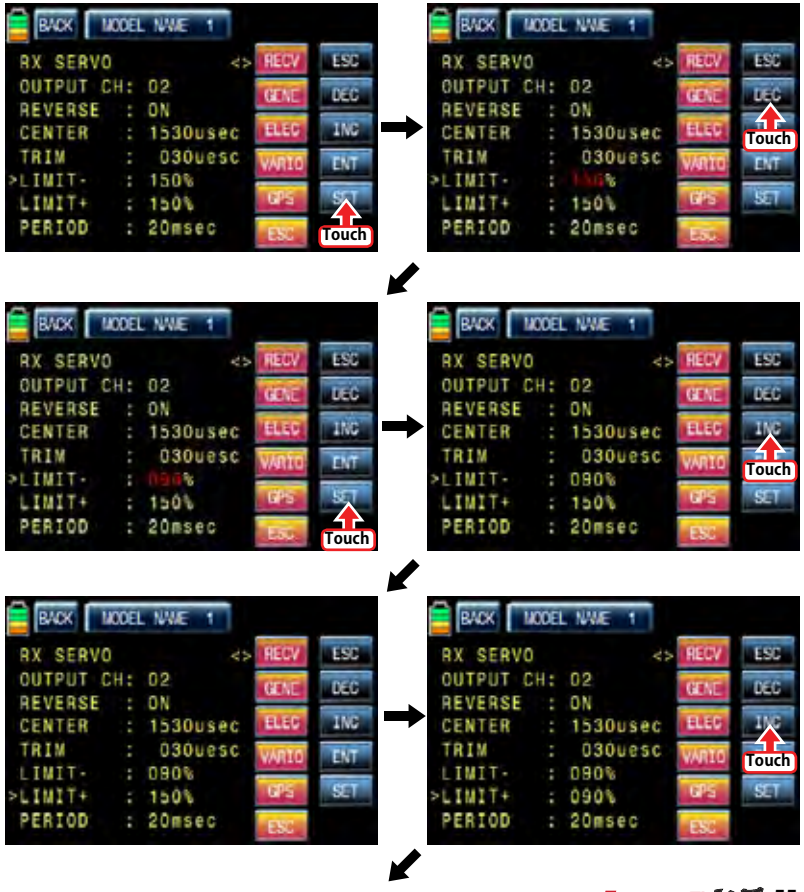
• TRIM

It is used to set the servo's "Trim position".
Touch "SET" icon then the values of CENTER and TRIM are activated in red. Adjust TRIM values with INC and DEC buttons and touch "SET" icon again to deactivate the value. Touch INC button to move the cursor to "LIMIT -"

NOTICE: When TRIM value is adjusted, the default value of CENTER, 1500usec, is automatically set and the trim setup value is added to 1500usec.

• LIMIT -, +

The function supports the adjustment of servo's maximum travel amount for +,- direction. Even the default value is 150%, the travel amount is limited to 100% that is programmed at SERVO EPA of transmitter so 100%~150% range cannot be programmed and under 100% range can be only programmed at " LIMIT–". Only if SERVO EPA of transmitter is set to "150%", you can set below 150% at LIMIT- value. Touch "SET" icon to activate the value in red and adjust the value with INC and DEC buttons. Touch "SET" icon again to deactivate the value and touch INC button to move the cursor to "PERIOD".



• PERIOD

It is used to set the speed of receiver's output signal.
Touch "SET" icon to activate the default value, 20msec, in red and set the value to 10msec with INC and DEC buttons. Touch "SET" icon again to deactivate the value and touch ENT button to call "RX FAIL SAFE" setup page

- RX FAIL SAFE

• OUTPUT CH/ INPUT CH

You may edit and adjust transmitter channel which is connected with a receiver using "OUTPUT CH" and "INPUT CH". Receiver CH1, 2, 3, 4, 5, 6 are connected to the same channels of transmitter as the default and you may edit the channel connection of receiver and transmitter. Since OUTPUT CH is changed if INPUT CH would be changed, we recommend that you would change INPUT CH.
Touch INC button to move the cursor to "INPUT CH" and touch "SET" icon to activate the value in red then select the channel to be connected to "OUTPUT CH" with INC and DEC buttons. Touch "SET" icon again to deactivate the value. Touch INC button to move the cursor to "MODE"

• MODE

It is used to select the failsafe type. “HOLD” is basically set in all the channels.
Touch “SET” icon to activate the value in red then you may select HOLD or OFF or FAIL SAFE with INC and DEC buttons. After selecting one of HOLD, OFF and FAIL SAFE, touch “SET” icon again to deactivate the value. Touch INC button to move the cursor to “F.S.POS”

• F.S.POS

It is used to decide the servo’s position when FAIL SAFE function is activated.
Touch “SET” icon to activate the value in red and adjust the value with INC and DEC buttons. Touch “SET” icon again to deactivate the value. Touch INC button to move the cursor to “DELAY”

• DELAY

It is used to set the time delay. The failsafe will delay for the setup time.
Touch “SET” icon to activate the value in red and adjust the value with INC and DEC buttons. Touch “SET” icon again to deactivate the value. Touch INC button to move the cursor to “FAIL SAFE ALL”

• FAIL SAFE ALL

This function allows that all failsafe position for every channel can be set at a time without the use of F.S.POS function. Notice that MODE of all channels should be set to FAIL SAFE. Touch “SET” icon to activate the value, NO, in red and move and hold the throttle stick to the desired position for FAIL SAFE operation position. Touch “SET” icon then that position is assigned to FAIL SAFE operation position and the relevant value is displayed in F.S.POS line. The servo that is connected to receiver is operated to the set position of FAIL SAFE when transmitter is turned off Touch INC button to move the cursor to “POSITION”

• POSITION

You may check the operation range of transmitter’s stick which is connected with “INPUT CH”. Touch “ENT” icon on the right to access to the next page, “RX FREE MIXER”.

- RX FREE MIXER

This function is used to correct the unintended movement of airplane during the flight by mixing master channel and slave channel.

• MIXER

You may decide MIXER number that you want to set. Touch “SET” icon to activate the value in red and select MIXER number with INC and DEC buttons. Touch “SET” icon again to deactivate the value. Touch INC button to move the cursor to “MASTER CH”

• MASTER CH

You may set the master channel of FREE MIXER.
Touch “SET” icon to activate the value in red and select the master channel number with INC and DEC buttons. Touch “SET” icon again to deactivate the value. Touch INC button to move the cursor to “SLAVE CH”

• SLAVE CH

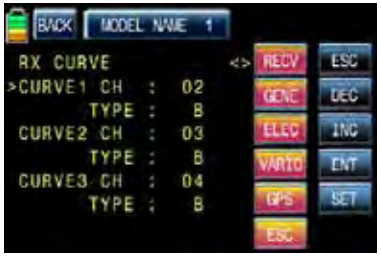
You may set the salve channel of FREE MIXER.
Touch “SET” icon to activate the value in red and select the slave channel number with INC and DEC buttons. Touch “SET” icon again to deactivate the value. Touch INC button to move the cursor to “S-TRAVEL-”

• “S-TRAVEL -, +”

It is used to set the mix operation range of SLAVE CH.
Touch “SET” icon to activate the value in red and select the slave channel number with INC and DEC buttons. Touch “SET” icon again to deactivate the value. If you operate the master channel, the slave channel is operated within the setup range at the same time. Touch INC button to move the cursor to “TAIL TYPE”

• TAIL TYPE

You may select the appropriate tale type for the airplane that you use
Touch “SET” icon to activate the value in red and select the appropriate tale type with INC and DEC buttons. Touch “SET” icon again to deactivate the value. Touch “ENT” icon on the right to access to the next page, “RX CURVE”,



- RX CURVE

It is used to set the curve of CH2, CH3, and CH4 and 3 types of A, B, and C are selectable.

> A type : Sensitive operating
> B type : Normal operating
> C type : smooth operating

The default, B type is set and it is very similar with “EXP” function of transmitter. You may transfer the cursor, >, with INC and DEC buttons and can select the desired category.
Touch “SET” icon to activate the value in red and select the channel and type with INC and DEC buttons. Touch “SET” icon again to deactivate the value. If you operate the master channel, the slave channel is operated within the setup range at the same time. Touch “ENT” icon on the right to access to the next page, “RX SERVO TEST”,

- RX SERVO TEST

This function allows servo operation to be tested and program the receiver's power voltage, the alarm for the maximum/minimum temperature of receiver and the channel out type of receiver.

• ALL-MAX/ ALL-MIN/ TEST

The travel amount for servo test is decided for the setup value of ALL-MAX and ALL-MIN Touch "SET" icon to activate the value of ALL-MAX and ALL-MIN in red and adjust the value with INC and DEC buttons. Touch "SET" icon again to deactivate the value. Transfer the cursor to TEST line and touch "SET" icon to activate the value, STOP, in red. Now, switch to START with INC and DEC buttons and touch "SET" icon again to deactivate the value then all servos connected to receiver are slowly operated within the setup. if you set to STOP by touching "SET" and "INC/DEC" icons, all servos stop operating. Touch INC button to move the cursor to "TAIL TYPE"

Touch "SET" icon again to deactivate the value. If you operate the master channel, the slave channel is operated within the setup range at the same time. Touch INC button to move the cursor to "ALARM VOLT",

• ALARM VOLT

It is the low voltage alarm setup for receiver power battery. Transmitter sounds an alarm throughout telemetry technology when the battery of receiver reaches the low voltage limit. Touch “SET” icon to activate the value in red and adjust the value with INC and DEC buttons. Touch “SET” icon again to deactivate the value. Touch INC button to move the cursor to “ALARM TEMP+”

• ALARM TEMP +/-

It is the alarm setup for the maximum/minimum temperature of receiver. Transmitter sounds an alarm throughout telemetry technology when the temperature of receiver reaches the temperature limits.
Touch “SET” icon to activate the value in red and adjust the value with INC and DEC buttons. Touch “SET” icon again to deactivate the value. Touch INC button to move the cursor to “CH OUT TYPE”

- CH OUT TYPE

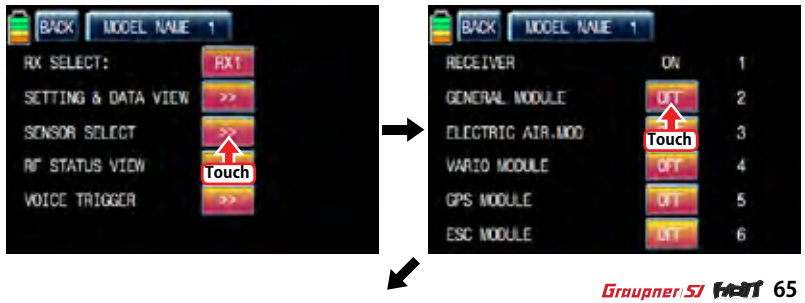
It is used to set the type of receiver’s signal output and it consists of ONCE, SAME, SUMO 12, SUMI, and SUMD HD12.

> ONCE : This type is applied to the analog servo. “20msec” is automatically set to PERIOD in RX SERVO setup
> SAME : This type is usually applied to the digital servo. You need to “10 ~ 20msec” to PERIOD. In case that the analog servo is connected, you need to set “20msec” to PERIOD.
> SUMI : The receiver set to SUMI take the output signal from the receiver set to SUMO and outputs the signal.
> SUMO : Only the selected channel outputs the signal of all channels of receiver. In case that 1 receiver is set to SUMO and the other receiver is set to SUMI and then they are connected in ex code, the receiver set to SUMI take the output signal from the receiver set to SUMO and it is operated at the same time. The final channel of receiver is the output channel of SUMO, but you may change to the desired channel.
> SUMD HD : The digital output signal of all channels in receiver is outputted from the selected channel. It is used to the product that needs the receiver digital signal such as Power box and Flybarless system. The factory default for SUMD HD output channel is the last channel of receiver, but you may change it

Touch “SET” icon to activate the value in red and select the desired type with INC and DEC buttons. Touch “SET” icon again to deactivate the value. Touch INC button to move the cursor to “CH OUT TYPE” In order to set for CH OUT TYPE, touch “INC” icon to move the cursor to CH OUT TYPE and then touch the “SET” icon. Now, “SAME” in CH OUT TYPE is activated in a red. When it is activated, touch the INC or DEC icons to select the desirable receiver type and then touch the “SET” icon to remove the cursor. The set type of receiver is activated. When you select SUMO 8 and SUMD HD8 and try to select the different output channel, touch “SET” icon to activate the channel number in red then select the desired channel with INC and DEC buttons. Touch “SET” icon again to deactivate the value. Now, the selected channel outputs PPM signal.

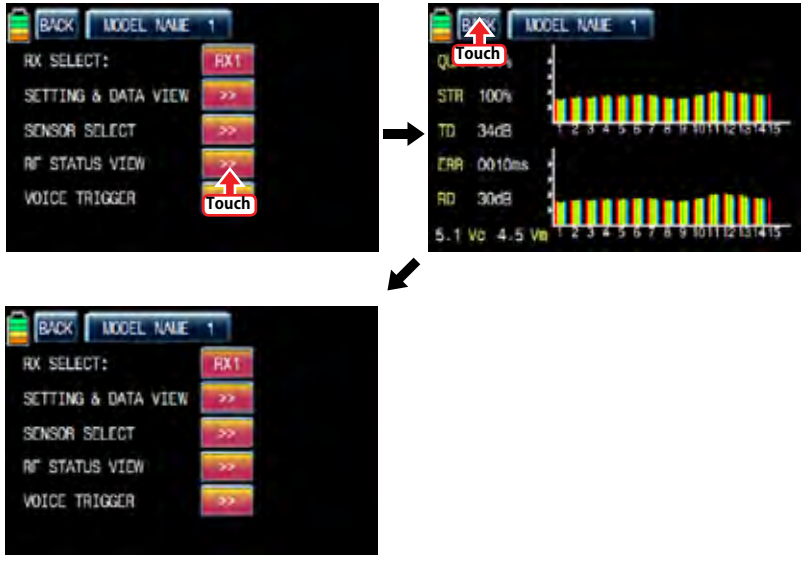
14-3. SENSOR SELECT

This function is used to program telemetry sensor that is connected to HoTT receiver.
You should select the sensor first to use and program the function such as voice function, warning and the telemetry data information.
Touch “>>” icon in SENSOR SELECT line then RECEIVER, GENERAL MODULE, ELECTRIC AIR, MOD, VARIO MODULE, GPS, and ESC are displayed. RECEIVER is set to ON, the others are set to OFF by default.
To select the sensor, touch “OFF” icon to switch to “ON” then voice function, warning and the telemetry data information are available. After the sensor selection is completed, touch “BACK” icon to return to the previous page.



14-4. RF STATUS VIEW

It shows RF status between transmitter and receiver throughout telemetry function
Touch “>>” icon in RF STATUS VIEW line then the indication to show the RF connection status is displayed by graph.



14-5. VOCIE TRIGGER

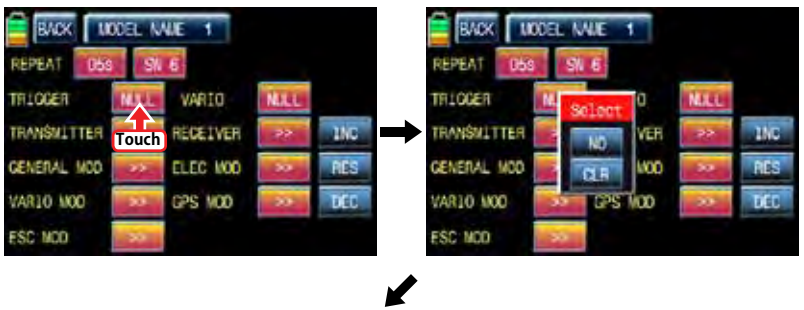
It is used to program the sensors related with voice function. REPEAT, TRIG, VARIO, TRANSSMITTER, RECEIVER are available by default and the optional sensors could be attached. If the optional sensor is connected, it is need to add the optional sensor at SENSOR SELECT mode then new category in VOICE TRIGGER is created. The useable sensors are GENERAL MODULE, ELECTRIC AIR MODULE, VARIO MODULE, GPS, AIR ESC
Touch “>>” icon in VOICE TRIGGER line to call “VOICE TRIGGER” setup page.

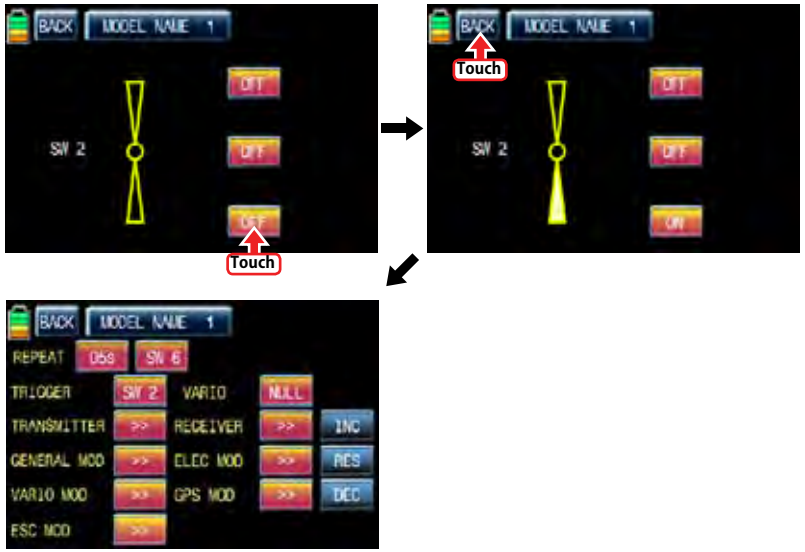
- REPEAT

You may set the time and select the switch. If the switch is on, one of voice functions is repeated for the setup time.
Touch the value, “01s”, in blue and adjust the repeat time with INC and DEC buttons. Touch “NULL” icon to call the “Select” message popup. Move the switch or volume with your choice then that switch or volume is designated as on/ off key and then the key direction setup page appears. You may select ON or OFF by touching icons. When the key is moved to the direction of ON, the function is operated. Touch “BACK” icon to return to “VOICE TRIGGER” setup page.

- TRIG

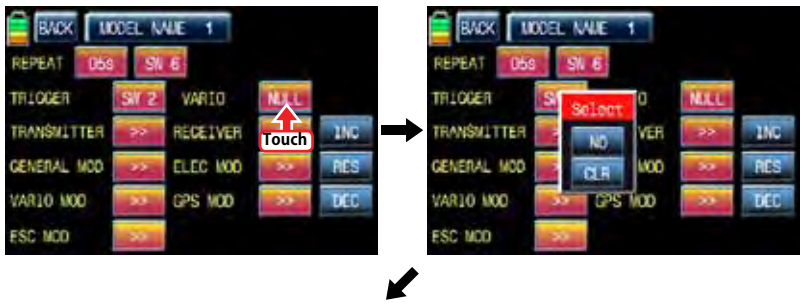
You may designate the switch for the voice functions of transmitter, receiver and sensor. The next voice function is came in turn whenever the switch is on/off
To set TRIGGER, touch “NULL” icon to call the “Select” message popup. Move the switch or volume with your choice then that switch or volume is designated as on/ off key and then the key direction setup page appears. You may select ON or OFF by touching icons. When the key is moved to the direction of ON, the function is operated. Touch “BACK” icon to return to “VOICE TRIGGER” setup page.
If the switch that has spring such as S2 is designated as TRIG switch, On/Off operation is easier and convenient





- VARIO

It is used to set “on/off” switch for the voice function of Vario module.
To set VARIO, touch “NULL” icon to call the “Select” message popup. Move the switch or volume with your choice then that switch or volume is designated as on/ off key and then the key direction setup page appears. You may select ON or OFF by touching icons. When the key is moved to the direction of ON, the function is operated. Touch “BACK” icon to return to “VOICE TRIGGER” setup page.



- TRANSSMITTER

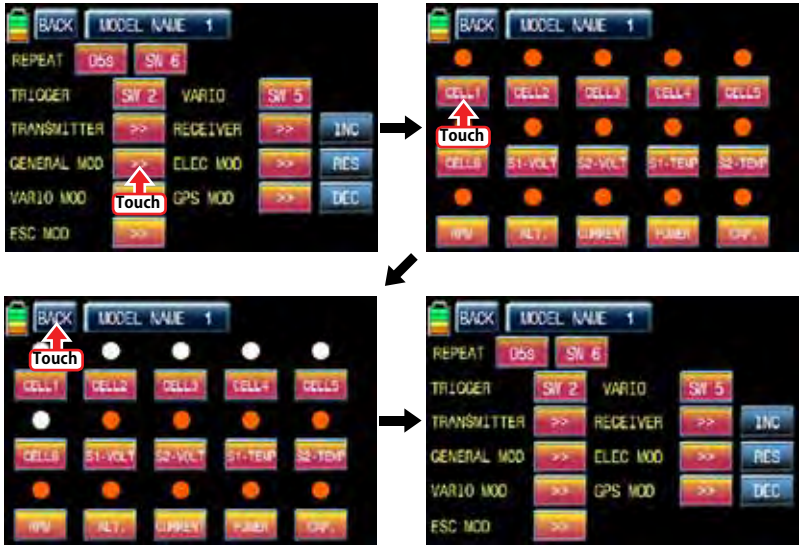
**송신기의 텔레메트리VOICE기능 TX VOLT, MODEL TIME, BATT TIME, TIMER 1, TIMER 2, CURRENT TIME 6가지 VOICE기능의 사용을 편집하는 기능입니다.
TRANSSMITTER기능을 설정하려면 TRANSSMITTER기능의 >>를 터치하면TRANSSMITTER 설정화면으로 이동합니다. TRANSSMITTER기능으로 이동하면 TX VOLT, MODEL TIME, BATT TIME, TIMER 1, TIMER 2, CURRENT TIME 6가지 TRANSSMITTER VOICE기능이 기본으로 빨간색으로 체크되어 있습니다. 사용하고 싶지 않은 기능을 터치하면 빨간색 체크가 흰색으로 해제되고 TRANSSMITTER VOICE기능에서 편집 됩니다. TRANSSMITTER기능설정이 끝나면 좌측상단의 BACK를 터치하면 VOICE TRIGGER기능 설정화면으로 이동합니다.**

- RECEIVER

**수신기의 텔레메트리VOICE기능 TEMP, STRENGTH, RX VOLT, LOW VOLT 4가지 VOICE기능의 사용을 편집하는 기능입니다.
RECIVER기능을 설정하려면 RECIVER기능의 >>를 터치하면 RECIVER 설정화면으로 이동합니다. RECIVER기능으로 이동하면 TEMP, STRENGTH, RX VOLT, LOW VOLT 4가지 RECIVER VOICE기능이 기본으로 빨간색으로 체크되어 있습니다. 사용하고 싶지 않은 기능을 터치하면 빨간색 체크가 흰색으로 해제되고 RECIVER VOICE기능에서 편집 됩니다. RECIVER기능설정이 끝나면 좌측상단의 BACK를 터치하면 VOICE TRIGGER기능 설정화면으로 이동합니다.**

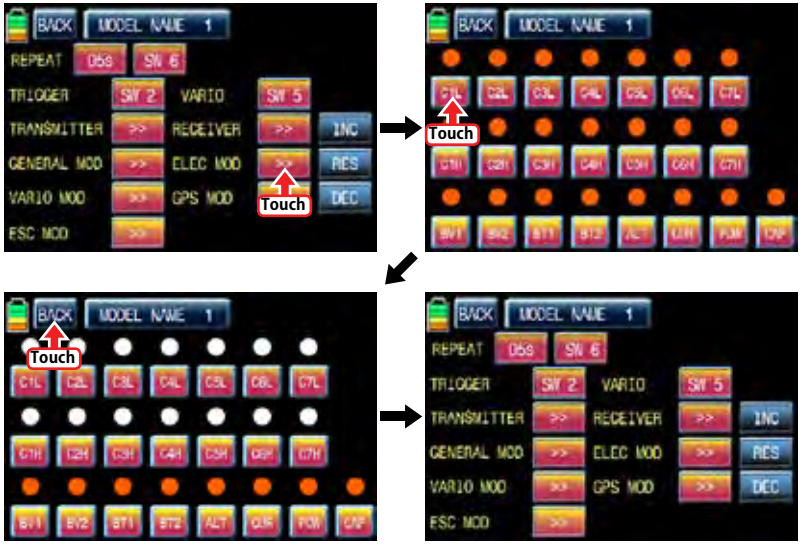
- GENERAL MOD

GENERAL MODUL의 텔레메트리 VOICE기능 CELL1, CELL2, CELL3, CELL4, CELL5, CELL6, S1-VOLT, S2-VOLT, S1-TEMP, S2-TEMP, RPM, ALT, CURRENT, POWER, CAP 15가지 GENERAL MOD VOICE기능의 사용을 편집하는 기능입니다.
GENERAL MOD기능을 설정하려면 GENERAL MOD기능의 >>를 터치하면 GENERAL MOD 설정화면으로 이동합니다. GENERAL MOD 기능으로 이동하면 CELL1, CELL2, CELL3, CELL4, CELL5, CELL6, S1-VOLT, S2-VOLT, S1-TEMP, S2-TEMP, RPM, ALT, CURRENT, POWER, CAP 15가지 GENERAL MOD VOICE기능이 기본으로 빨간색으로 체크되어 있습니다. 사용하고 싶지 않은 기능을 터치하면 빨간색 체크가 흰색으로 해제되고 GENERAL MOD VOICE기능에서 편집 됩니다.
GENERAL MOD기능설정이 끝나면 좌측상단의 BACK를 터치하면 VOICE TRIGGER기능 설정화면으로 이동합니다.



- ELEC MOD

ELECTRIC MODUL의 텔레메트리 VOICE기능 C1L, C2L, C3L, C4L, C5L, C6L, C7L, C1H, C2H, C3H, C4H, C5H, C6H, C7H, BV1, BV2, BT1, BT2, ALT, CUR, POW, CAP 22가지 ELEC MOD VOICE기능의 사용을 편집하는 기능입니다.
ELEC MOD기능을 설정하려면 ELEC MOD기능의 >>를 터치하면 ELEC MOD 설정화면으로 이동합니다. ELEC MOD 기능으로 이동하면 C1L, C2L, C3L, C4L, C5L, C6L, C7L, C1H, C2H, C3H, C4H, C5H, C6H, C7H, BV1, BV2, BT1, BT2, ALT, CUR, POW, CAP 22가지 ELEC MOD VOICE기능이 기본으로 빨간색으로 체크되어 있습니다. 사용하고 싶지 않은 기능을 터치하면 빨간색 체크가 흰색으로 해제되고 ELEC MOD VOICE기능에서 편집 됩니다. ELEC MOD기능설정이 끝나면 좌측상단의 BACK를 터치하면 VOICE TRIGGER기능 설정화면으로 이동합니다.



- VARIO MOD

VARIO MODUL의 텔레메트리 VOICE기능의 ALTITUD, MAX ALT, MIN ALT 3가지 VARIO MOD VOICE기능의 사용을 편집하는 기능입니다.
VARIO MOD기능을 설정하려면 VARIO MOD기능의 >>를 터치하면 VARIO MOD 설정화면으로 이동합니다. VARIO MOD 기능으로 이동하면 ALTITUD, MAX ALT, MIN ALT 3가지 VARIO MOD VOICE기능이 기본으로 빨간색으로 체크되어 있습니다. 사용하고 싶지 않은 기능을 터치하면 빨간색 체크가 흰색으로 해제되고 VARIO MOD VOICE기능에서 편집 됩니다. VARIO MOD기능설정이 끝나면 좌측상단의 BACK를 터치하면 VOICE TRIGGER기능 설정화면으로 이동합니다.

- TRANSSMITTER

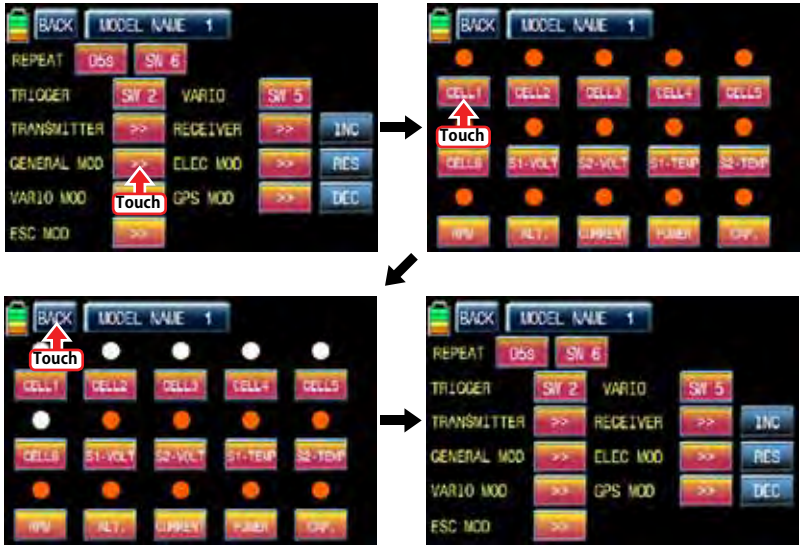
**송신기의 텔레메트리VOICE기능 TX VOLT, MODEL TIME, BATT TIME, TIMER 1, TIMER 2, CURRENT TIME 6가지 VOICE기능의 사용을 편집하는 기능입니다.
TRANSSMITTER기능을 설정하려면 TRANSSMITTER기능의 >>를 터치하면TRANSSMITTER 설정화면으로 이동합니다. TRANSSMITTER기능으로 이동하면 TX VOLT, MODEL TIME, BATT TIME, TIMER 1, TIMER 2, CURRENT TIME 6가지 TRANSSMITTER VOICE기능이 기본으로 빨간색으로 체크되어 있습니다. 사용하고 싶지 않은 기능을 터치하면 빨간색 체크가 흰색으로 해제되고 TRANSSMITTER VOICE기능에서 편집 됩니다. TRANSSMITTER기능설정이 끝나면 좌측상단의 BACK를 터치하면 VOICE TRIGGER기능 설정화면으로 이동합니다.**

- RECEIVER

**수신기의 텔레메트리VOICE기능 TEMP, STRENGTH, RX VOLT, LOW VOLT 4가지 VOICE기능의 사용을 편집하는 기능입니다.
RECIVER기능을 설정하려면 RECIVER기능의 >>를 터치하면 RECIVER 설정화면으로 이동합니다. RECIVER기능으로 이동하면 TEMP, STRENGTH, RX VOLT, LOW VOLT 4가지 RECIVER VOICE기능이 기본으로 빨간색으로 체크되어 있습니다. 사용하고 싶지 않은 기능을 터치하면 빨간색 체크가 흰색으로 해제되고 RECIVER VOICE기능에서 편집 됩니다. RECIVER기능설정이 끝나면 좌측상단의 BACK를 터치하면 VOICE TRIGGER기능 설정화면으로 이동합니다.**

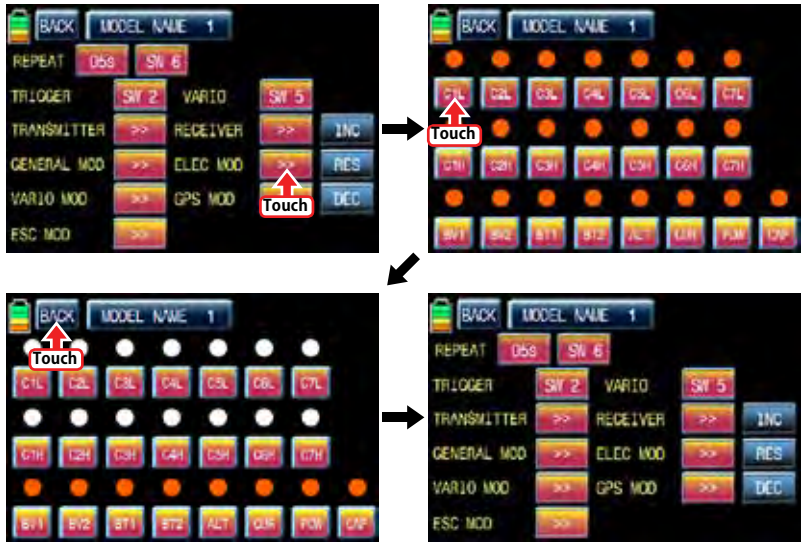
- GENERAL MOD

GENERAL MODUL의 텔레메트리 VOICE기능 CELL1, CELL2, CELL3, CELL4, CELL5, CELL6, S1-VOLT, S2-VOLT, S1-TEMP, S2-TEMP, RPM, ALT, CURRENT, POWER, CAP 15가지 GENERAL MOD VOICE기능의 사용을 편집하는 기능입니다.
GENERAL MOD기능을 설정하려면 GENERAL MOD기능의 >>를 터치하면 GENERAL MOD 설정화면으로 이동합니다. GENERAL MOD 기능으로 이동하면 CELL1, CELL2, CELL3, CELL4, CELL5, CELL6, S1-VOLT, S2-VOLT, S1-TEMP, S2-TEMP, RPM, ALT, CURRENT, POWER, CAP 15가지 GENERAL MOD VOICE기능이 기본으로 빨간색으로 체크되어 있습니다. 사용하고 싶지 않은 기능을 터치하면 빨간색 체크가 흰색으로 해제되고 GENERAL MOD VOICE기능에서 편집 됩니다.
GENERAL MOD기능설정이 끝나면 좌측상단의 BACK를 터치하면 VOICE TRIGGER기능 설정화면으로 이동합니다.



- ELEC MOD

ELECTRIC MODUL의 텔레메트리 VOICE기능 C1L, C2L, C3L, C4L, C5L, C6L, C7L, C1H, C2H, C3H, C4H, C5H, C6H, C7H, BV1, BV2, BT1, BT2, ALT, CUR, POW, CAP 22가지 ELEC MOD VOICE기능의 사용을 편집하는 기능입니다.
ELEC MOD기능을 설정하려면 ELEC MOD기능의 >>를 터치하면 ELEC MOD 설정화면으로 이동합니다. ELEC MOD 기능으로 이동하면 C1L, C2L, C3L, C4L, C5L, C6L, C7L, C1H, C2H, C3H, C4H, C5H, C6H, C7H, BV1, BV2, BT1, BT2, ALT, CUR, POW, CAP 22가지 ELEC MOD VOICE기능이 기본으로 빨간색으로 체크되어 있습니다. 사용하고 싶지 않은 기능을 터치하면 빨간색 체크가 흰색으로 해제되고 ELEC MOD VOICE기능에서 편집 됩니다. ELEC MOD기능설정이 끝나면 좌측상단의 BACK를 터치하면 VOICE TRIGGER기능 설정화면으로 이동합니다.



- VARIO MOD

VARIO MODUL의 텔레메트리 VOICE기능의 ALTITUD, MAX ALT, MIN ALT 3가지 VARIO MOD VOICE기능의 사용을 편집하는 기능입니다.
VARIO MOD기능을 설정하려면 VARIO MOD기능의 >>를 터치하면 VARIO MOD 설정화면으로 이동합니다. VARIO MOD 기능으로 이동하면 ALTITUD, MAX ALT, MIN ALT 3가지 VARIO MOD VOICE기능이 기본으로 빨간색으로 체크되어 있습니다. 사용하고 싶지 않은 기능을 터치하면 빨간색 체크가 흰색으로 해제되고 VARIO MOD VOICE기능에서 편집 됩니다. VARIO MOD기능설정이 끝나면 좌측상단의 BACK를 터치하면 VOICE TRIGGER기능 설정화면으로 이동합니다.

- GPS MOD

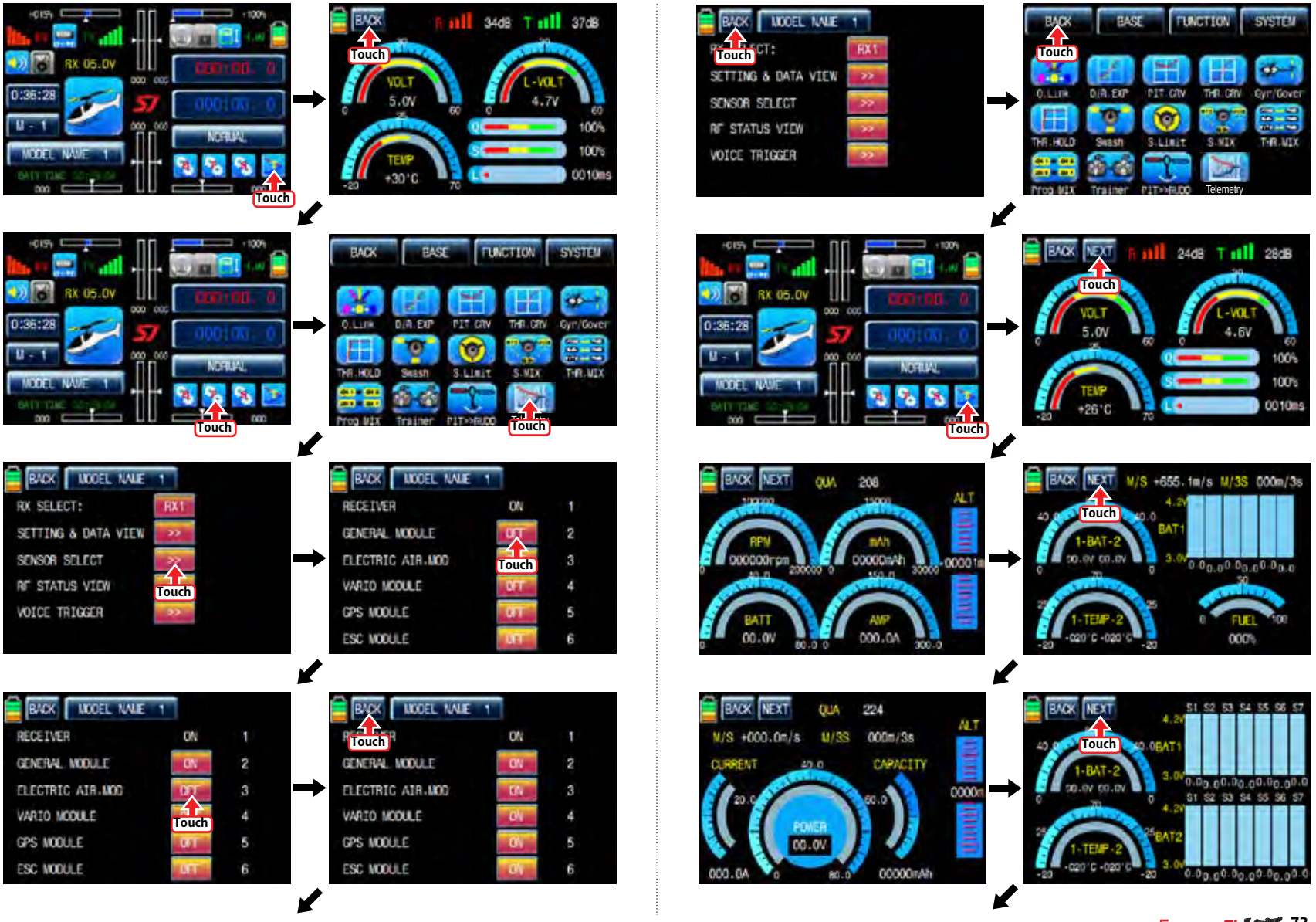
You may decide the voice functions of GPS MOD to use or not to use. 4 voice functions, SPEED, DISTANCE, ALTITUDE, and DIRECTION, are available.
Touch “>>” icon to call the GPS MOD setup page. All the functions are marked with red dot by default in the page. Touch the function icon that you don’t want to use then the red dot is switched to white dot. The functions marked with white dot are edited out from the voice functions. Touch “BACK” icon to return to VOICE TRIGGER setup page.

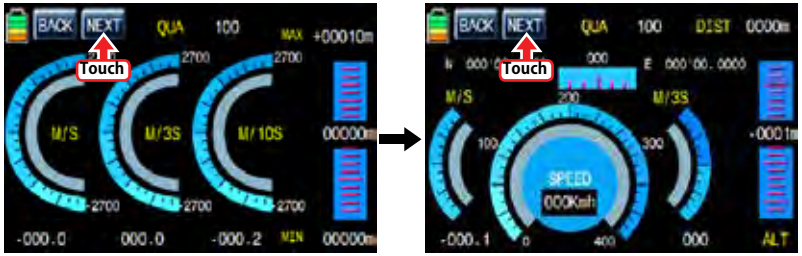
- ESC MOD

You may decide the voice functions of ESC MOD to use or not to use. 4 voice functions, RPM, CURRENT, POWER-V, and CAPACITY, are available.
Touch “>>” icon to call the ESC MOD setup page. All the functions are marked with red dot by default in the page. Touch the function icon that you don’t want to use then the red dot is switched to white dot. The functions marked with white dot are edited out from the voice functions. Touch “BACK” icon to return to VOICE TRIGGER setup page.

14-6. DISPLAY SETUP FOR TELEMETRY SENSOR

All telemetry indication of the sensors are displayed at the receiver telemetry page.
Connect option sensors to receiver and access to the sensor select setup page by course of page transfer.
Touch “OFF” icon of the connected sensors to switch to “ON” at the sensor select setup page. After that, return to the receiver telemetry page. You may check all telemetry indication here and access to the next page by touching “NEXT” icon on the top left


RX 05.0v
0:36:28
MODEL NAME 1
NORMAL
Touch
BACK
34dB
37dB
VOLT
5.0V
L-VOLT
4.7V
TEMP
+30°C
100%
100%
0010ms
BASE
FUNCTION
SYSTEM
Q.Link
D/R EXP
PIT CRV
THR.CRV
Gyr/Gover
THR.HOLD
Swash
S.Limit
S.MIX
THR.MIX
Prog MIX
Trainer
PIT>>RUDD
Telemetry
RX SELECT:
RX1
SETTING & DATA VIEW
SENSOR SELECT
RF STATUS VIEW
VOICE TRIGGER
RECEIVER
ON
GENERAL MODULE
ELECTRIC AIR.MOD
VARIO MODULE
GPS MODULE
ESC MODULE
OFF
NEXT
24dB
28dB
+26°C
QUA
208
224
RPM
mAh
ALT
BATT
AMP
00.0V
000.0A
M/S +000.0m/s
M/3S
000m/3s
CURRENT
CAPACITY
POWER
00000mAh
M/S +655.1m/s
1-BAT-2
1-TEMP-2
BAT1
BAT2
FUEL



1-1 NEW

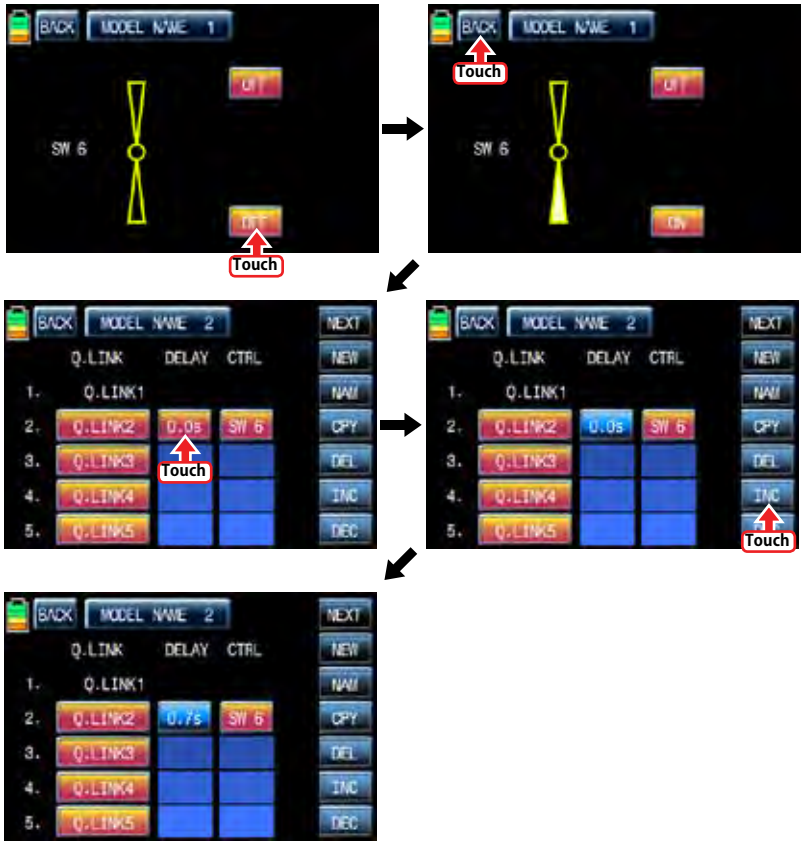
This function is used when you wish to create new Q.LINK. If you may want to set for new Q.LINK, touch the value in “Q.LINK” line to activate it in blue and touch “NEW” icon in the right to call “CTRL” and “DELAY” options. In “CTRL” setup, touch “NULL” icon to call “Select” message popup and move the switch or stick with your choice then the switch or stick is set to Q.LINK switch or stick. To set “DELAY” function, touch “0.0s” icon to activate in blue and set the delay time with “INC” and “DEC” buttons. DELAY indicates the time till Q.LINK start to work after Q.LINK is switched on

FUNCTION MENU (Airplane, Gilder)

1. Q.LINK

This function is used to set Q.LINK and assign the corresponding switch to cope with the un-expected trouble situation. Since the adjusted value is activated by moving the switch and you can cope with the crisis with just one switch. It makes you operating the flight much easier. Q.LINK for airplane type consists of 8 types. (NORMAL, IDEL UP1, IDLE UP2, IDEL UP3, HOLD, Q.LINK6, Q.LINK7, Q.LINK8) Normal type is set as a default value.

In the transmitter main page, touch “Function” icon to call the Function page and touch “Q.LINK” icon to call Q.LINK setup page. Q.LINK list is displayed. “1.NORMAL” is the default value and it cannot be changed.



1-2 NAM

It is used when to revise the name of “Q.LINK”. Touch the target value in “Q.LINK” to activate in blue. Now touch “NAM” icon to call NAM setup page. In the page, enter the desired name using the keypad. After that, touch “EN” icon then the revised name is displayed in “New Q.LINK Name”. Now, touch “BACK” icon on the left top left to call “Q.LINK” setup page and the revised name is stored at the corresponding Q.LINK.

1-3 CPY

CPY function is used to copy the preset Q.LINK setup data into another Q.LINK. Touch the desired entry in “Q.LINK” line to activate in blue. Touch “CPY” icon to call “COPY” message popup. Touch the entry in TARGET then all entry in TARGET are displayed in turn. Now, select the desired Q.LINK entry and touch “YES” icon then the preset data is saved into the selected Q.LINK entry and return to Q.LINK setup page.

1-4 DEL

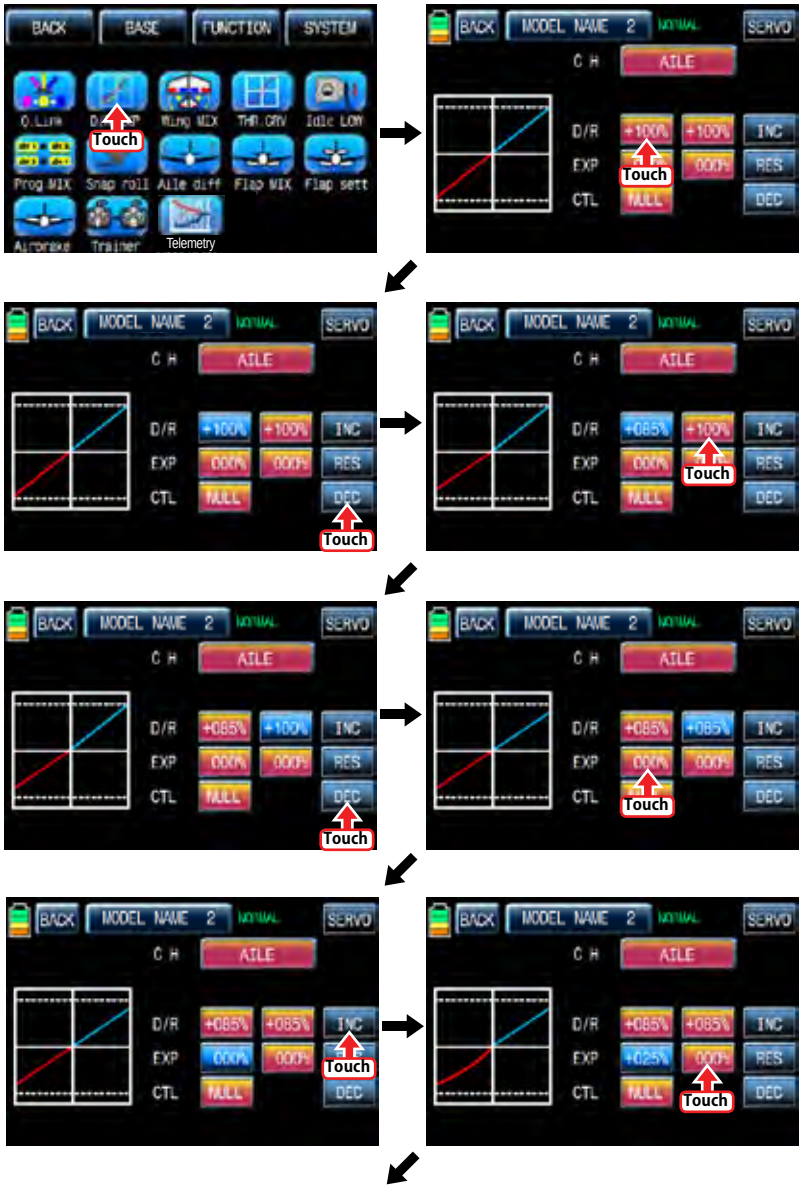
It is used to delete the unused Q.LINK. Touch the entry in Q.LINIK line that you want to delete to activate in blue and touch “DEL” icon. Now, the selected Q.LINK entry is deleted in Q.LINK list

1-5 NEXT

If you touch “NEXT” icon, you may call the next page

2. D/R, EXP

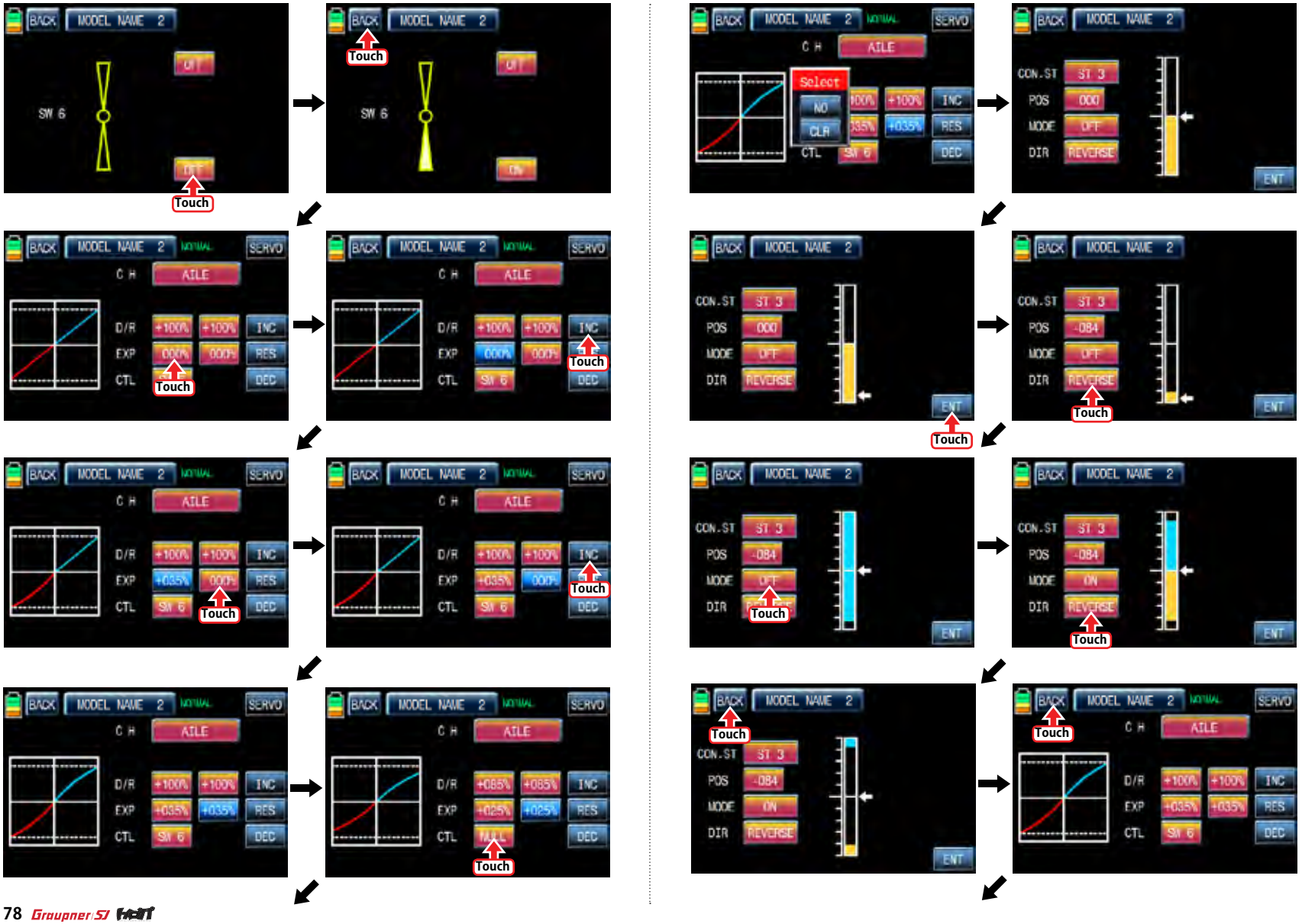
D/R function is used to adjust Servo travel amount that is connected to all channels including aileron, elevator and rudder channels. You can assign them to numerous switches and sticks EXP function is used to set D/R function to aileron, elevator and rudder channels and adjust the sensitivity of natural position of every channel. Positive Exponential reduces the control sensitivity of neutral position for more precise control and negative exponential increase the control sensitivity of neutral position D/R, EXP function can be operated with the assigned switch or connected to Q.LINK for purpose In the function page, touch “D/R, EXP” icon to call D/R, EXP setup page. Touch D/R or EXP icon to activate in blue and perform D/R or EXP programming setup with “INC” and “DEC”.



After “D/R”, “EXP” setup, perform CTL setup. It is used to assign a switch to D/R, EXP function Touch “NULL” icon in CTL line to call “Select” message popup and move the switch that you want to use then that switch is set on/ off to switch and the switch direction setup page appears. You may select ON or OFF by touching icons. When the switch is moved to the direction of ON, the function is operated. Touch “Back” icon to return D/R, EXP setup page. When D/R, EXP switch is off, D/R, EX is returned to the default setup.

If you want to use stick instead of switch for “D/R”, “EXP” function, Touch SW6 in CTL line to call “Select” message popup and move the stick with your choice then that stick is selected as on/ off stick and the stick direction setup page appears. In the direction setup page, move the stick to the position that you can comfortably reach, when the stick reach this position, D/R, EXP function is off. Touch “ENT” icon on the right bottom then the designated position is marked with the red or blue bar in the graph and the value of set position is displayed in POS. If you touch REVERSE in “DIR” line, all setup is reversed.

To set “ON” or “OFF” at the both end of stick operation range, touch “SINGLE” icon to change to “DUAL” then D/R, EXP function is on or off at the both end of stick operation range. You may set ELEV and RUDD channel in the same way. We recommend to set 5~12 channels to Q.LINK since they don’t have on/off setup in D/R, EXP. When the setting is completed, touch “BACK” icon to return the function page.

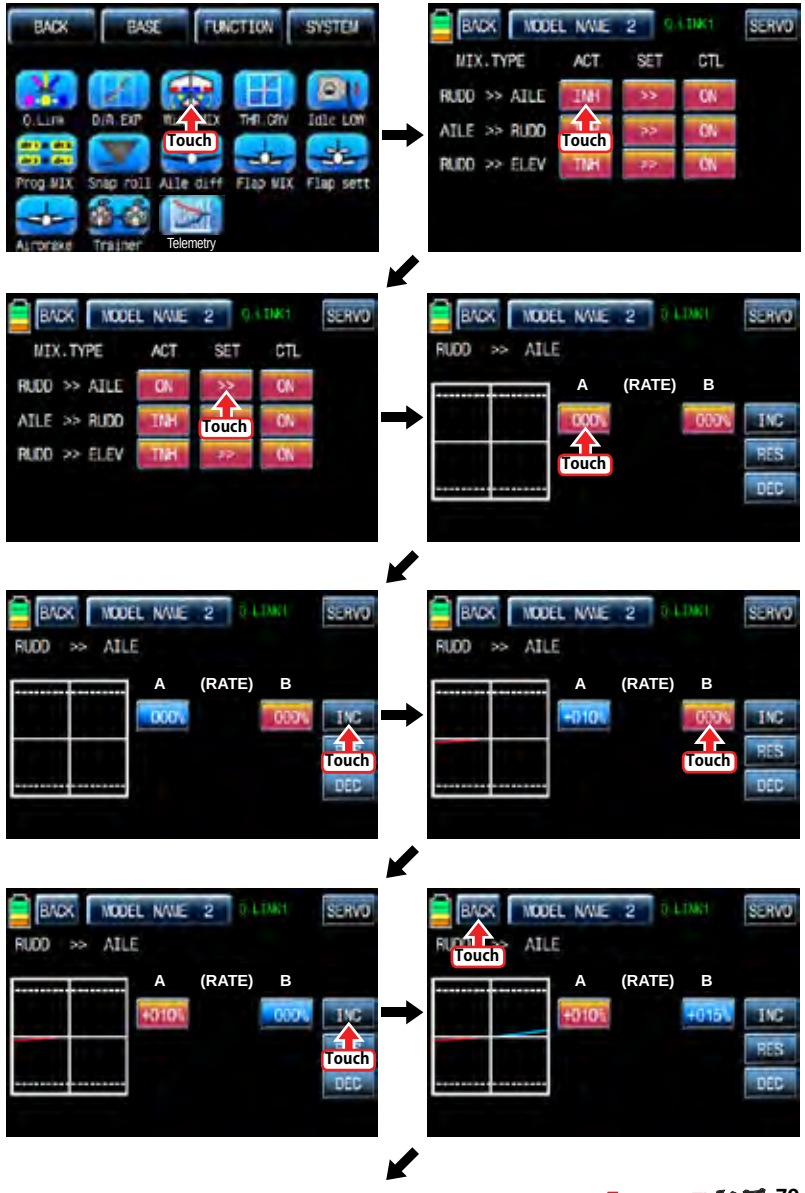

BACK
MODEL NAME 2
SW 6
OFF
Touch
ON
NORMAL
SERVO
C H
AILE
D/R
EXP
CTL
+100%
+035%
SW 6
INC
RES
DEC
Select
NO
CLR
CON.ST
ST 3
POS
000
-084
MODE
DIR
REVERSE
ENT

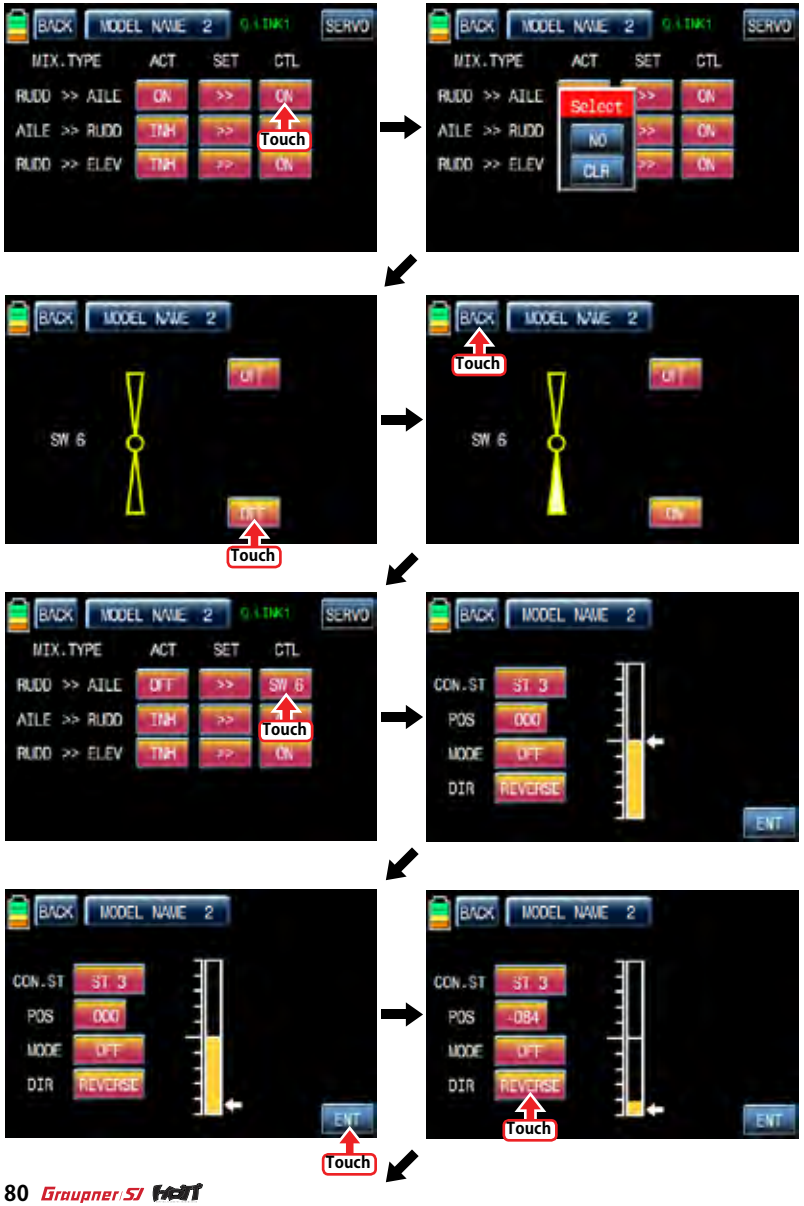
3. Wing MIX

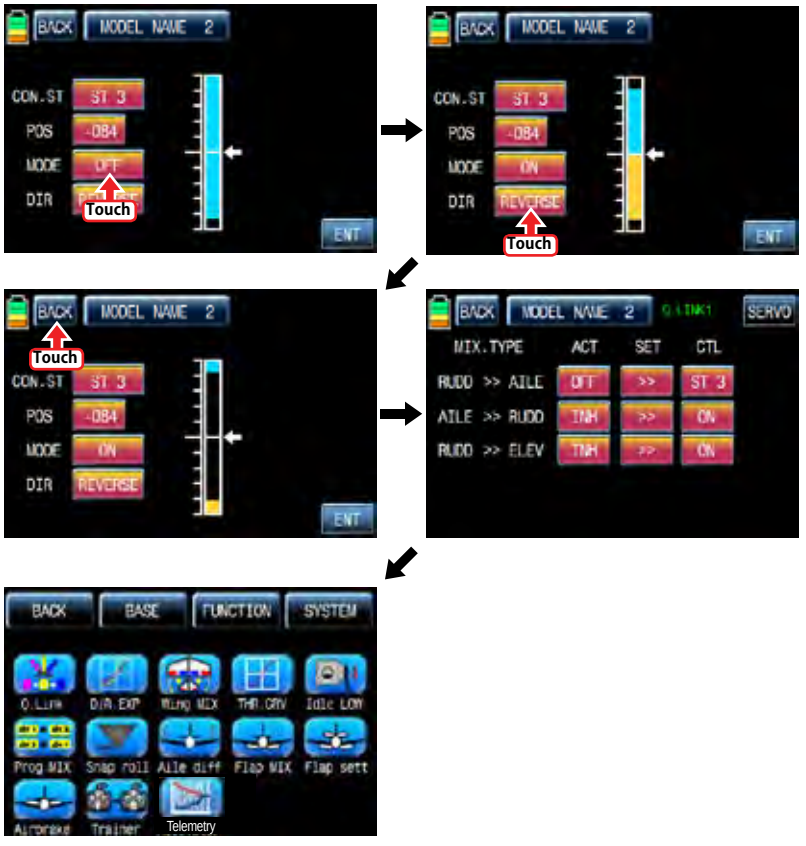
Wing MIX consists of various mixing functions which are essential to fly. There are three types mix, RUDD>>AILE", "AILE>>RUDD", and "RUDD>>ELEV"

In FUNCTION page, touch "Wing MIX" icon to call "Wing MIX" setup page. Touch "INH" icon in "ACT" line to switch to ON and touch ">>" icon in "SET" line to call "SET" page. In "SET" page, you may adjust the travel amount of slave channel for the master channel operation. Touch and activate the values in LEFT and RIGHT line and adjust the mixing value with "INC" and "DEC" buttons. The programmed values are indicated in the left graph. Touch "BACK" icon to return to "Wing MIX" setup page. Now, you need to set CTL function. Touch "On" icon to call "Select" message popup then move the switch with your choice then that switch is designated as on/ off switch and then the switch direction setup page appears. You may select ON or OFF by touching icons. When the switch is moved to the direction of ON, the function is operated. Touch "BACK" icon to return to "Wing MIX" setup page.

If you want to use stick instead of switch for "Wing MIX" function, Touch SW6 in CTL line to call "Select" message popup and move the stick with your choice then that stick is selected as on/ off stick and the stick direction setup page appears. In the direction setup page, move the stick to the position that you can comfortably reach, when the stick reach this position, "Wing MIX" function is off. Touch "ENT" icon on the right bottom then the designated position is marked with the red or blue bar in the graph and the value of set position is displayed in POS. If you touch REVERSE in "DIR" line, all setup is reversed.
To set "ON" or "OFF" at the both end of stick operation range, touch "SINGLE" icon to change to "DUAL" then Wing MIX function is on or off at the both end of stick operation range.
When the setting is completed, touch "BACK" icon to return to the wing mix setup page and to the function page.







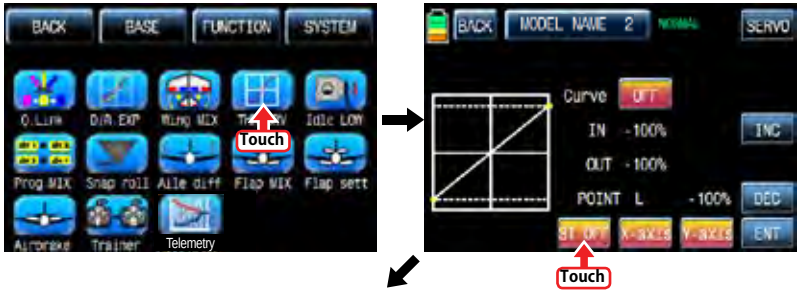
4. THR,CRV

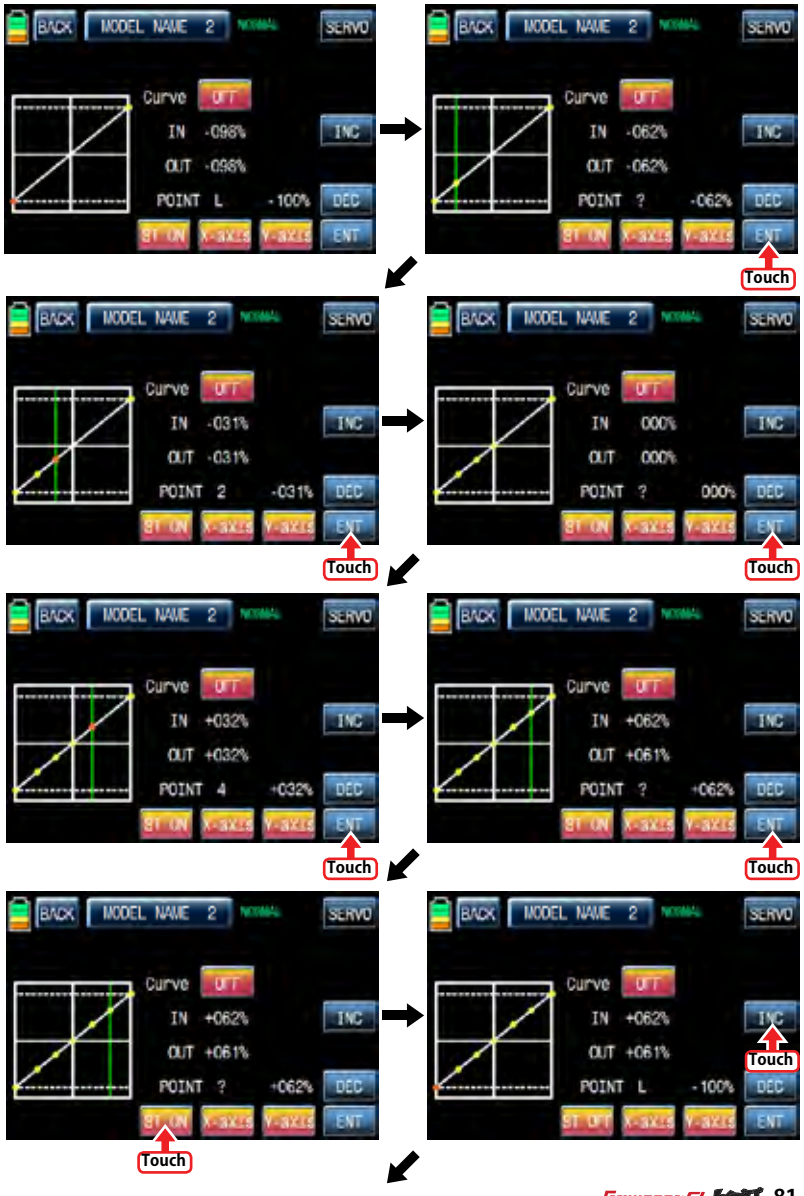
This function adjusts the throttle operation curve in relation to the movement of the throttle stick for each condition

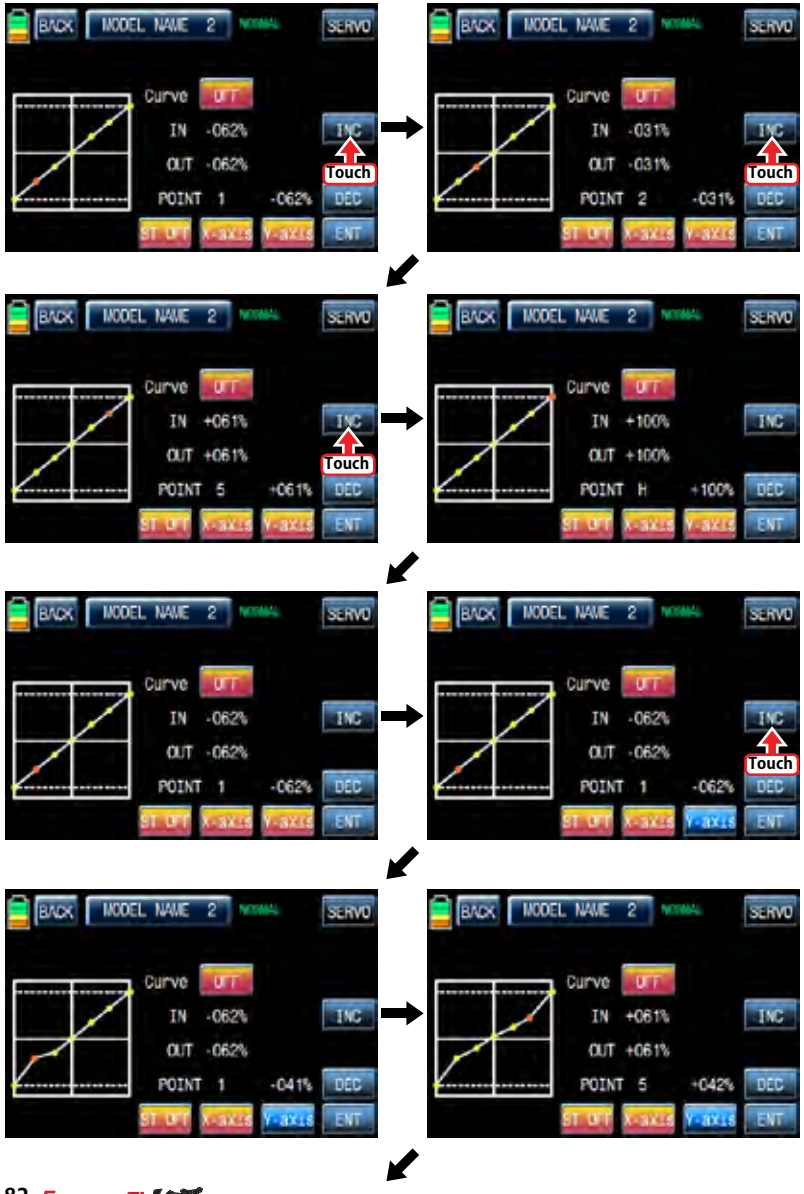
Since the throttle curve is closely related with Q.LINK setup, Q.LINK setup should precede THR.CRV setup.

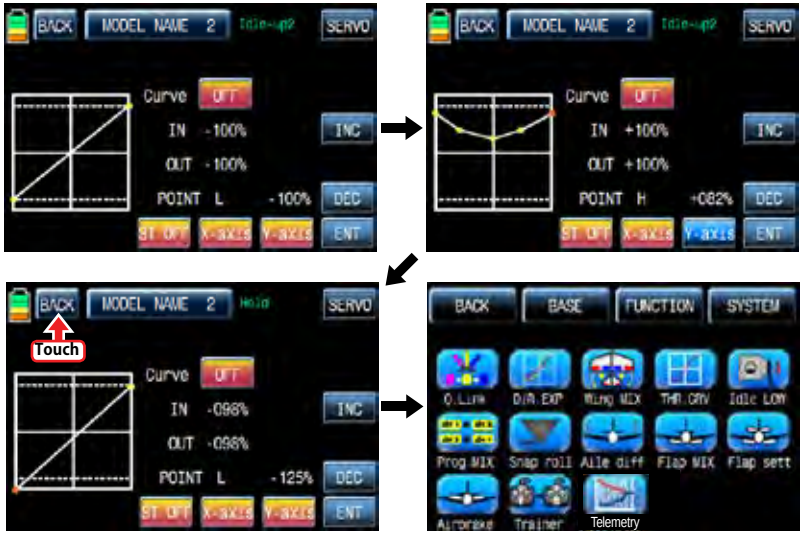
Call Q.LINK setup page and check Q.LINK setup is completed correctly and touch “BACK” icon to return FUNCTION page. (Refer to the manual on Q.LINK setup)

In FUNCTIOPN page, touch “THR.CRV” icon to call THR.CRV setup page. You need to mark the point on graph first and then adjust the operation curve with “DEC”, “INC”, X-axis and Y-axis buttons. Touch “ST OFF” to switch to “ST ON” then the throttle position line appears on graph. Move throttle stick and place the line at the desired position between point “L” and “H” then touch “ENT” icon on the bottom right. Now the new point is marked in graph. You can mark five points between point “L” and “H” in the same way. Touch ST ON” to switch to “ST OFF” and complete the point setup. Now touch “DEC” or “INC” button to select point and touch X-axis or Y-axis to activate and then touch DEC” or “INC” button to adjust the operation curve. Turn on the preset Q.LINK switch then you may adjust the operation curve for every Q.LINK as well. When the setting is completed, touch “BACK” icon to return to the function page.



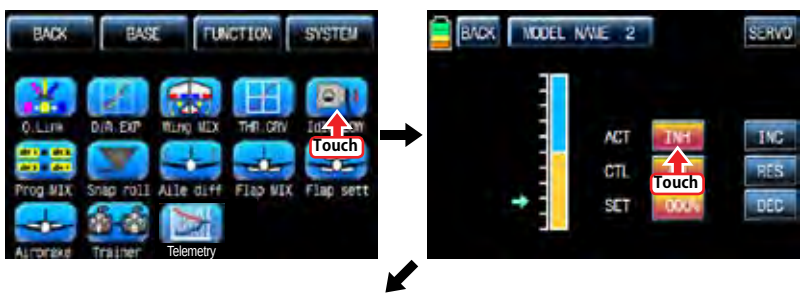


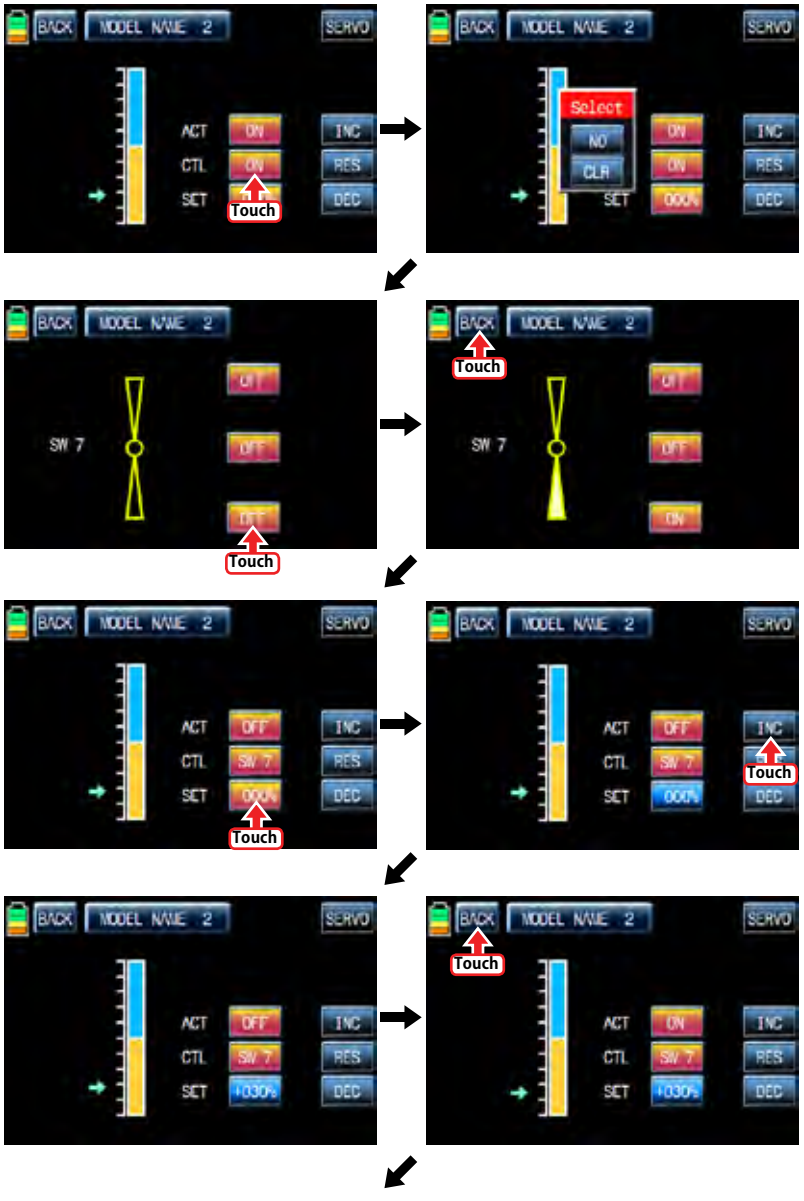




5. Idle LOW

It is used to lower the idle speed of the engine temporarily when airplane lands
In FUNCTIOPN page, touch “Idle LOW” icon to call “Idle LOW” setup page and touch and switch “INH” in ACT line to “ON” then Idle LOW function is activated. Touch “ON” in CTL line to call “Select” message popup then move the switch with your choice then that switch is designated as on/ off switch and then the switch direction setup page appears. You may select ON or OFF by touching icons. When the switch is moved to the direction of ON, the function is operated. Touch “BACK” icon to return to Idle LOW setup page. Now, you need to set the operation value of Idle LOW. Touch and activate the value in SET line and set the desired value with INC and DEC buttons. Touch “BACK” icon to return to FUNCTION page
NOTICE: After setup Idle LOW, make sure to check the arrow direction of throttle channe





6. Prog.MIX

Prog.MIX function is used to mix the different channels for diverse purpose. We recommend you to use the same “On” switch with the one of Q.LINK. You may set the different program mix function for each Q.LINK condition.
8 MIXs are available. The mixing method introduced here is divided into 2 type, liner mixing type and curve mixing type. 1~5 MIXs are liner mixing type and 6~8 MIX is curve mixing type.

6-1. Liner mixing type

In FUNCTION page, touch “Prog.MIX” icon to call the prog.mix page. Touch “INH” icon in ACT line to switch to “ON” and touch “NONE” in MST line to call the mixing channel setup page. Touch and activate “NONE” icon and select the desired channel for the master by touching. Now, touch and activate the left “NONE” icon, it is for Slave channel, and select the desired channel for the slave by touching. Touch “BACK” icon to return to Prog.MIX setup page. Touch >> icon in SET line to call the program mixing setup page. Now, you need to set CTL function.

- CTL setup with a switch

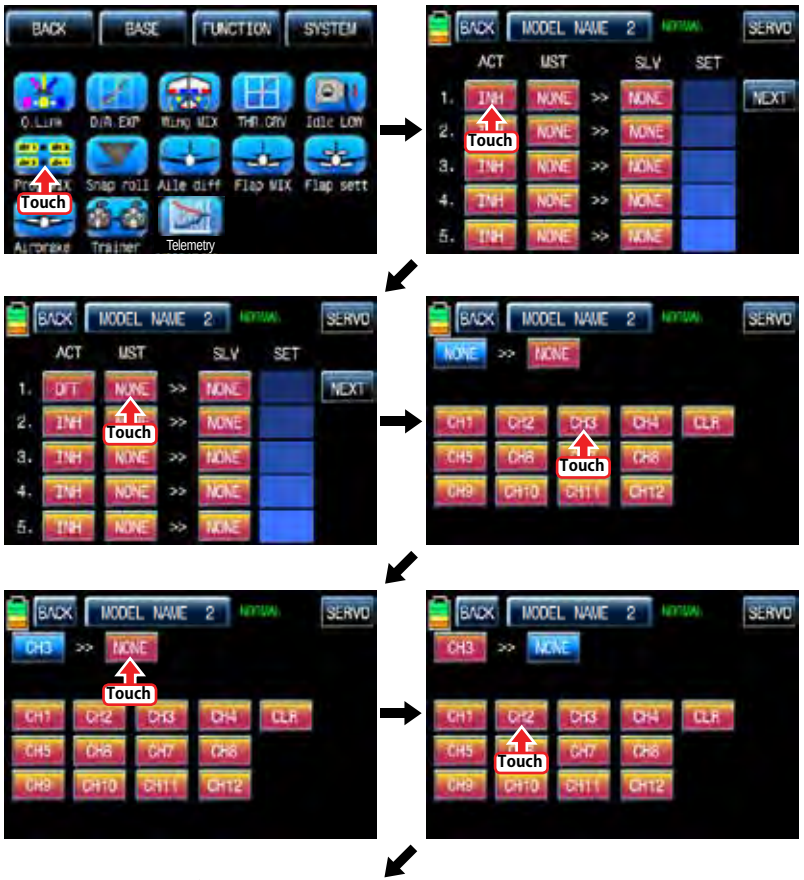
Touch “NULL” icon in CTL line to call “Select” message popup then move the switch with your choice then that switch is designated as on/ off switch and then the switch direction setup page appears. You may select ON or OFF by touching icons. When the switch is moved to the direction of ON, the function is operated. Touch “BACK” icon to return to Prog.MIX setup page.

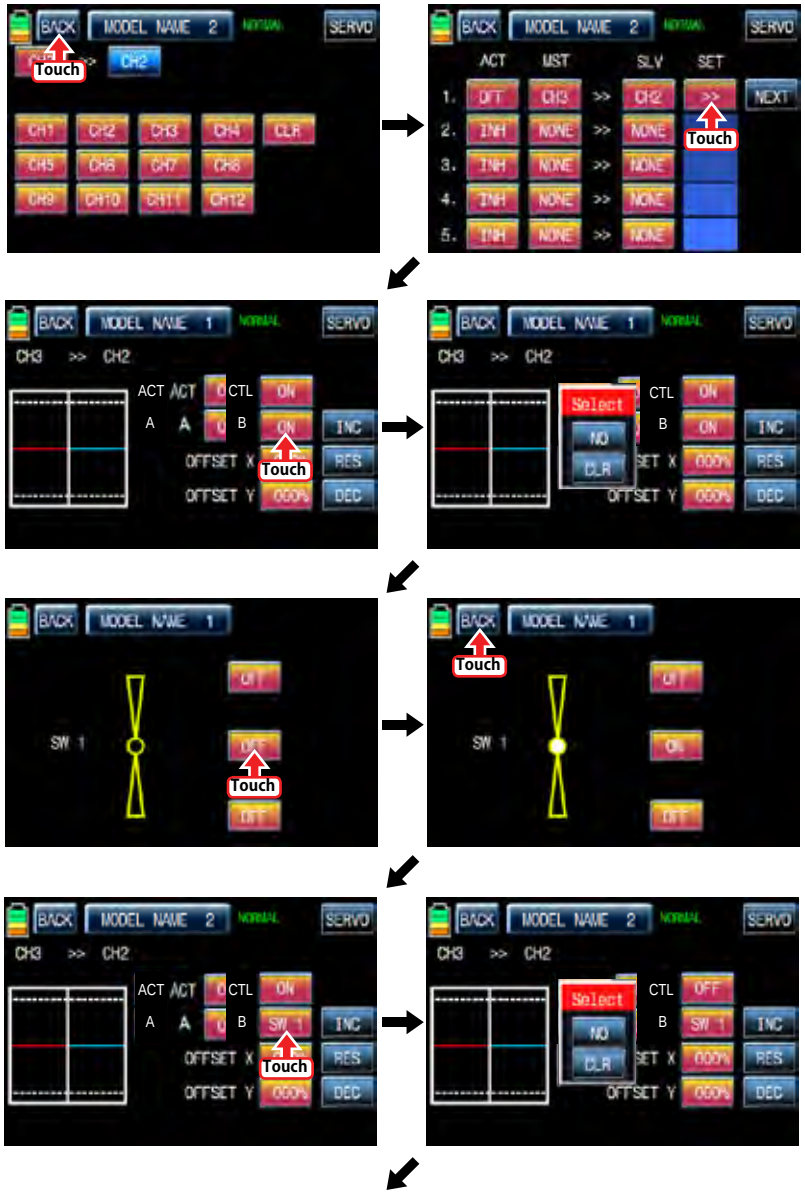
- CTL setup with a stick

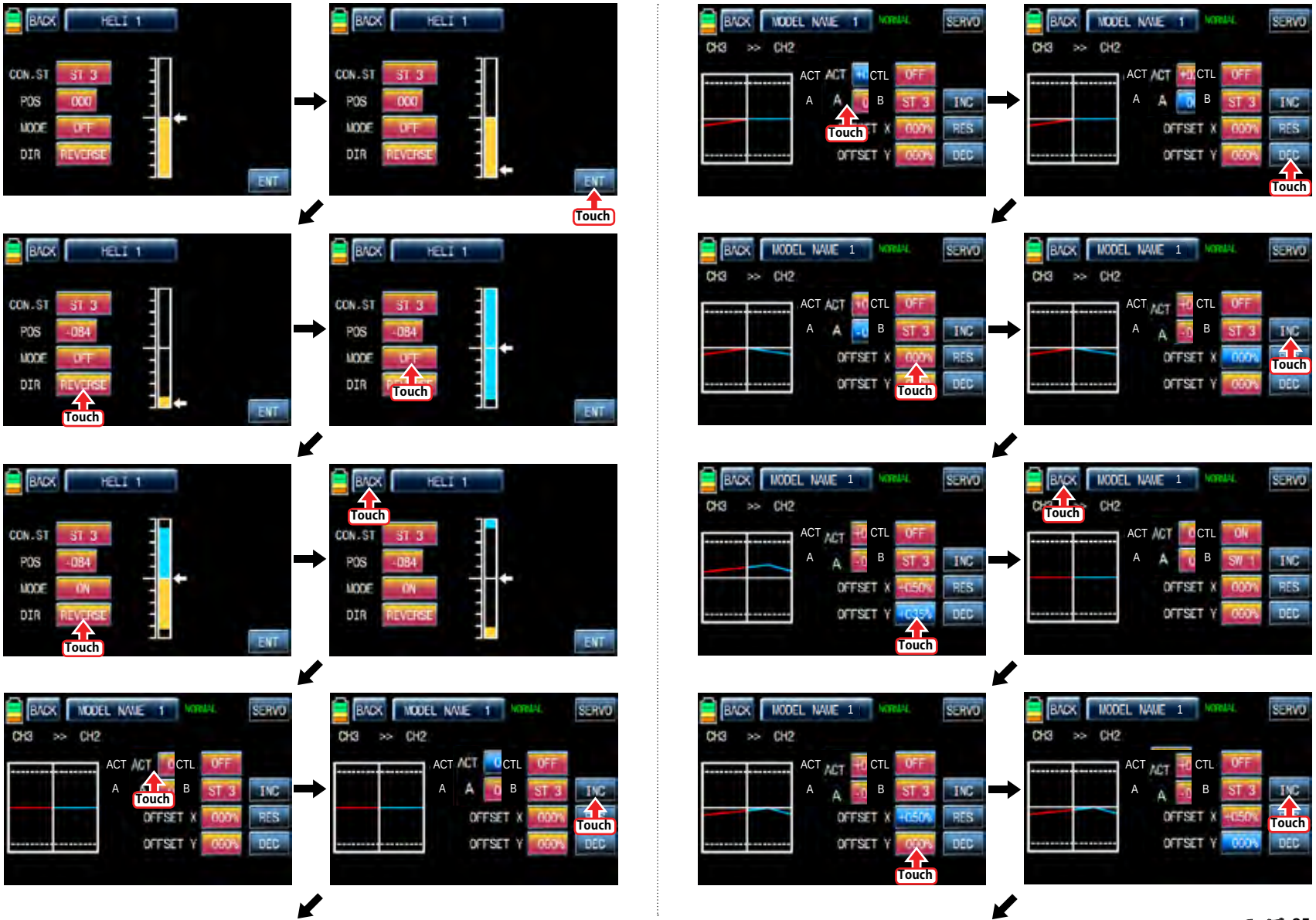
Touch “SW6” icon in CTL line to call “Select” message popup then move the stick with your choice then that stick is designated as on/ off stick and then the stick direction setup page appears. Move the stick to the position that you can comfortably reach, when the stick reach this position, Prog.MIX function is off.

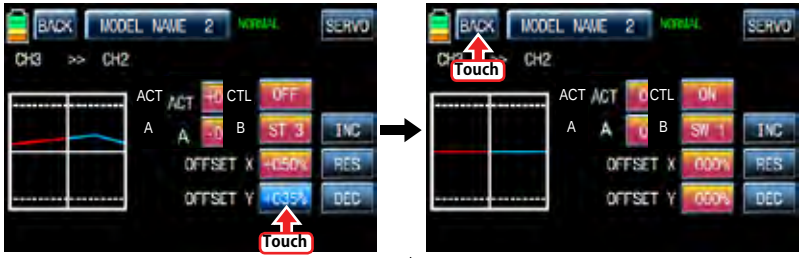
Touch “ENT” icon on the right bottom then the designated position is marked with the red or blue bar in the graph and the value of set position is displayed in POS. If you touch REVERSE in “DIR” line, all setup is reversed. To set “ON” or “OFF” at the both end of stick operation range, touch “SINGLE” icon to switch to “DUAL” then Prog.MIX function is on or off at the both end of stick operation range. Touch “BACK” icon to return to the program mixing setup page.

After CTL setup, you need to adjust the program mix operation value. Since the throttle channel is designated to the master channel, the operation value is displayed in A and B. Touch and activate the values in blue to adjust the value with “DEC” and “INC” buttons, the setup value is displayed in graph. OFFSET X/Y can be set the same method and the setup value is displayed as well.






BACK
HELI 1
CON.ST
ST 3
POS
000
MODE
OFF
DIR
REVERSE
ENT
Touch
-084
ON
MODEL NAME 1
NORMAL
SERVO
CH3 >> CH2
ACT
CTL
A
B
INC
RES
DEC
OFFSET X
OFFSET Y
SW 1



6-2. Curve mixing type

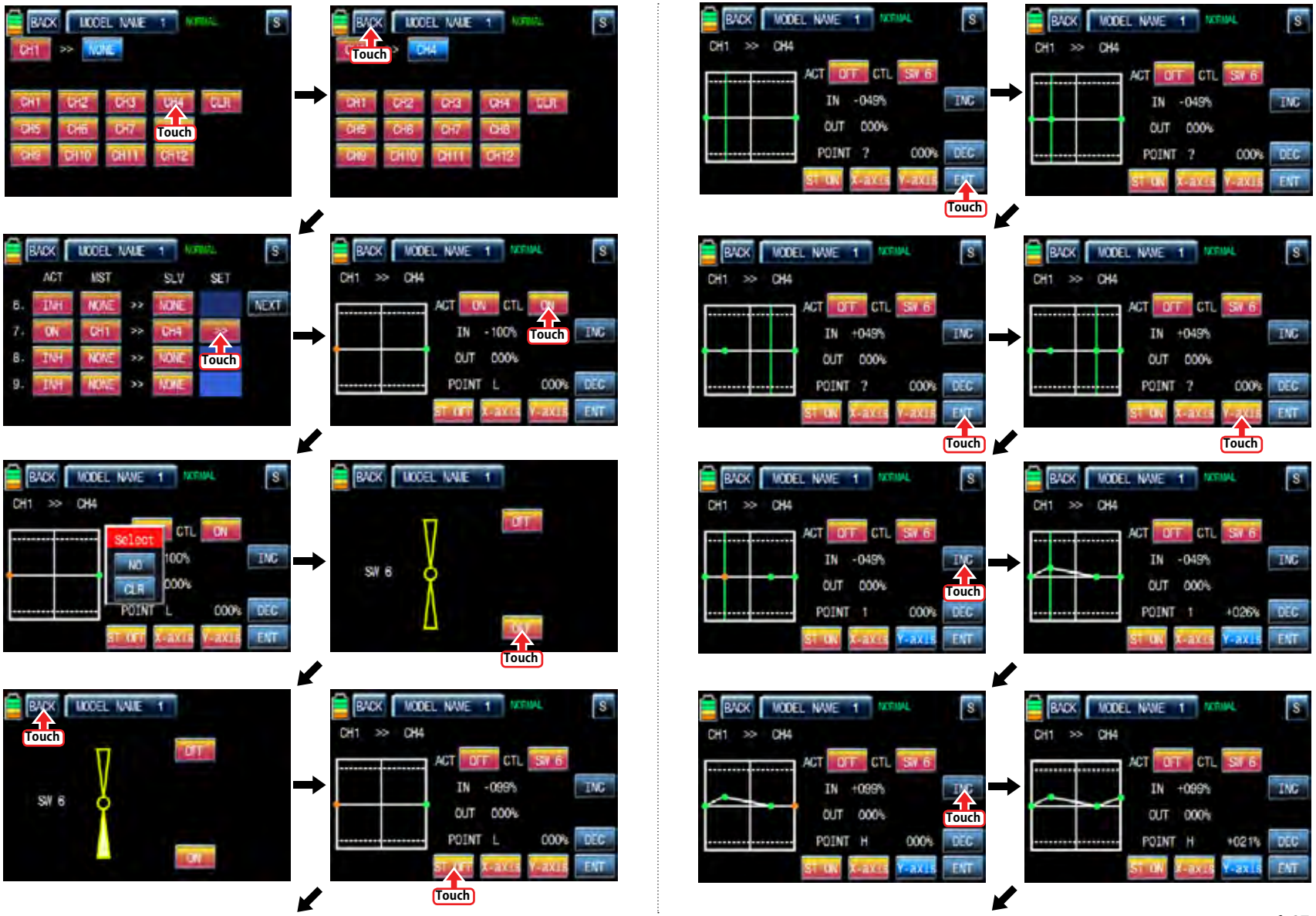
In the prog.mix page, touch “NEXT” icon to call the next page and touch “INH” icon in the cross line of NO7 and ACT to switch to “ON”. Touch “NONE” in MST line to access the channel selection page and touch and activate “NONE” icon to select the desired channel of MST and SLV. Touch “BACK” icon to return to the prog.mix page. Touch “>>” icon to call the program mixing setup page. Now, you need to set CTL function.

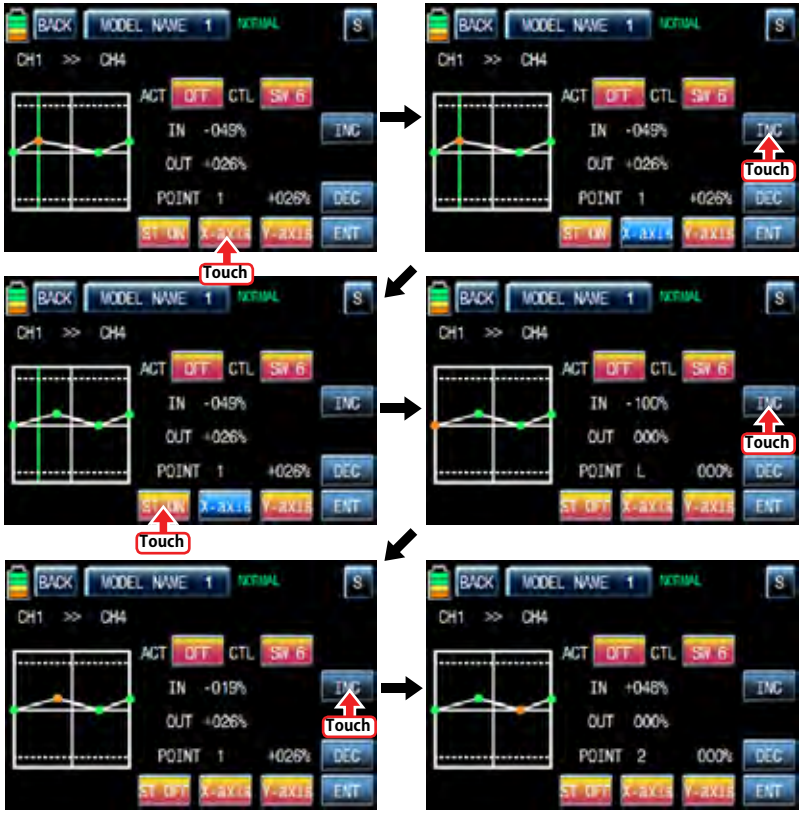
- CTL setup with a switch
Touch “ON” icon in CTL line to call “Select” message popup then move the switch with your choice then that switch is designated as on/ off switch and then the switch direction setup page appears. You may select ON or OFF by touching icons. When the switch is moved to the direction of ON, the function is operated. Touch “BACK” icon to return to the program mixing setup page.

- CTL setup with a stick
Hoping that you would refer the explanation as explained above

Here, you need to set the operation value, “L” and “H” points are set by default and you need to mark 5 points between “L” and “H” on graph first and then adjust the operation curve with “DEC”, “INC”, X-axis and Y-axis buttons. Touch “ST OFF” icon to switch to “ST ON” then the blue line appears on graph. Move the designated switch or stick to place the line at the desired position then touch “ENT” icon on the bottom right. Now the new point is marked in graph. You may set five points in your favorable position.

Touch “PITT >> RUDD” icon in the function page to call PIT >> RUDD setup page. You need to mark the point on graph first and then adjust the operation curve with “DEC”, “INC”, X-axis and Y-axis buttons. Touch “ST OFF” icon to switch to “ST ON” then the pitch position line appears on graph. Move throttle stick and place the line at the desired position between point “L” and “H” then touch “ENT” icon on the bottom right. Now the new point is marked in graph. Touch ST ON” to switch to “ST OFF” and complete the point setup. Now touch “DEC” or “INC” button to select point and touch X-axis or Y-axis to activate and then touch DEC” or “INC” button to adjust the operation curve.

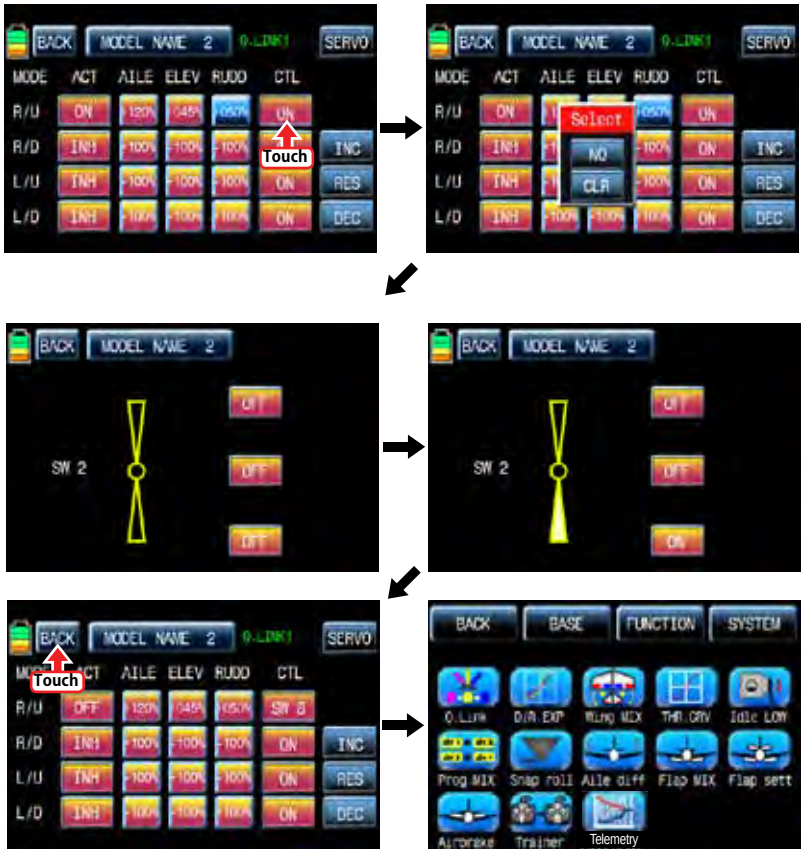

BACK
MODEL NAME 1
NORMAL
S
CH1 >> NONE
CH1 CH2 CH3 CH4 CLR
CH5 CH6 CH7 CH8
CH9 CH10 CH11 CH12
Touch
CH1 >> CH4
ACT INH MIX SLV SET
6. INH NONE >> NONE
7. ON CH1 >> CH4
8. INH NONE >> NONE
9. INH NONE >> NONE
NEXT
ACT ON CTL ON
IN -100%
OUT 000%
POINT L 000%
INC
DEC
ST ON
X-AXIS
Y-AXIS
ENT
Select
NO
CLR
SW 6
OFF
ON
ACT OFF CTL SW 6
IN -049%
OUT 000%
POINT ? 000%
IN +049%
POINT 1 +026%
IN -099%
POINT H +021%



7. Snap roll

It is used to select the switch and adjust the value of AILE, ELEV, RUDD channels for the snap roll function. Four snap roll directions can be set for your convenience.

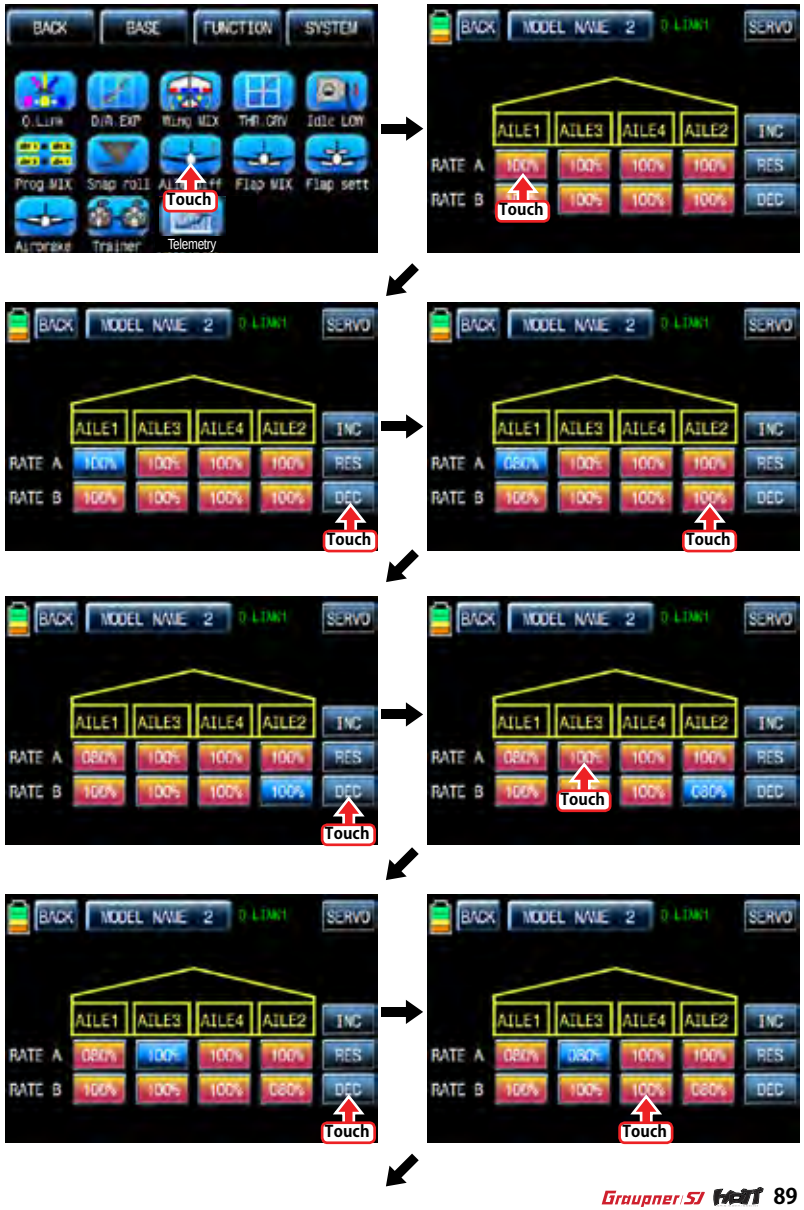
In function page, touch “Snap roll” icon to call the snap roll setup page. Touch “INH” icon in ACT line to switch to ON. Touch and activate the value in AILE, ELEV and RUDD line to adjust the values with “INC” and “DEC” buttons. Touch “NULL” icon in CTL line to call “Select” message popup then move the switch with your choice then that switch is designated as on/off switch and then the switch direction setup page appears. You may select ON or OFF by touching icons. When the switch is moved to the direction of ON, the function is operated. Touch “BACK” icon to return to Snap roll setup page and to FUNCTION page

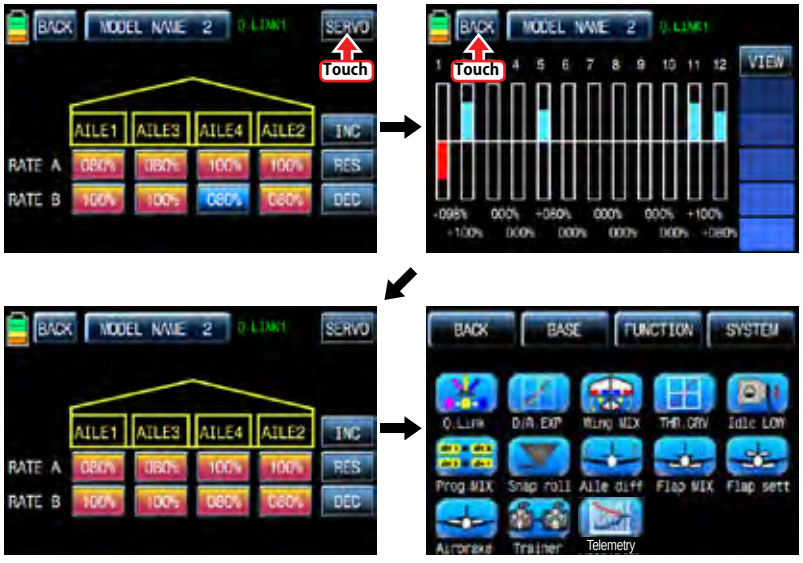


8. Aile diff

This function decreases the amount an aileron moves down without affecting the amount the other aileron moves up. This can decrease adverse yaw (right or left movement of the aircraft nose) tendencies during roll maneuvers.

Touch “Aile diff” icon to call “Aile diff” setup page. The setup options are different for each wing type. In “Aile diff” setup page, touch and activate the values in “RATE A” and “RATE B” lines to adjust them with INC and DEC buttons. We recommend setting accurately over the flight. Now, touch “Servo” icon on the left top to call SERVO VIEW page. In this page, you may check the value for the aileron stick movement in a graph. Touch “BACK” icon to return to the aile diff setup page and the function page.



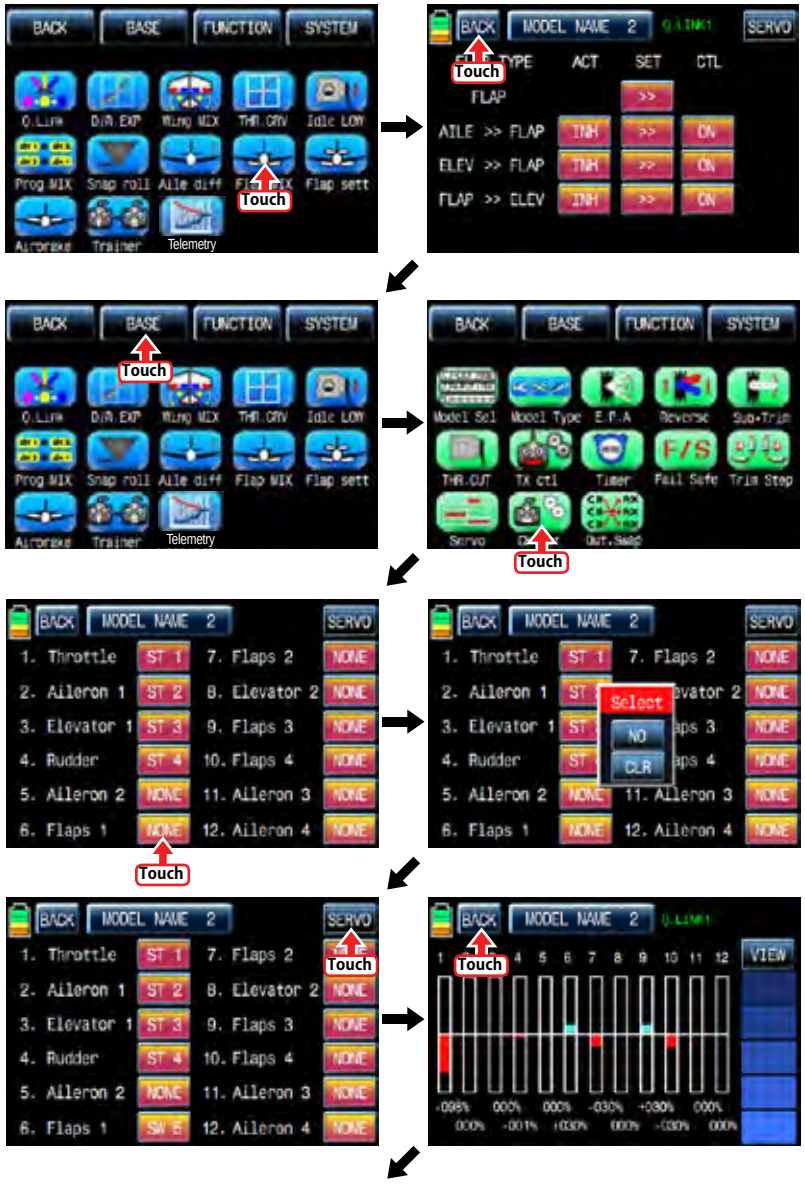


9. Flap MIX

It consists of 4 mixing types, “FLAP”, ”AILE>>FLAP”, “ELEV>>FLAP”, and “FLAP>>ELEV”.

9-1. FLAP

This function is used to adjust the flap angle to increase or decrease airplane lift
To setup the flap function, you need to designate on/off control key such as switch, stick and volume. When you move the control key, the flap function is operated.
Touch “CH SET” in BASE page to call “CH SET” setup page. Touch “NONE” icon in FLAP 1 line to pop up “Select” message. Move the control key with your choice then that control key is designated as on/ off key. Now, touch “SERVO” icon in the right top to call the servo view page. The default value, 30%, for the travel amount of servo is displayed in the graph and this function value can be adjusted. To adjust the function value, touch “Flap MIX” icon in the function page to call Flap Mix page and touch “>>” icon in SET line to call the flap setup page. Touch and activate the function value to adjust with INC and DEC buttons. Now, touch “SERVO” icon again to call the servo view page then you may check the setup value in this page. After setup, touch “BACK” icon to return to Flap MIX page.



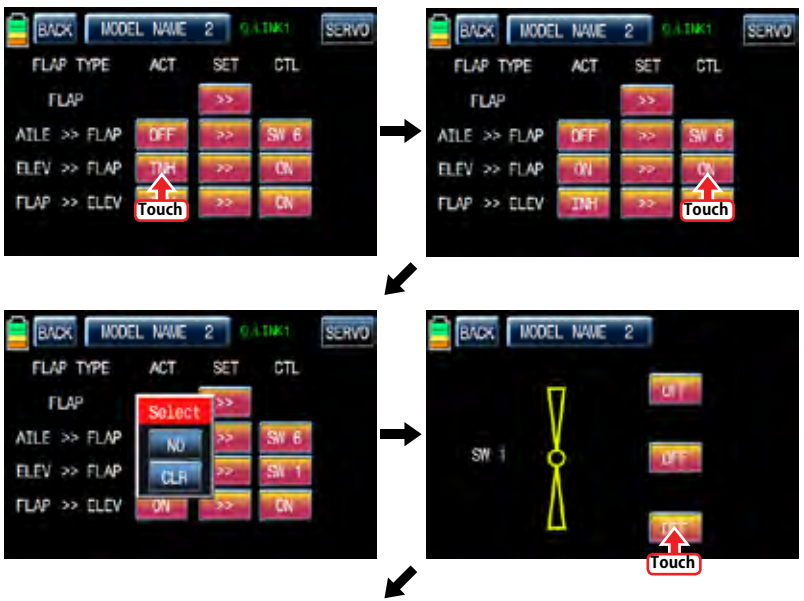
9-2. AILE >> FLAP

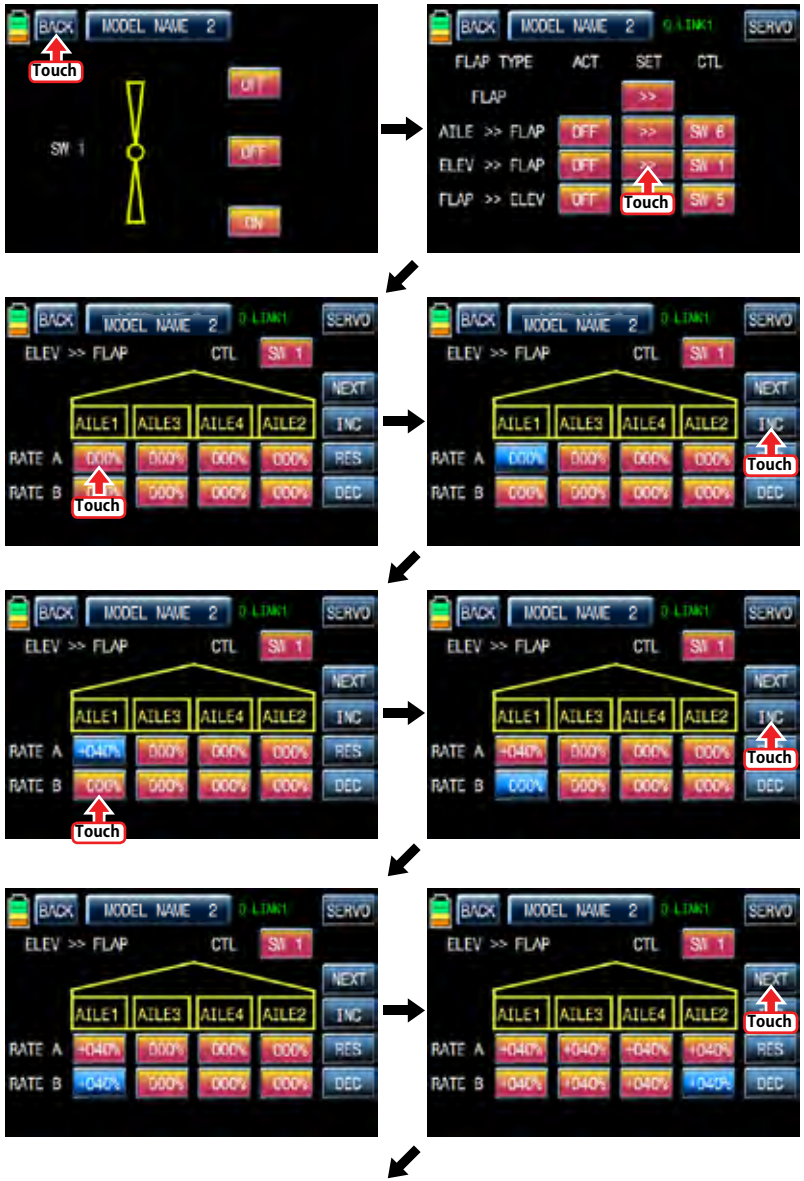
This mixing allows the entire trailing edge of the wing (aileron and flap) to operate as ailerons. When active, as aileron is applied the flaps also move so that the airplane rolls faster. In FLAP MIX page, touch “INH” icon in ACT line to switch to “ON” then AILE >>FLAP function is activated. Touch “ON” in CTL line to call the “Select” message popup and move the switch or stick or volume with your choice then that switch or stick or volume is designated as on/ off key and then the key direction setup page appears. You may select ON or OFF by touching icons. When the key is moved to the direction of ON, the function is operated. Touch “BACK” icon to return to FLAP MIX page. Touch “>>” icon in “SET” and “AILE >> FLAP” cross line to call “AILE >> FLAP” setup page. Touch and activate the values in blue and adjust them with INC and DEC buttons. When the setup is completed, touch SERVO icon on the top right to call SERVO page. You may check the setup value for “AILE >> FLAP”.


BACK
MODEL NAME 2
SERVO
FLAP TYPE
ACT
SET
CTL
FLAP
AILE >> FLAP
ELEV >> FLAP
FLAP >> ELEV
INH
ON
Touch
Select
NO
CLR
SW 6
AILE >> FLAP
CTL
FLAP1
FLAP3
FLAP4
FLAP2
INC
RES
DEC
RATE A
RATE B
VIEW

9-3. ELEV >> FLAP

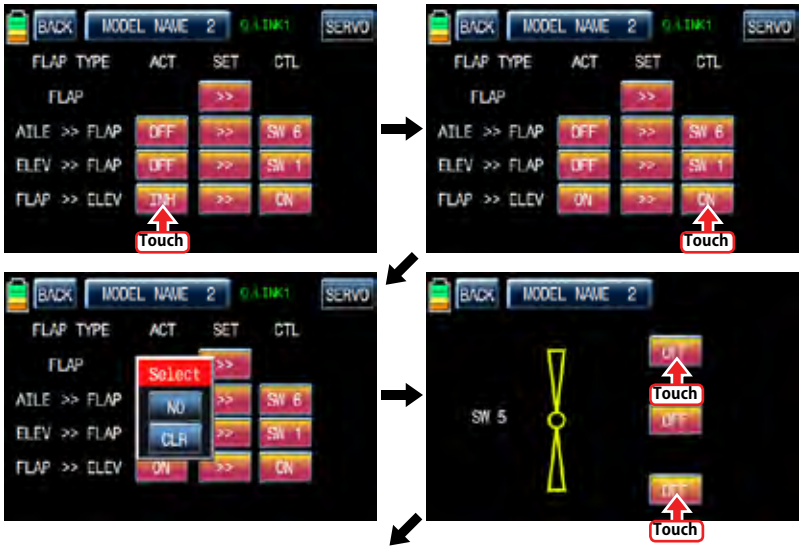
This mixing creates more lift of airplane, allowing a tighter turn. The entire trailing edge of the wing (aileron and flap) operates as flaps when elevator is applied. Touch INH icon in ACT line to switch to “ON” then ELEV >> FLAP is activated. Touch “ON” in CTL line to call the “Select” message popup and move the switch or stick or volume with your choice then that switch or stick or volume is designated as on/ off key and then the key direction setup page appears. You may select ON or OFF by touching icons. When the key is moved to the direction of ON, the function is operated. Touch “BACK” icon to return to FLAP MIX page. Touch “>>” icon in “SET” and “ELEV >> FLAP” cross line to call “ELEV >> FLAP” setup page. You may call “ AILE” and “FLAP” setup page with NEXT button in the top right. Touch and activate the values in blue and adjust them with INC and DEC buttons. When the setup is completed, touch SERVO icon on the top right to call SERVO page. You may check the setup value for “ELEV >> FLAP”.

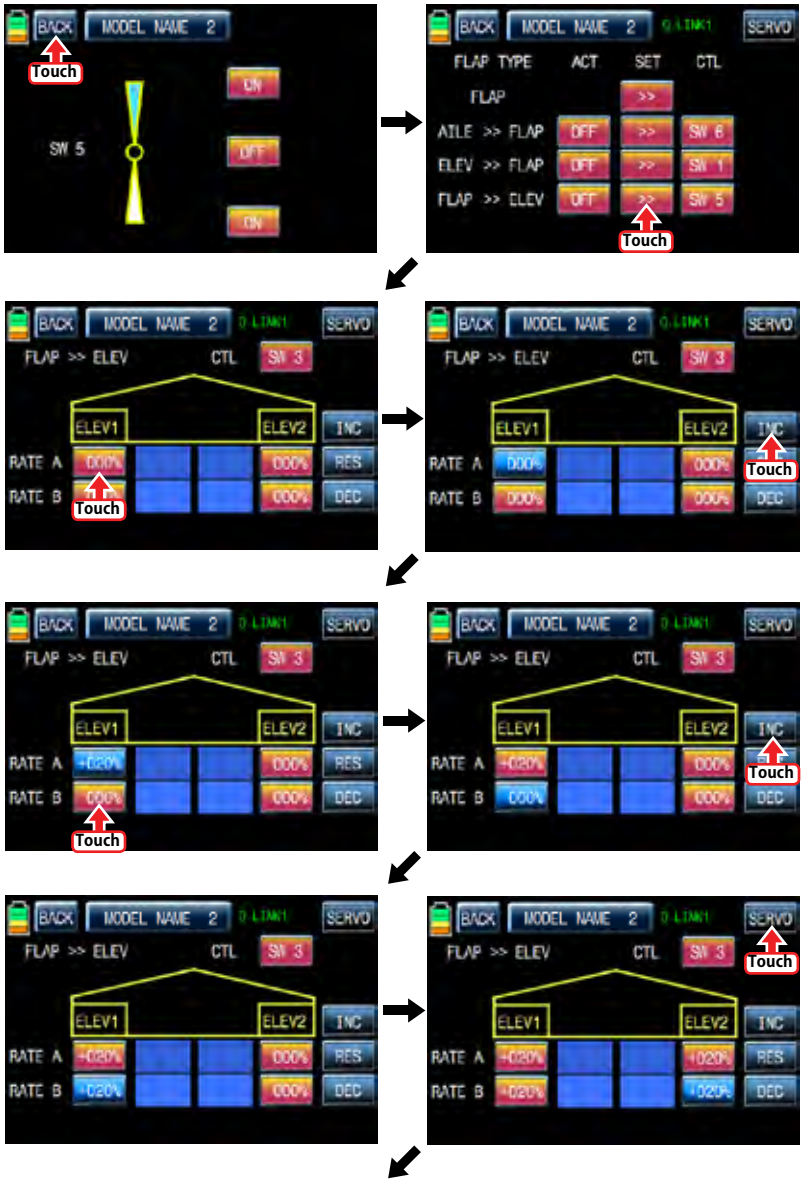


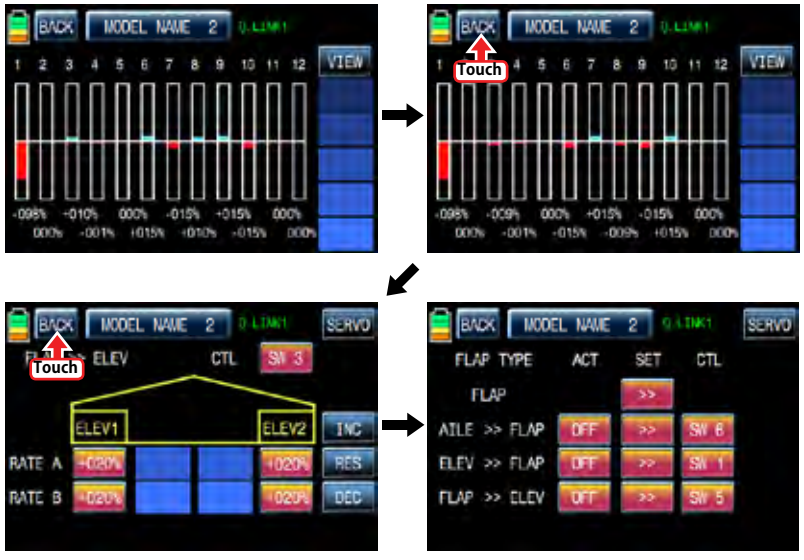


9-4. FLAP >> ELEV

This mixing prevents the change of the nose of airplane that occurs when FLAP is applied by operating elevator In FLAP MIX page, touch “INH” icon in ACT line to switch to “ON” then FLAP >> ELEV function is activated. Touch “ON” in CTL line to call the “Select” message pop-up and move the switch or stick or volume with your choice then that switch or stick or volume is designated as on/ off key and then the key direction setup page appears. You may select ON or OFF by touching icons. When the key is moved to the direction of ON, the function is operated. Touch “BACK” icon to return to FLAP MIX page. Touch “>>” icon in “SET” and “FLAP >> ELEV” cross line to call “FLAP >> ELEV” setup page. Touch and activate the values in blue and adjust them with INC and DEC buttons. When the setup is completed, touch SERVO icon on the top right to call SERVO page. You may check the setup value for “FLAP >> ELEV”. The preset set “FLAP” and the set “FLAP >> ELEV” are activated at the same time when SW5 which was set in “FLAP >> ELEV” is set to “ON”.



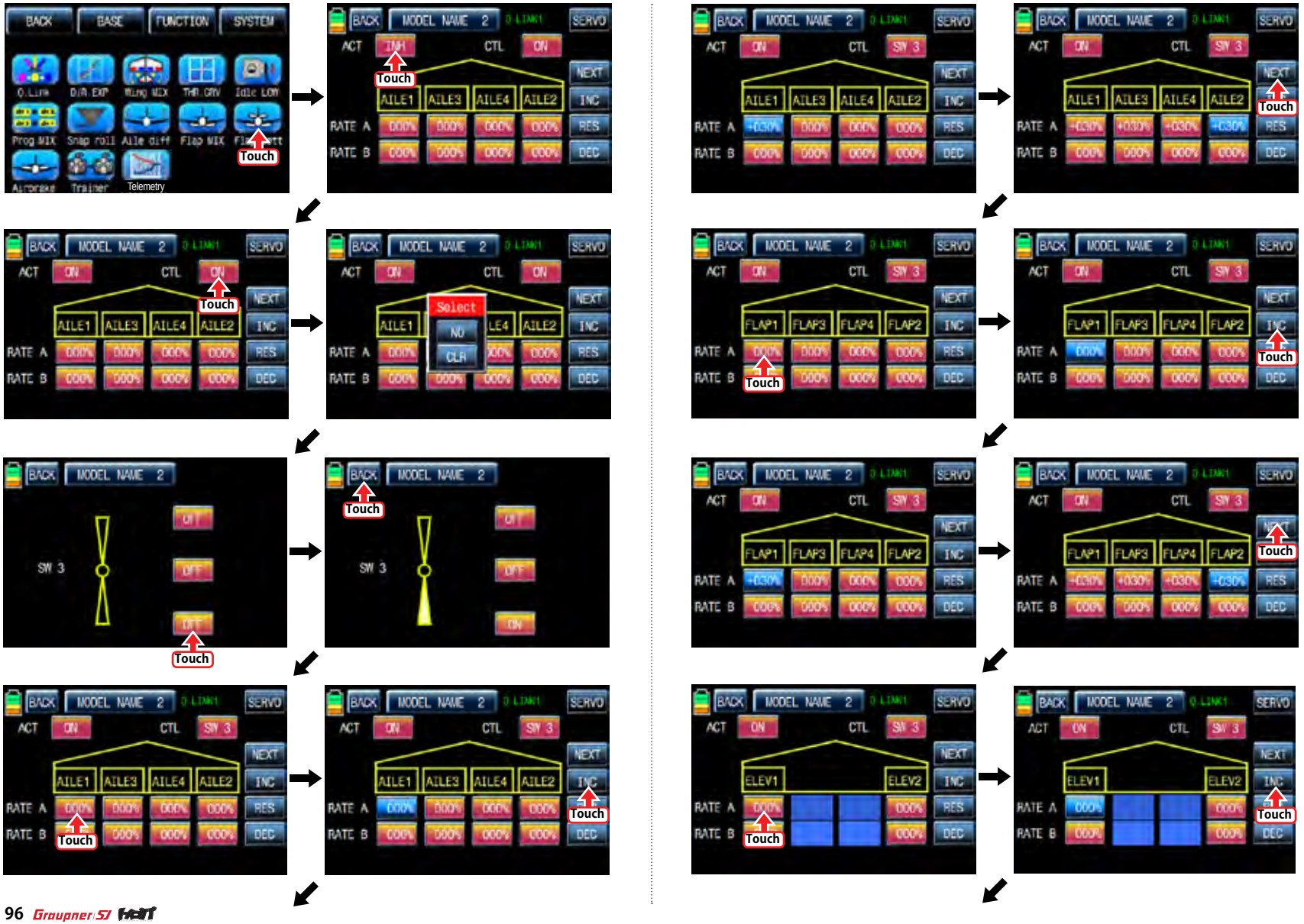


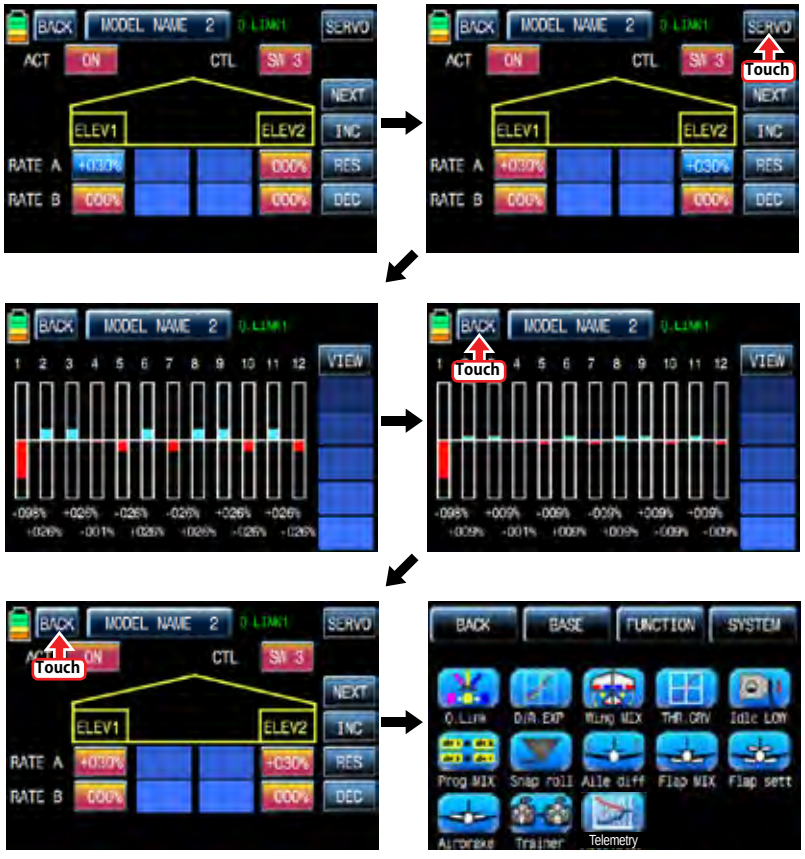


Flap mix Functions can be adjusted for each Q.LINK condition.

10. Flap sett (Airplane, Gilder)

This mixing allows that the aileron, flap and elevator setups are applied at the same time by operating a switch.
Touch “Flap sett” icon to access to the “Flap sett” setup page. The first page is AILE setup and you may access to FLAP and ELEV setup page by touching “NEXT” icon in the top right. Touch “INH” icon in ACT line to switch to “ON” and touch “ON” in CTL line to call the “Select” message popup. Move the switch or stick or volume with your choice then that switch or stick or volume is designated as on/ off key and then the key direction setup page appears. You may select ON or OFF by touching icons. When the key is moved to the direction of ON, the function is operated. Touch “BACK” icon to the previous page then touch and activate the values in blue and adjust them with “INC” and “DEC” buttons. After performing the programming setup of AILE and FLAP and ELEV in turn, touch SERVO icon on the top right to call SERVO page. You may check the setup value for Flap sett. When Tx and Ctl are set to DV1, DV2, DV3, DV4, SL1, and SL2 in advance, the setup values are applied by operating “DV” or “SL” while flying

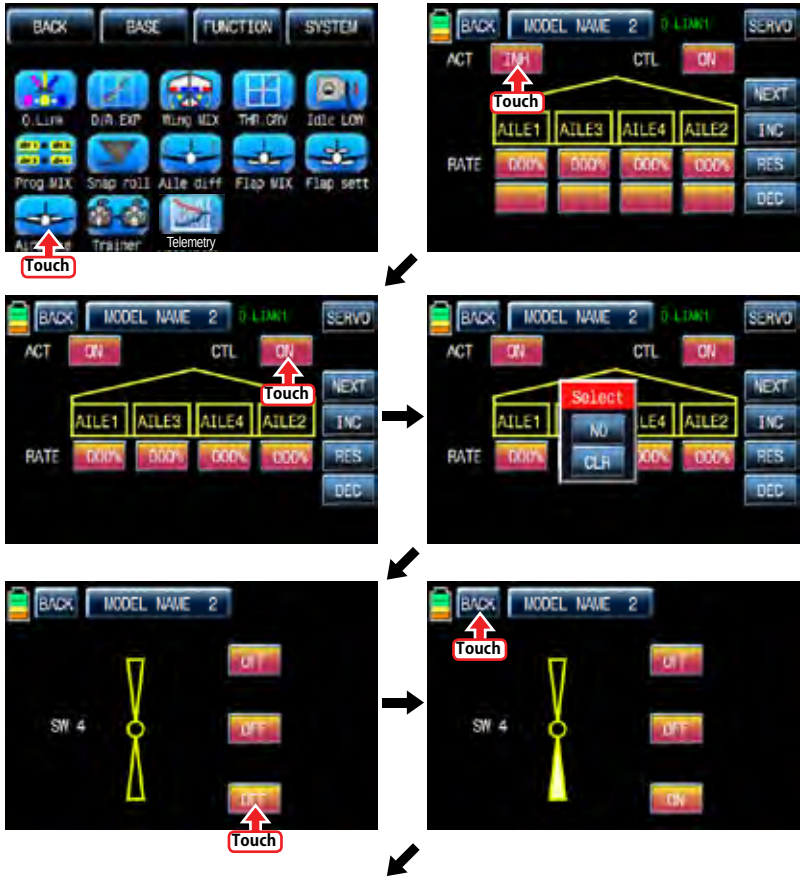

BACK
BASE
FUNCTION
SYSTEM
Q.Link
D/R EXP
Wing MIX
THR CRV
Idle DOWN
Prog MIX
Snap roll
Aile diff
Flap MIX
Aileron
Trainer
Telemetry
Touch
MODEL NAME 2
Q.LINK1
SERVO
ACT
CTL
NEXT
INC
RES
DEC
RATE A
RATE B
AILE1
AILE3
AILE4
AILE2
Select
NO
CLR
SW 3
ON
OFF
FLAP1
FLAP3
FLAP4
FLAP2
ELEV1
ELEV2

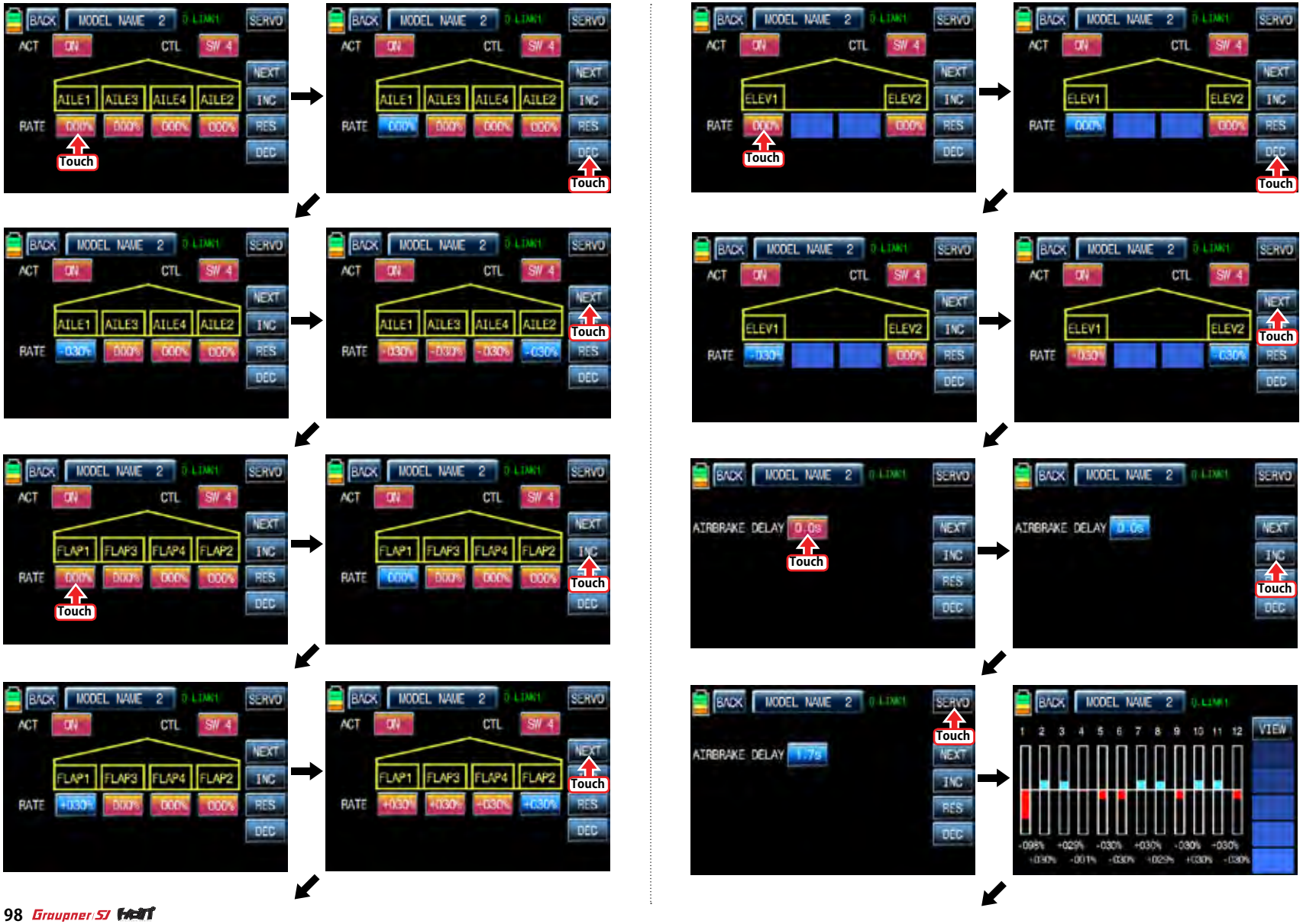


11. Airbrake (Airplane)

This mixing is used when the airplane is need to land or descent vertically. Airbrake can be set by AILE, FLAP and ELEV.

Touch “Airbrake” icon in the function setup page to call the airbrake setup page. The first page is AILE setup and you may access to FLAP, ELEV and AIRBRAKE DELAY setup page by touching “NEXT” icon in the top right. Touch “INH” icon in ACT line to switch to “ON” and touch “ON” in CTL line to call the “Select” message popup. Move the switch or stick or volume with your choice then that switch or stick or volume is designated as on/ off key and then the key direction setup page appears. You may select ON or OFF by touching icons. When the key is moved to the direction of ON, the function is operated. Touch “BACK” icon to the previous page then touch and activate the values in blue and adjust them with “INC” and “DEC” buttons. After the programming setup of FLAP, ELEV and AIRBRAKE DELAY in turn, touch SERVO icon on the top right to call SERVO page. You may check the setup value for Airbrake.

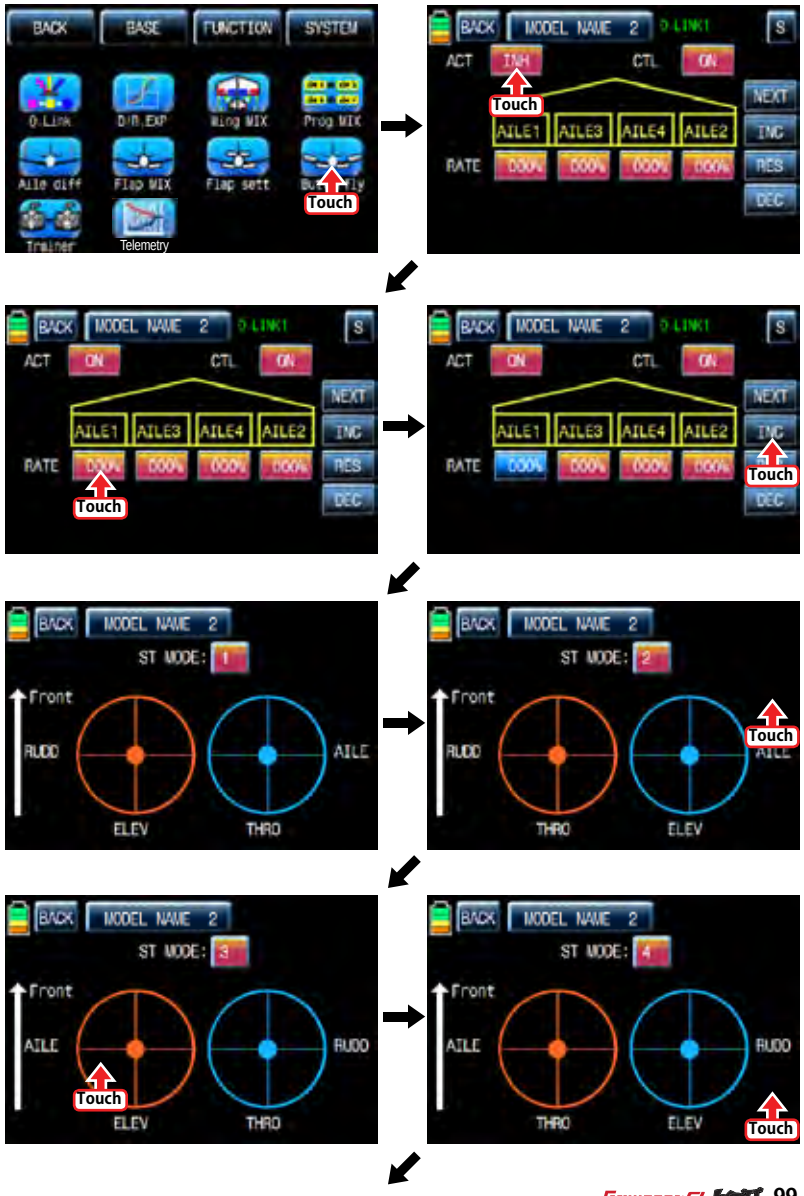


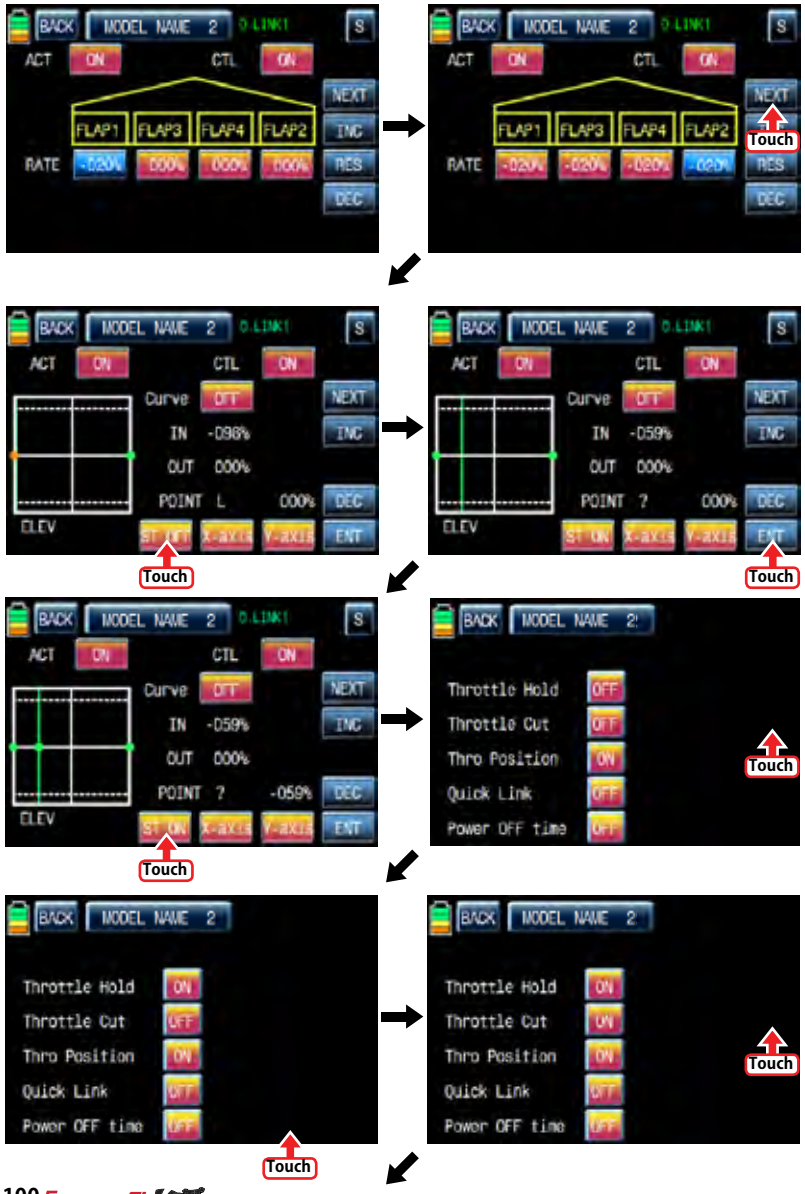

BACK
MODEL NAME 2
SERVO
ACT
ON
CTL
SW 4
NEXT
INC
RES
DEC
AILE1
AILE3
AILE4
AILE2
RATE
Touch
ELEV1
ELEV2
FLAP1
FLAP3
FLAP4
FLAP2
AIRBRAKE DELAY
VIEW

12. Butterfly (Glider)

It is used in glider type only. This function allows powerful brake operation by simultaneously raising the left and right ailerons and lowering the flaps. Butterfly produces an extremely efficient landing configuration by flying at a slower speed.
CAUTION: We recommend that you do several tests on high altitude to make the best use of this function.

For the setup of butterfly function, touch “Butterfly” icon to access to the Butterfly setup page. Touch “INH” icon to switch to “ON” to call the “Select” message popup and move the switch or stick or volume with your choice then that switch or stick or volume is designated as on/ off key and then the key direction setup page appears. You may select ON or OFF by touching icons. When the key is moved to the direction of ON, the function is operated. Touch “BACK” icon to return to the Butterfly setup page. The setup pages of AILE, FLAP, ELEV and BUTTERFLY OFF appear by touching “NEXT” button. AILE, FLAP values are activated in blue by touching and adjusted with INC and DEC buttons. ELEV can be set with curve in the graph. You need to mark the point on graph first and then adjust the operation curve with “DEC”, “INC”, X-axis and Y-axis buttons. Touch “ST OFF” to change to “ST ON” then the throttle position line appears on graph. Move throttle stick and place the line at the desired position between point “L” and “H” then touch “ENT” icon on the bottom right. Now the new point is marked in graph. You can mark five points between point “L” and “H” in the same way. Touch ST ON” to change to “ST OFF” and complete the point setup. Now touch “DEC” or “INC” button to select point and touch X-axis or Y-axis to activate and then touch DEC” or “INC” button to adjust the operation curve. If you touch OFF icon in Curve line, it is changed to ON and the operation curve is smoother. Now touch “NEXT” icon to call “BUTTERFLY OFF” setup page. This function is used to set whether it is switched off. Move and hold the throttle stick to the desired position for the function off and touch the value then the stick position is decided and the assigned value is displayed. The butterfly function is operated under the assigned value and it is not operated over the assigned value. When the setting for butterfly is completed, touch “S” icon on the top right to access to Servo page. In Servo page, you may check the setup value of AILE, FLAP, and ELEV.

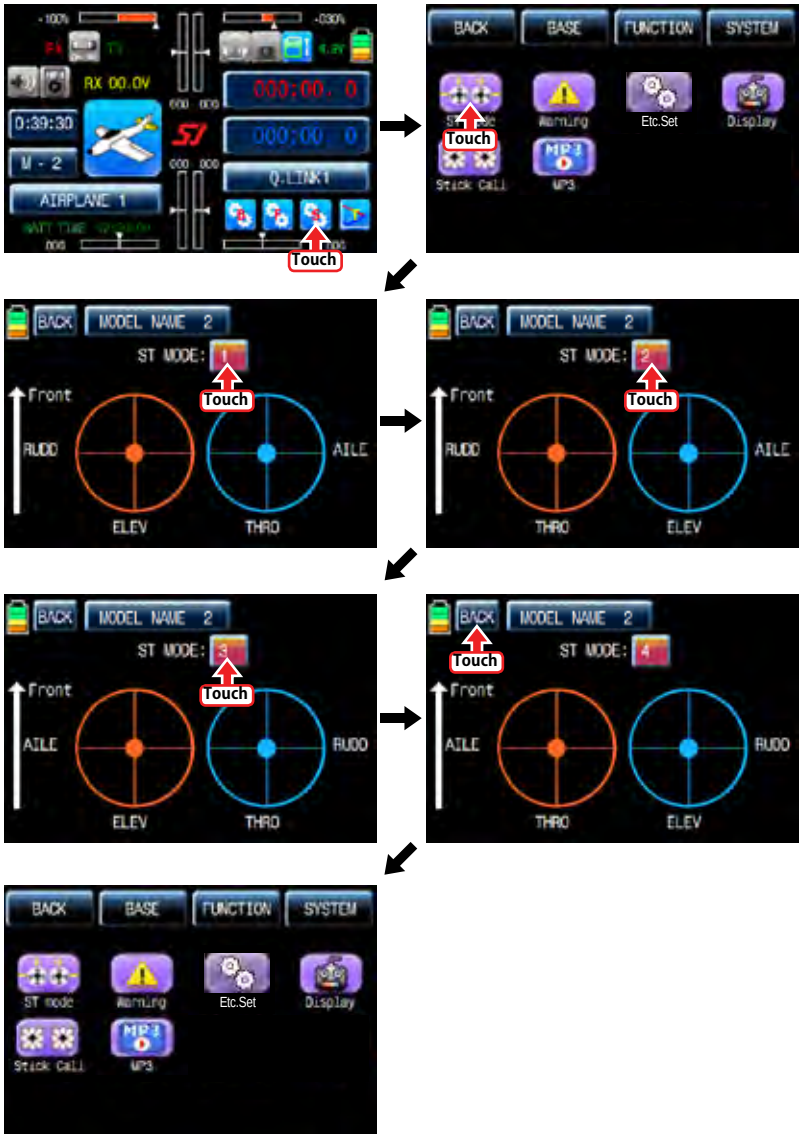




SYSTEM (Helicopter, Airplane, Gilder)

1. ST mode

The Stick model can be selected from 1 to 4. “Mode 1” is widely used in ASIA and Mode 2 is widely used in North America and Europe and also mode 3, 4 are available to use.
In the initial page, touch “SYSTEM” icon to call SYSTEM setup page and touch “ST mode” icon to call ST mode setup page. In ST mode setup page, ST mode is selectable from “1” to “4” whenever “ST mode number” is touched and the indications are displayed for each ST mode. When the stick setup is completed, touch “BACK” icon to call the SYSTEM menu page

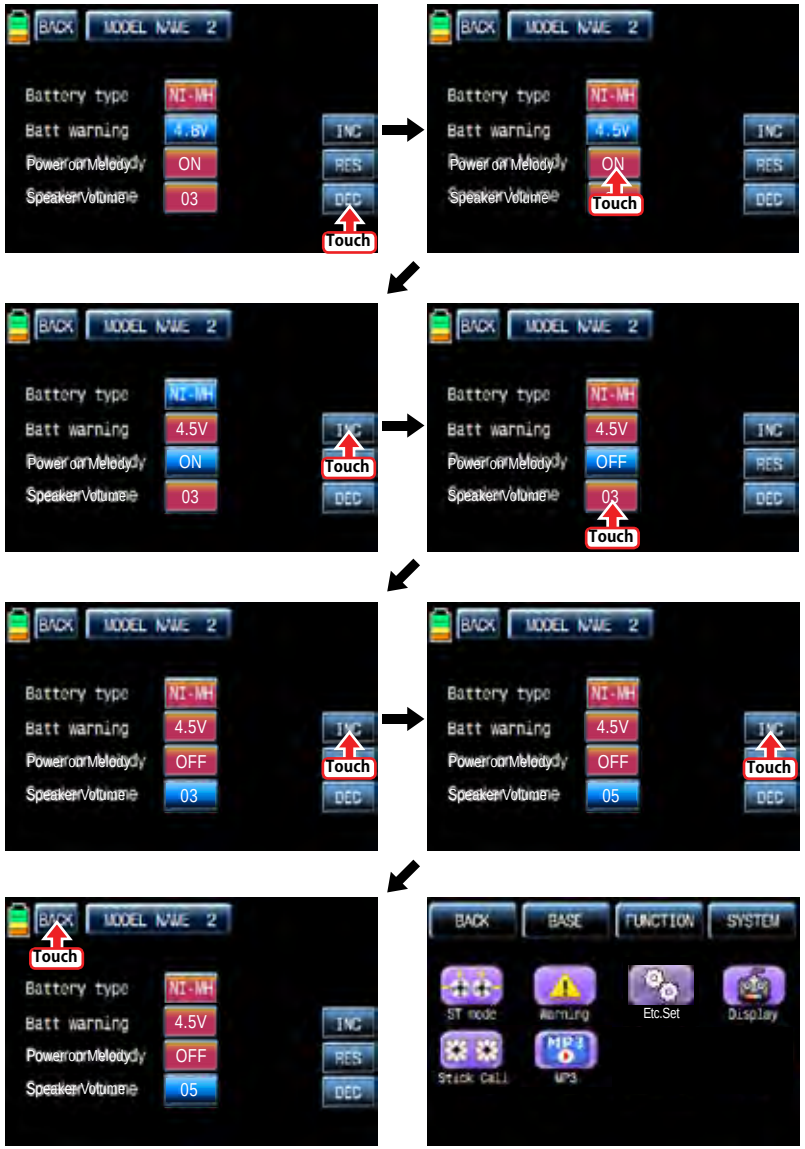


2. Warning

The Warnings function programs an alarm to sound to be made if specific switches or stick positions are in an unsafe position when the transmitter is powered on. You can program 5 warnings such as “Throttle Hold”, “Throttle Cut”, “Thro Position”, “Quick Link”, and “Power Off time”. “On” is basically set in only “Thro Position” and “Off” is basically set in the others. Touch “ON/OFF” icons to switch to “OFF/ON”. After the setup is completed, touch “BACK” icon on the top left to return to “SYSTEM” menu page.

3. Etc. set

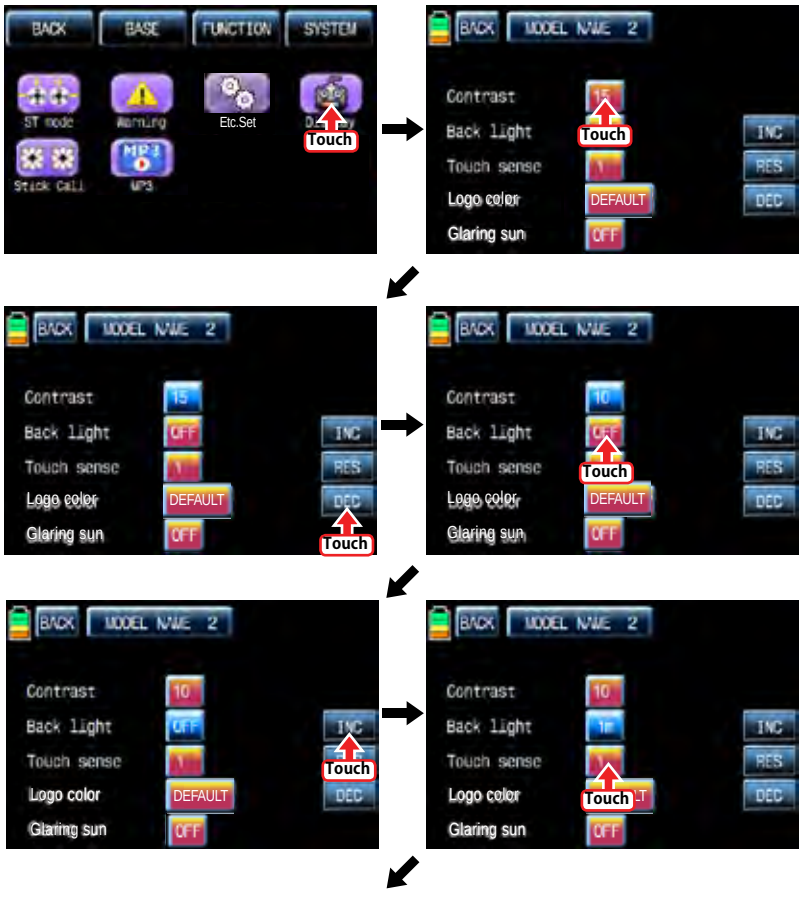
It is used to select the battery type and set battery warning voltage, Power on melody and Speaker volume. Touch “Etc. set” icon to call Etc. set page and touch and activate the value in blue. After that, choose the desired battery type, warning time, Power on Melody and Speaker volume with INC and DEC icons. If the setup is completed, touch “BACK” icon to return to the System menu page.



4. Display

It is used to adjust TFT LCD's contrast, back light off time, the sensitivity of Touch sense, Logo color and Glaring sun. Touch "Display" icon in the system menu page to access to the display setup page. In this page, touch and activate the value in blue and set the relevant value to each category with the INC and DEC icons. After the setup is completed, touch "BACK" icon to return to the System menu page.

NOTICE: In Glaring sun category, we recommend to switch the value to "ON". It enables the more clear display in the sun



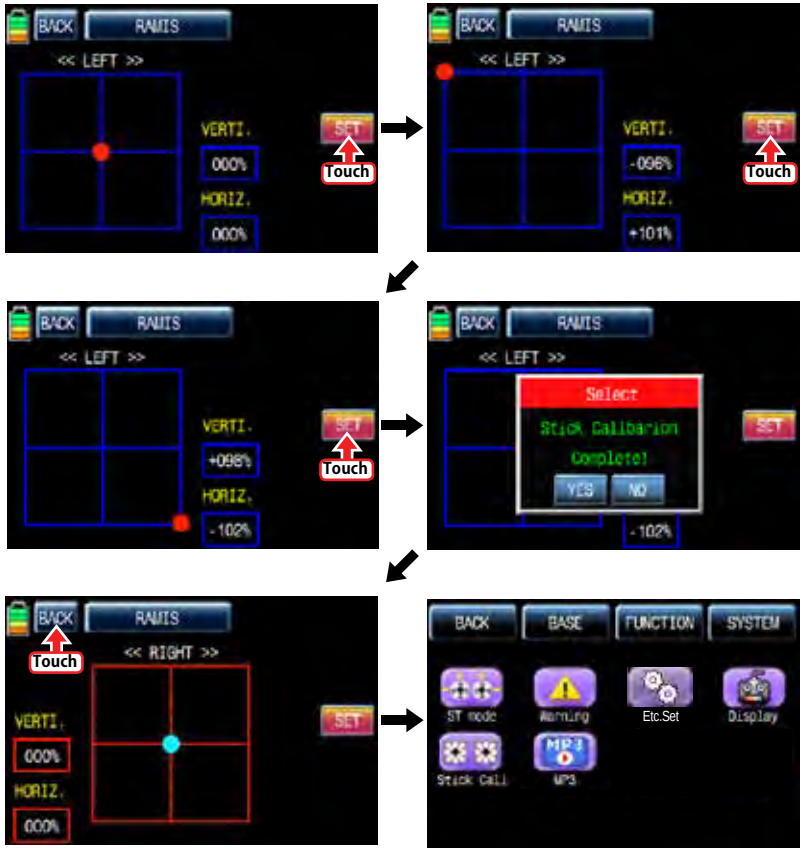
5. Stick Cali

It is used to calibrate the stick's neutral position
Touch "Stick Cali" icon in the system menu page to call "Stick Cali' page. The right stick and the left stick of transmitter are calibrated in turn and the stick position is indicated on VERTI, HORIZ with percentage

- Center: When the dot is centered on the graph, move and hold the stick at the desired neutral position and touch "SET" icon then the stick's neutral position is saved.

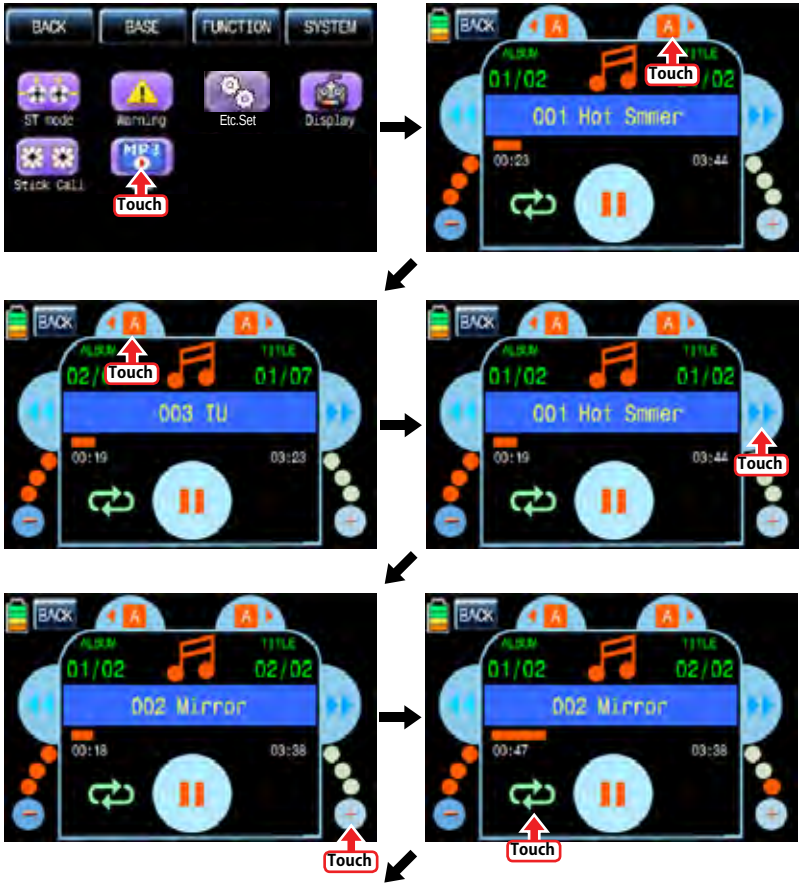
- Full down, Full left: When the dot is at the corner of the top left on the graph, move and hold the stick at the desired end position of the top left and touch "SET" icon then the stick's Full down/Full left position is saved.

- Full up, Full right: When the dot is at the corner of the bottom right on the graph, move and hold the stick at the desired end position of the bottom right and touch "SET" icon then the stick's Full up/Full right position is saved.
After Full up and Full right setup, "Stick Calibration complete!" message is popped up. Now, touch "Yes" icon to complete the Stick Calibration setup. Touch the "Back" icon to return to SYSTEM menu page.



6. MP3

You may listen to the music by storing music files on SD card. You can enjoy music while flying or practicing. To make use of MP3 function, touch “MP3” icon to call the MP3 setup page. You may select folder with <A, A> icons and select the song with “<<, >>” icons. Also you can control a volume with “–“ and ”+” icons. You may repeat the music (all song, one song selectable) and stop the repeat with a repeat icon and play or pause the music with the start and pause icon. When “BACK” icon is touched, you may return to “SYSTEM” menu page.



- FIRMWARE UPDATE

For more information on the latest firmware and the related software, please refer to the download menu on our website www.openhobby.com, www.graupner-sj.com

NOTICE: The optional USB adapter is needed to update.

• SAFETY APPROVAL

Declaration of Conformity
(in accordance with ISO/IEC 17050-1)

- Product(s): Graupner/SJ mz-24 Transmitter
Item Number(s):
Equipment class: 2
The objects of declaration described above are in conformity with the requirements of the specifications listed below, following the provisions of the European R&TTE directive 1999/5/EC:

EN 62479:2010
EN 60950-1:2006/A11:2009/A1:2010/A12:2011
EN 301 489-1 V1.9.2
EN 301-489-17 V2.2.1
EN 300 328 V1.7.1

• FCC Information

- Graupner /SJ mz-24 Transmitter

Contains FCC ID: SNL-36204410
FCC 47 CFR PART 15C
FCC 47 CFR PART 15B

• FCC Statement

1. This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions:
(1) This device may not cause harmful interference.
(2) This device must accept any interference received, including interference that may cause undesired operation.
2. Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

• NOTE

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

• Reorient or relocate the receiving antenna.
• Increase the separation between the equipment and receiver.
• Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
• Consult the dealer or an experienced radio/TV technician for help.

• FCC radiation exposure statement

This equipment complies with FCC radiation exposure limits set forth for an uncontrolled environment. This equipment should be installed and operated with minimum distance of 20 cm between the radiator and your body.

• KC Information

- Graupner /SJ mz-24 Transmitter

- KCC인증번호: KCC-CRM-sjr-16005200, KCC-CRM-sjr-36204410
- 방송통신위원회고시 제2013-01호 "무선설비규칙"
- 방송통신위원회고시 제2012-102호 "신고하지 아니하고 개설할 수 있는 무선기기"

KN 301 489-1:2009
KN 301 489-17:2009
KN 61000-4-2:2008
KN 61000-4-3:2011

• **Caution**

• This equipment's aerial must be at least 20 cm from any person when the system is in use. We therefore do not recommend using the equipment at a closer range than 20cm.
• Ensure that no other transmitter is closer than 20cm from your equipment, in order to avoid adverse effects on the system's electrical characteristics and radiation pattern.
• The radio control system should not be operated until the Country setting has been set correctly at the transmitter. This is essential in order to fulfill the requirements of various directives - FCC, ETSI, CE, KC and etc. Please refer to the instructions for your particular transmitter and receiver for details of this procedure.
• Check all working systems and carry out at least one full range check on the ground before every flight, in order to show up any errors in the system and the models programming.
• Never make any changes to the programming of the transmitter or receiver whilst operating a model.

• **ENVIRONNEMENTAL PROTECTION NOTES**

This product must not be disposed of with other waste. Instead, it is the user's responsibility to their waste equipment by handing it over to a designated collection point for the recycling of waste electrical and electronic equipment. The separate collection and recycling of your waste equipment at the time of disposal will help to conserve natural resources and ensure that it is recycled in a manner that protects human health and the environment. For more information about where you can drop off your waste equipment for recycling, please contact your local city office, your household waste disposal service or where you purchased the produce

Graupner/SJ HoTT

HOPPING.TELEMETRY.TRANSMISSION

mz-24 HoTT

Optimized 12CH Digital Proportional System

mz-24 radio provides you with various advanced features which can lead you to the high level flight for both airplane and helicopter. Advanced data log system in mz-24 radio will lead you to very easy and stable operation during flight with the incredible control of Graupner/SJ 2.4GHz HoTT technology. mz-24 should be a perfect choice for anyone who needs a high quality radio !

▸ Hopping System

Remarkable interference rejection thanks to optimised frequency hopping broad channel sequence.

▸ 3.5" True Color LCD

User friendle true color wide LCD screen with full touch function shows everythings that user needs to monitor.

▸ Teacher and Purpil System

Advanced HoTT wired/wireless trainer system makes Teacher and Pupil system more enjoyable and gives user convenience for the teaching/learning.

▸ Voice announcement System

Smart voice announcement system allows user to hear various data such as timers, telemetry data, and warnings in real time.

▸ Fast Data Interface

The standard Micro SD Memory card is used for data interface. User can share model setup, expand model memory and stay up to date with the latest Graupner/SJ Firmware.

WWW.OPENHOBBY.COM

2.4 GHz | MP3 | 3.5" TFT

No. S1006

Appendix E

Computerized Control Boards

SECTION 1: MikroKopter 2.5 and Navi-Ctrl 2.0

en/FlightCtrl_ME_2_5

17

HolgerB
MikroKopter.de

Contents

1 Flight Ctrl V2.5

The !Flight-Ctrl V2.5 is now equipped with a new pressure sensor and a more powerful ACC sensor. Now we have a significantly better height control and flights are possible up to 5000mtr.
The FlightCtrl V2.5 is shipped with:

- already assembled cables for:
- a PPM Sum signal receiver
- and a Telemetry connection
- already installed with the latest software
- fully tested for functionality

INFO:
You can use the FlightCtrl V2.5 only with the MikroKopter Software since Version V2.00d !

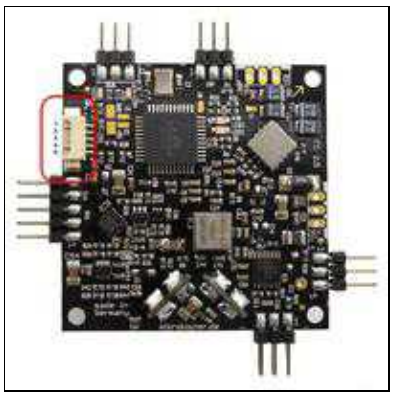
TIPP:
Below you can download a finished setting for the FlightCtrl where all functions are already set.

New thing on the FlightCtrl V2.5:

- new Air pressure sensor (with light / wind protection)
- new ACC-Sensor
- better altitude control
- less sensitive to vibrations (all Axis)
- Altitude sensor work now up to 5000m
- LEDs on the switching outputs
- Voltage up to 7S (30V)
- Protection resistors to the servo outputs
- 400uF for better voltage regulation on the power supply
- Note: Not compatible with older firmware versions!

2 Connections

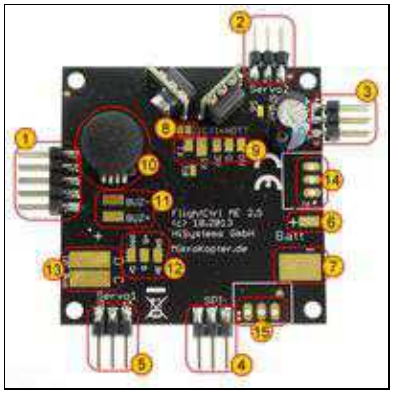
2.1 connections Top



Molex connector:

1. GND (FC und Summer)
2. + Buzzer
3. I2C Bus (D)
4. I2C Bus (C)
5. +12V (battery voltage)

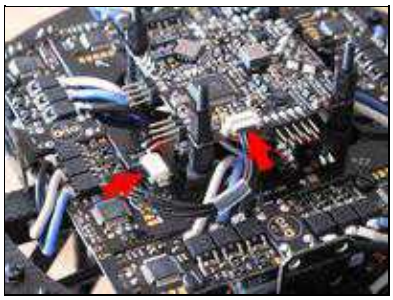
2.2 connections Bottom



1. 10-pol connection strip (for MK-USB or to connect NaviCtrl)
2. 6-pol connection strip (Servo2 / Servo3)
3. 6-pol connection strip (Servo4 / Servo5)
4. 6-pol connection strip (SPI to NaviCtrl)
5. 6-pol connection strip (Servo1 / switching outputs Out1/Out2)
6. Connection Lipo (Plus) (not needed if you use the Molex connection)
7. Connection Lipo (Minus) (not needed if you use the Molex connection)
8. JETI+HOTT - Solder bridge. To send the telemetry data to a HoTT or Jeti transmitter. (Factory default)

9. Solder pads Tx, Rx, 3V, G (GND), 5V (See "Receiver Connections")
10. Air pressure sensor (with light / wind protection)
11. Connection Buzzer (BUZ-/BUZ+) (not needed if you use the Molex connection)
12. Connection PPM Sum signal receiver (GN=brown, +5=red, PPM=orange)
13. I2C connection (D/C) for BL-Ctrl (not needed if you use the Molex connection)
14. DC/DC converter 5V Recom (supply FlightCtrl) (Factory default)
15. DC/DC converter 5V Recom (supply Servos) (Factory default)

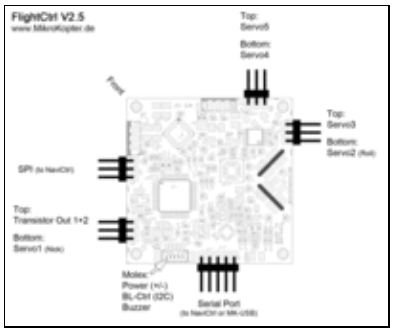
2.3 Connecting Molex



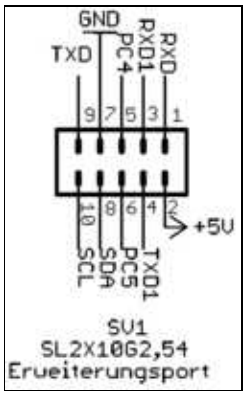
suitable Molex connector for "XL" power distributor in the shop
suitable Molex cable for "XL" power distributor in the shop

INFO: MK is switched on by connecting in the Lipo.

3 Connection Diagram



3.1 Connection Serial Port (SV1)



3.2 Connection SV2

Top row (outputs OUT1/OUT2)

Pin1: 100mA switching output NPN Open Collector e.g. for Shuttercable. Programmable in KopterTool with OUT1.

Pin3: +5 Volt

Pin5: 100mA switching output NPN Open Collector e.g. for LEDs. Programmable in KopterTool with OUT2.

Bottom row: Nick servo output

Pin2: Servo1 output (for Nick-Servo camera mount) (Setting KopterTool)

Pin4: +5 Volt

Pin6: GND / Minus

Note: The servo outputs are activated only after the gyros are calibrated (Throttle up + yaw left).

3.3 Connection SV3

Top row (Servo 3)

Pin1: Servo3 output

Pin3: +5 Volt

Pin5: GND / Minus

Bottom row: Roll servo output

Pin2: Servo2 output (Setting KopterTool)

Pin4: +5 Volt

Pin6: GND / Minus

3.4 Connection SV4

Top row (Servo 5)

Pin1: Servo5 output

Pin3: +5 Volt

Pin5: GND / Minus

Bottom row (Servo 4)

Pin2: Servo5 output

Pin4: +5 Volt

Pin6: GND / Minus

4 Receiver Connections

Please be sure that the correct receiver is set in the settings under "Channels".

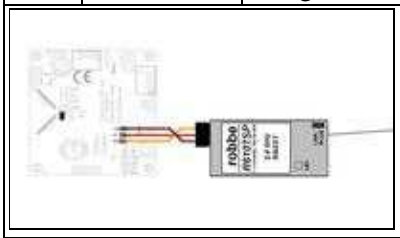
4.1 Standard PPM receiver

z.B.

- DSL4TOP (35/40MHz)
- R6107SP Futaba 2,4GHz

Connection:

PPM - Sum signal		
Pad	**Function**	**cable collor**
GN	GND/Minus	black or brown
+5	Plus 5V	red
PPM	data line	orange

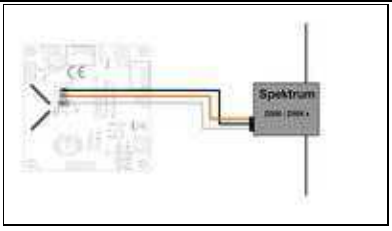


To enlarge - click the image

4.2 Spektrum Satellit receiver

Connection:

Connection to 2nd serial interface		
Pad	**Function**	**cable collor**
G	GND/Minus	black
3V	Plus 3V	orange
RX	data line	gray

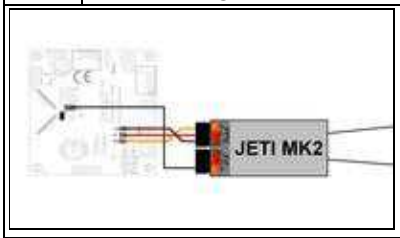


To enlarge - click the image

Siehe auch: Spektrum

4.3 Jeti receiver

Connection:

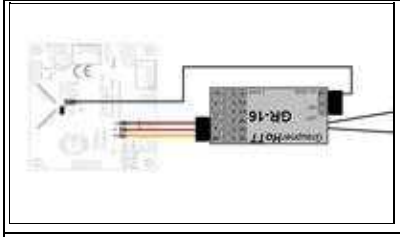
PPM - Sum signal + Telemetry connection		
Pad	**Function**	**cable collor**
GN	GND/Minus	black or brown
+5	Plus 5V	Rot
PPM	data line	orange
RX	Telemetry connection	arbitrarily
JET	Solder bridge for Telemetry	-
		
To enlarge - click the image		

See also: JetiDuplex

4.4 HoTT receiver

The HoTT receiver is also connected to the PPM and the RX pad. To send the telemetry data to the transmitter, the solder bride "JETI+HoTT" have to be closed.
More information how to connect, set and use a HoTT Transmitter/receiver can be found here: **HoTT**

Connection:

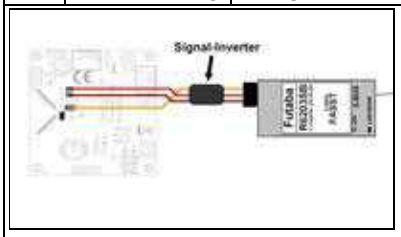
PPM - Summensignal + Telemetrieanschluss		
Pad	**Funktion**	**cable collor**
GN	GND/Minus	black or brown
+5	Plus 5V	red
PPM	Datenleitung	orange
RX	Telemetrieanschluss	arbitrarily
JET	Solder bridge for Telemetry	-
		
To enlarge - click the image		

4.5 Futaba S.Bus receiver

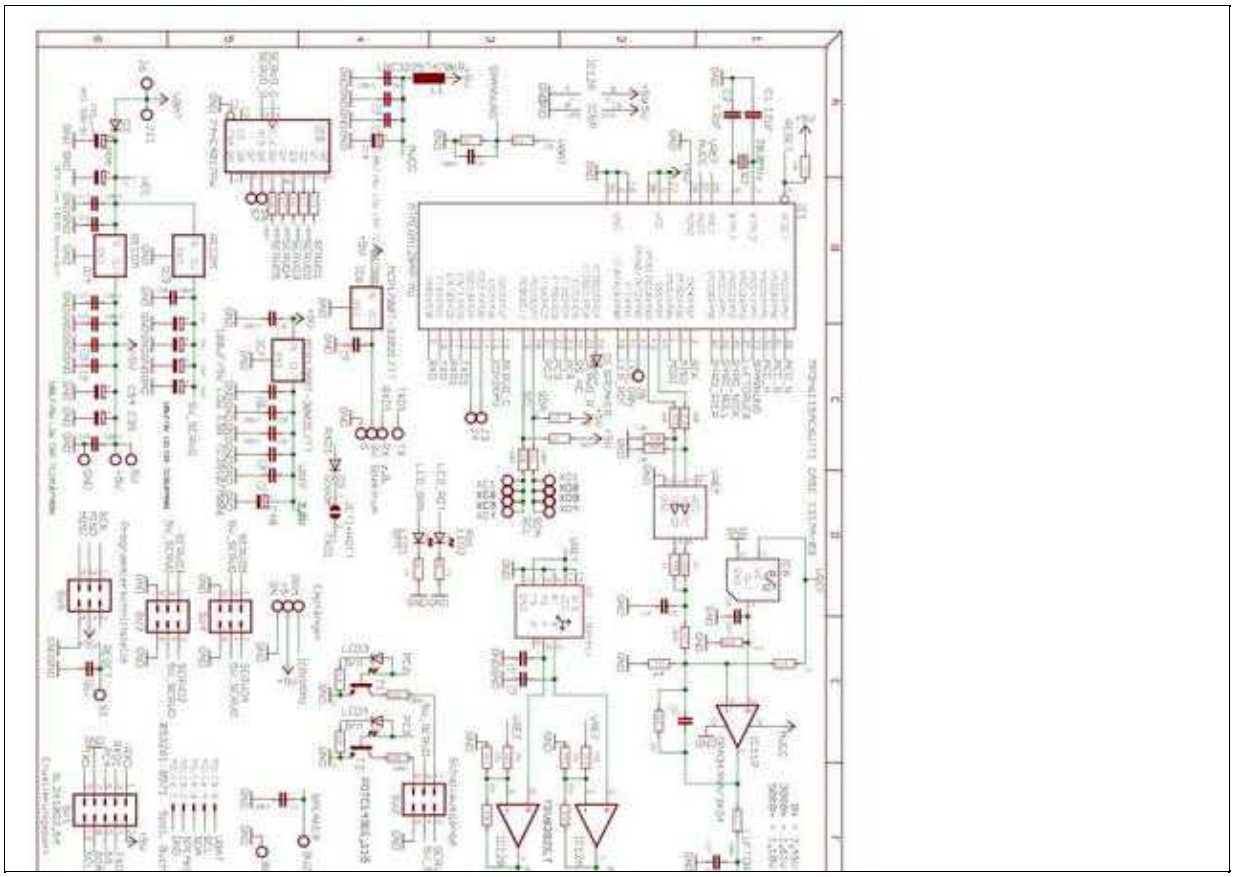
You can connect a S.Bus receiver with a Signal-Inverter on the FlightCtrl.
Here you can order the needed inverter: **Shoplink**

⚠ Please set the receiver to **"normal" mode** (The LED of the receiver will be short red if you power up the receiver), **do not** set to "High-Speed" (Receiver LED is Green/Red (or orange) if you power up the receiver)

Connection:

Connection to 2nd serial interface		
Pad	**Funktion**	**cable collor**
5V	Plus 5V	red
G	GND/Minus	black or Brown
RX	Datenleitung	orange
		
To enlarge - click the image		

5 Circuit diagram



⚠ The use of the MikroKopter software is only allowed on original hardware.

6 Other

- The Bootloader of the FC2.5 is not for free.
- If you have damage the Atmega you can buy a new one include bootloader here: **here**
- Please do not use a ISP programmer to upgrade the FlightCtrl. This can clear the Bootloader.

7 Settings

Here you can download the latest SW Version and a setting for the FlightCtrl where all is set: Download.

Here you can see the channel setting:

(To enlarge -> click on image)

8 Specifications

- 3S-6S
- 2 adjustable outputs with LED indicator on FlightCtrl
- 5 Servo output
- Connections for Set Navigation
- Altitude sensor (up to 5000m)

- KategorieMK-Baugruppe/de

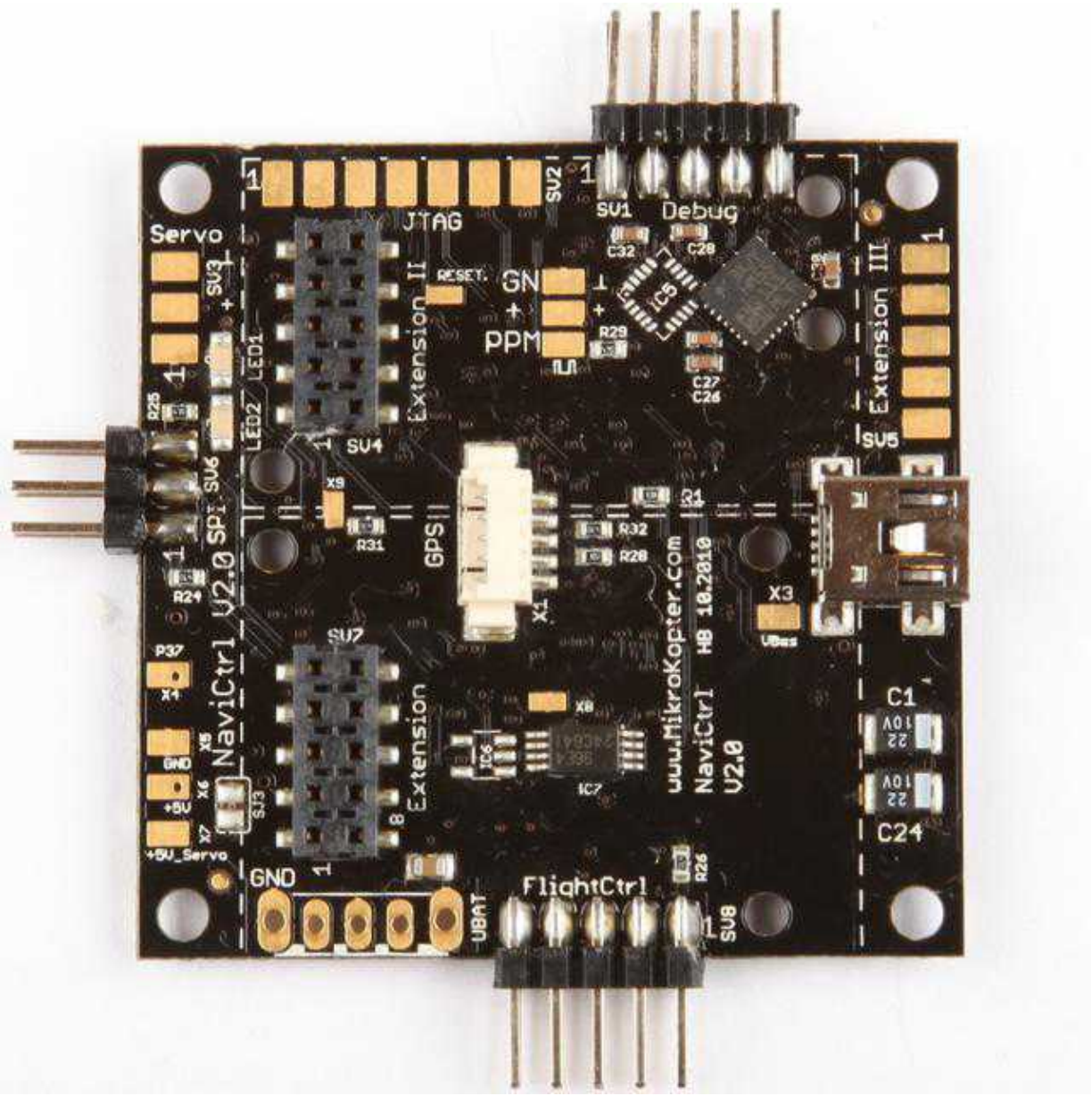
en/NaviCtrl_2.0

26

LotharF
MikroKopter.de

Contents

1 General



The **NaviCtrl** **V2.0** with integrated compass is the follow of NaviCtrl V1.1 and expands with the **MKGPS** the ability of the MikroKopter.
Throughout the use of those modules you will get a powerful **GPS-System**.

With this **GPS-System** you can use the function like **PositionHold, ComingHome, CareFree** the **Waypoint-flight** as well as the **FollowMe**-function.

For the waypoint-flight you can set up to 30 waypoints in the **OSD** KopterTool.
The waypoint-flight (and that of the FollowMe) is than in a **Radius of 250mtr. around the startpoint** of the Kopter possible.
Users with a commercial license can also use a bigger range.
(Questions about the license please wrote to: HiSystem)

All other functions (PositionHold, ComingHome, CareFree, etc.) are usable in the full range of the transmitter / receiver.

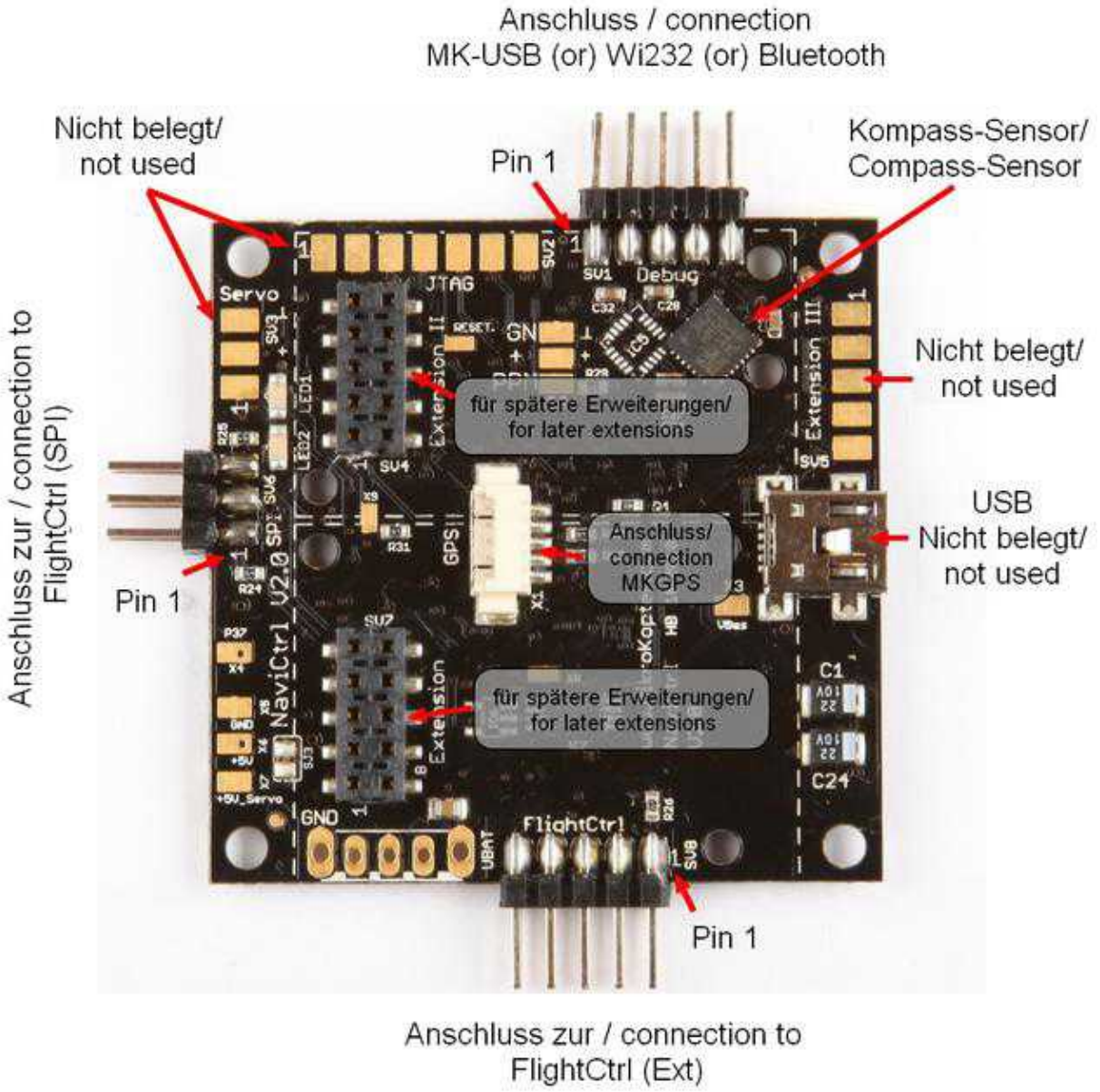
(The NaviCtrl with the integrated compass could be also used single with the FlightCtrl. But here would be only the function "CareFree" possible.)

The NaviCtrl-PCB has got besides the ARM9-Micro-Controller and the Micro-SD-Card-Socket two additional extension plugs.
The first and the second extension plug is free usable for future developments.

You can use also the NaviCtrl in connection with the MKGPS as a separate **FollowMe-Transmitter**. This is explained here: FollowMe

2 Connections

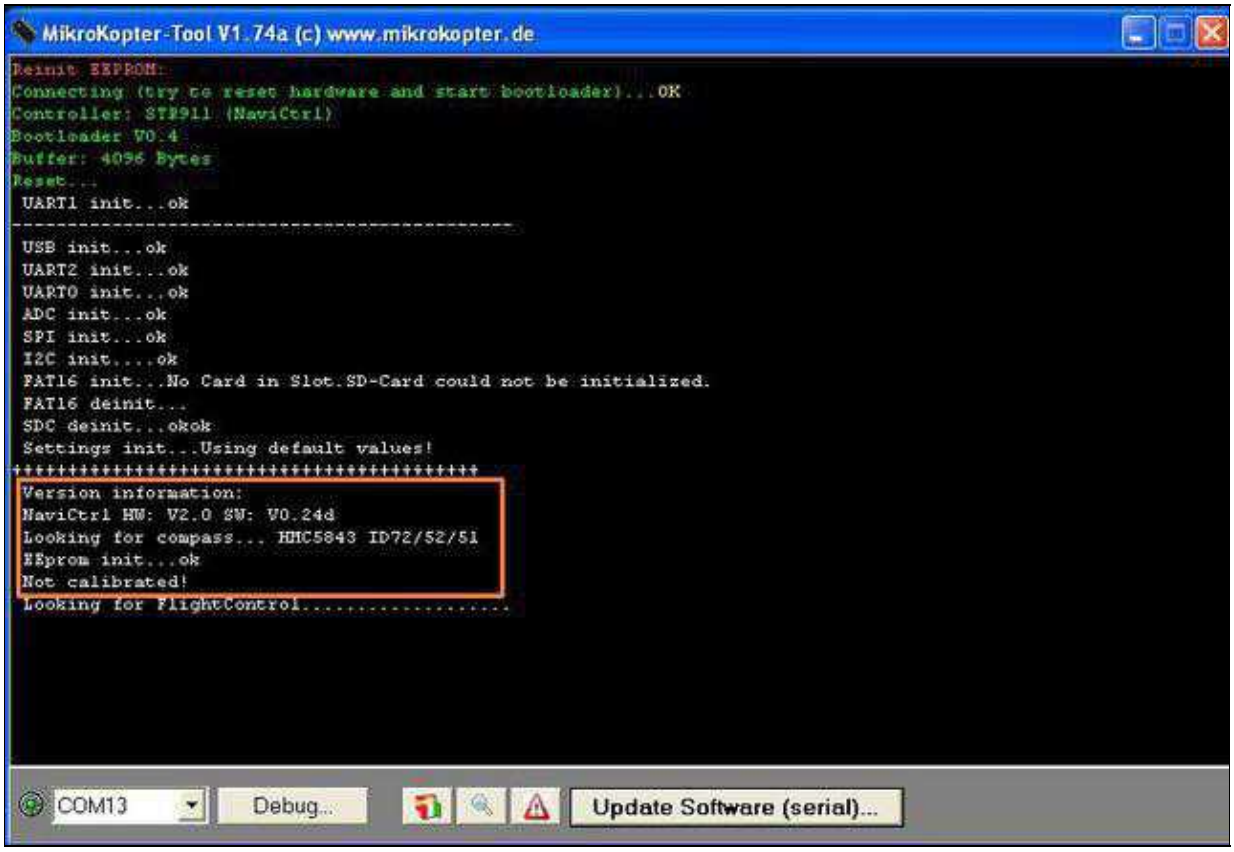
NaviCtrl V2.0 - **Top-Side**	NaviCtrl V2.0



3 Integrated compass

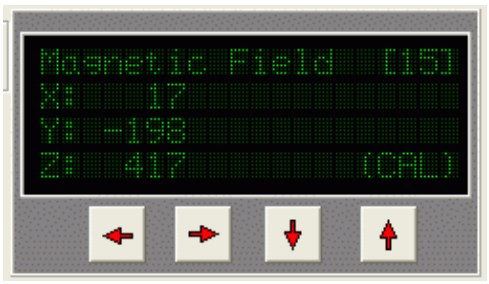
The function of the MK3Mag compass is now integrated in the NaviCtrl V2.0. You have to calibrate this integrated compass too (see "Calibration of the compass").

During the initialization you will see the integrated compass modul:

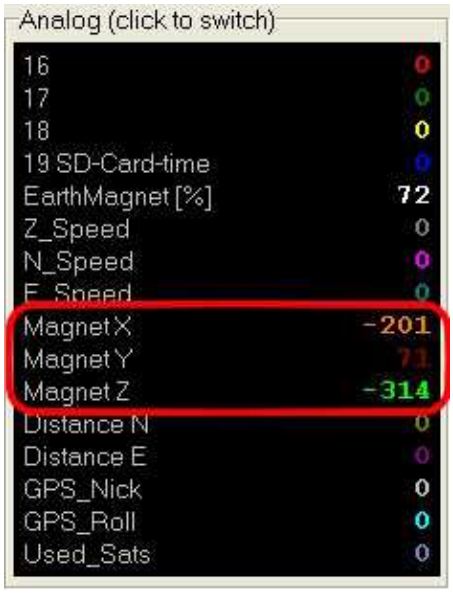


3.1 Indicate the magnet values

The values of the 3-axis sensor you can see on the virtual display of the KopterTool(Button "NaviCtrl"):



To check in the values in the scope of the KopterTool, you can chose them in the second analog-page:


Analog (click to switch)
16 0
17 0
18 0
19 SD-Card-time 0
EarthMagnet [%] 72
Z_Speed 0
N_Speed 0
E_Speed 0
Magnet X -201
Magnet Y 71
Magnet Z -314
Distance N 0
Distance E 0
GPS_Nick 0
GPS_Roll 0
Used_Sats 0

4 Placement

On the NaviCtrl V2.0 the pin-header to the interfaces of the **FlightCtrl, SPI** and **Debug** are already soldered.

5 Connection MKGPS

For the installation of the MKGPS please note the information under MKGPS.
How to connect the NaviCtrl and the MKGPS with the FlightCtrl you can find here: **MK-Tower**

6 Settings

6.1 Activate the GPS-System and assign channel

To use the NaviCtrl with the compass module MK3Mag and the MKGPS you must activate the function **GPS** in your settings.
In addition you need to have a channel for the mode control to switch between the functions (Free, PositionHold, ComingHome)
(pre-set is Poti2 => channel6). This channel must be assigned to a 3-way switch at the transmitter.
(How a channel at the transmitter will be assigned to a switch you will find in the appropriate instruction manual of the transmitter.)

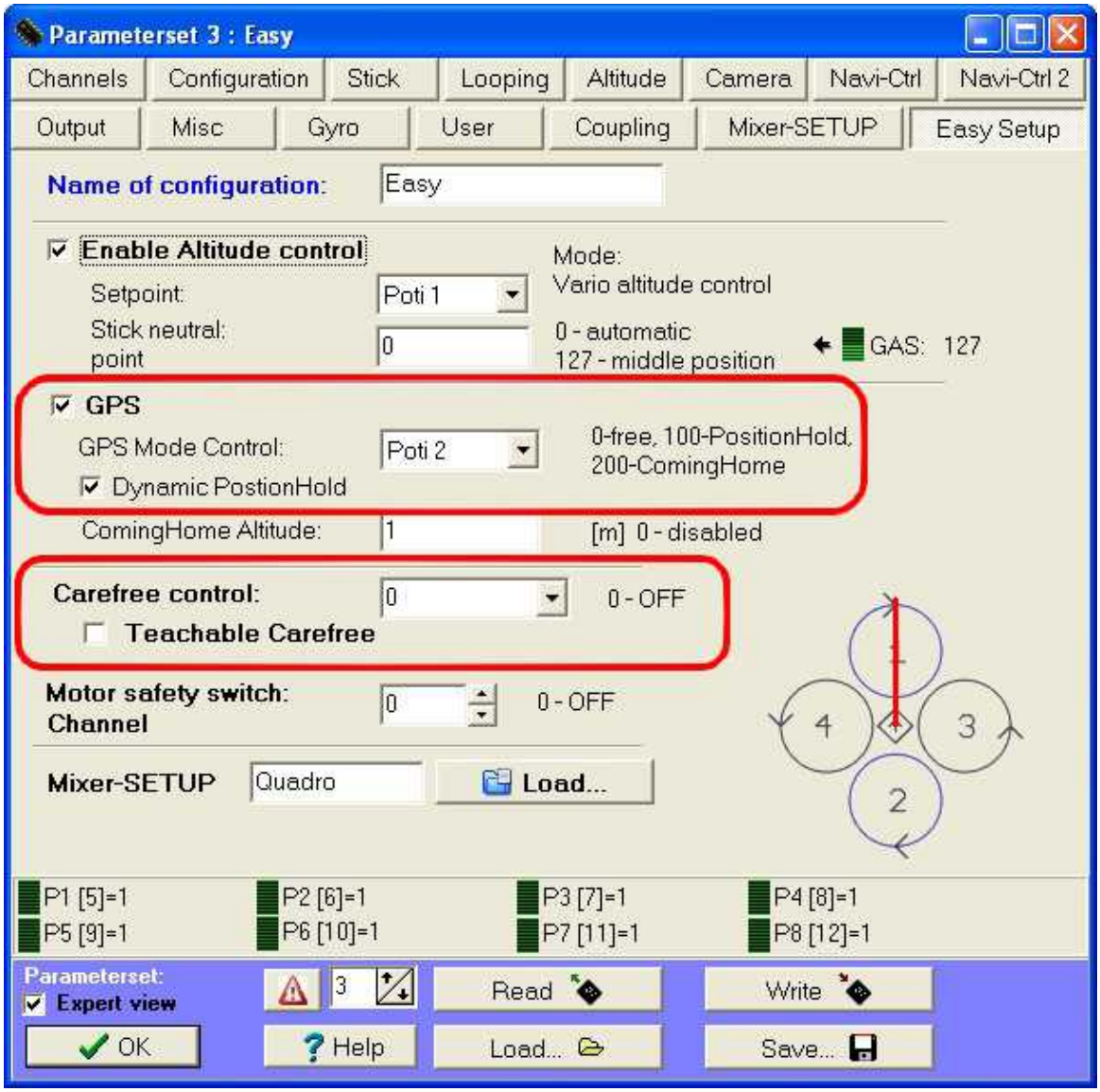
6.2 Activate CareFree and assign channel

If the function **CareFree** is used you must assign an additional channel to that function.
This function is set up to "0" = Deactivated by default.
If here an appropriate channel is set you must assign a switch at the transmitter.
(How a channel at the transmitter will be assigned to a switch you will find in the appropriate instruction manual of the transmitter.)

- How the function **CareFree** and the additional activated **Teachable CareFree** can be used, you can find here: CareFree

The easiest way to set up/activate the functions is over the menu-point **EasySetup**.
Here you can activate the **GPS** and set up the channels to switch for GPS/CareFree.
Pre-set is already **POTI2 => channel6** for the function of the GPS. CareFree is in the pre-settings on "0" = OFF.

Settings in EasySetup



INFO

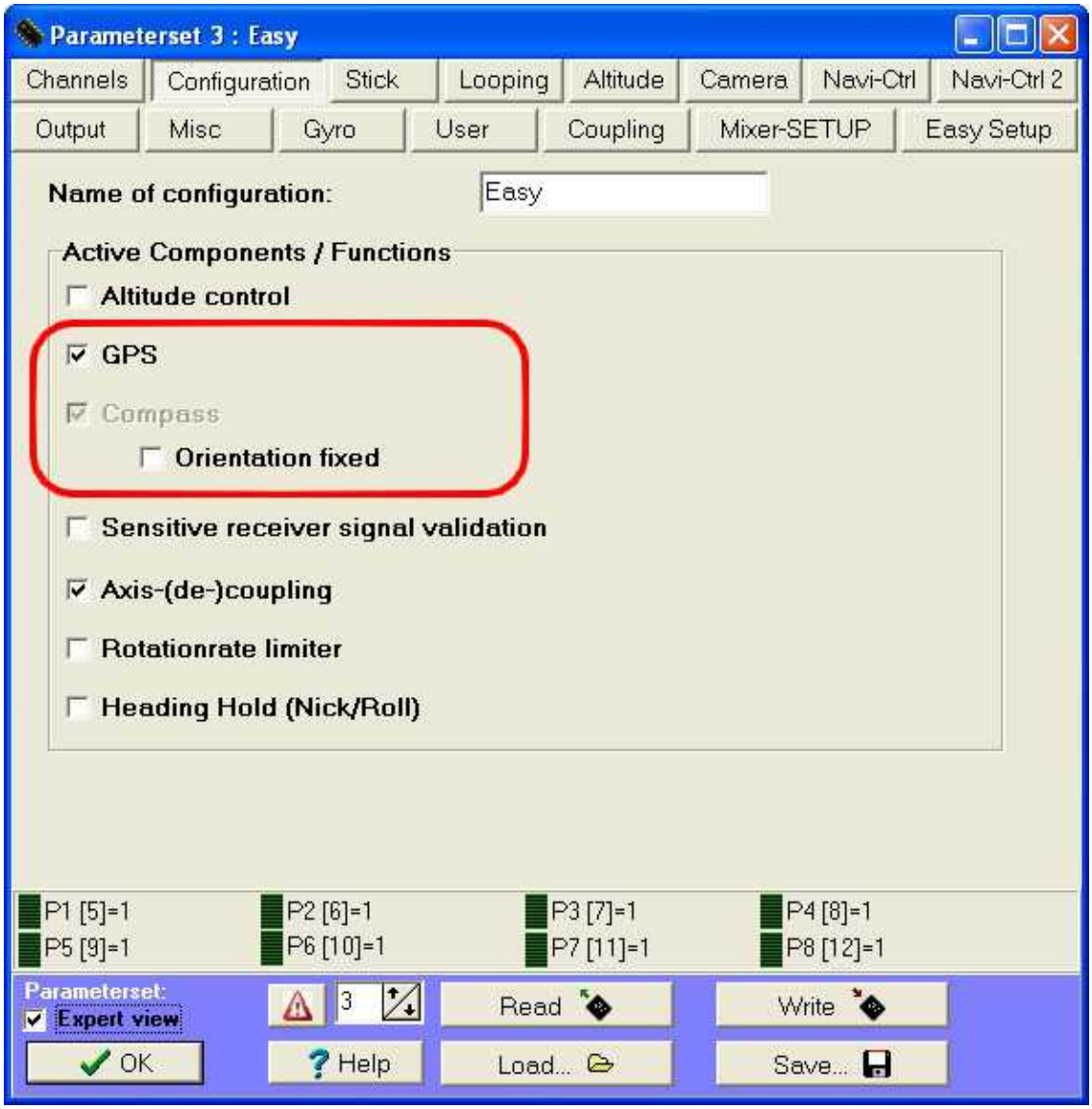
On the page **EasySetup** all important settings are summerized.
All settings made here are automatically transferred to the corresponding sub-sites.

The settings in **EasySetup** can be made directly in the different sub-sites.

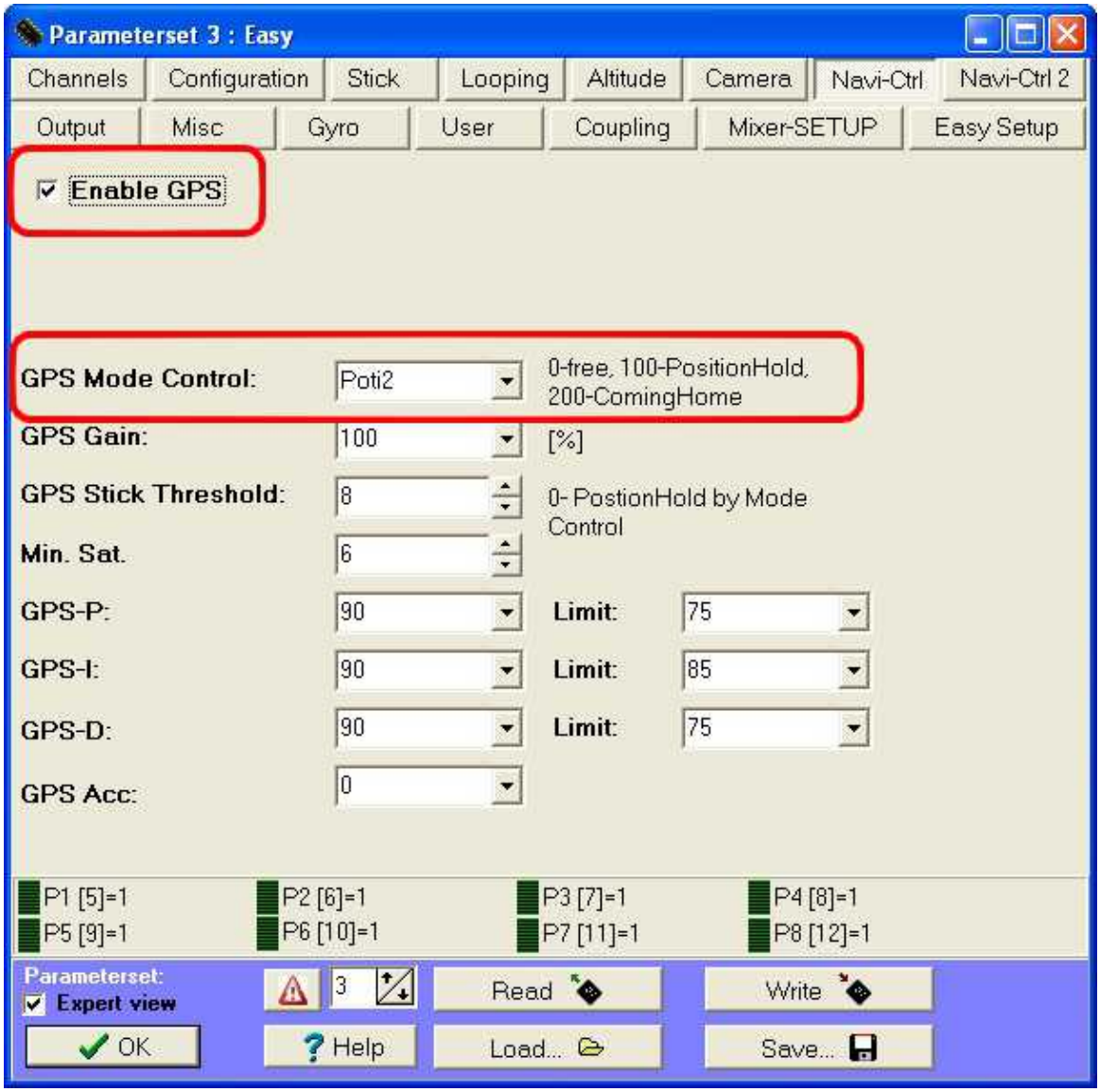
The **GPS** can be switched ON/OFF in the tab **Configuration**:

- If you use only the NaviCtrl with the compass module (MK3Mag) it can be activated here individually.
  An additional function like **Fixed alignment** can be given. Is that function activated you can yaw the Kopter during the flight

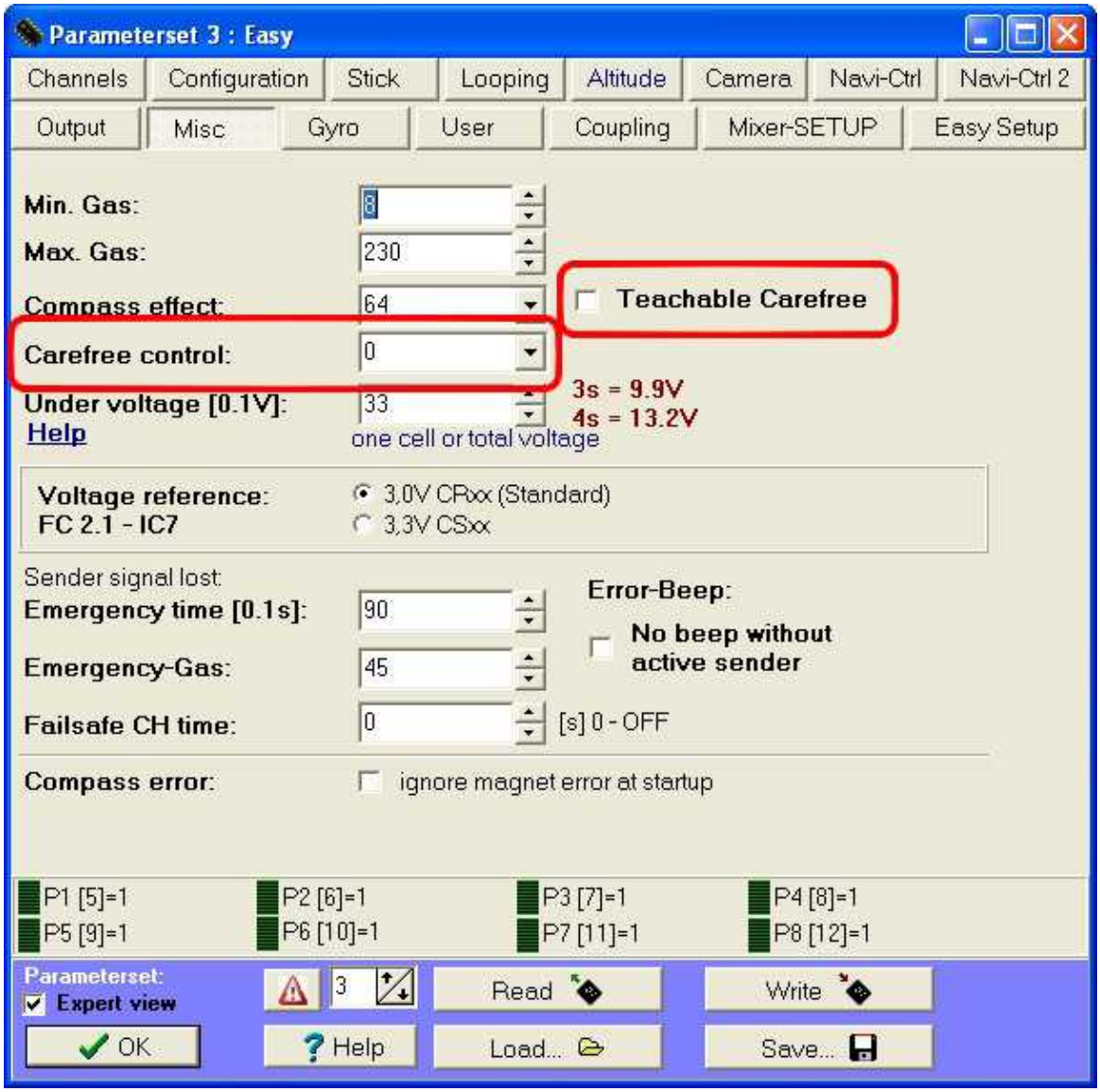
If you release the yaw-stick the Kopter automatically aligns itself into the direction in which the Kopter was at the start.



In the tab **Navi-Ctrl** you can switch also the **GPS** ON- and OFF.
Also, you can set up here the **channel** to switch the function:



Under the tab **Misc** you can set up the **CareFree control**
and the **Teachable CareFree**:


Parameterset 3 : Easy
Channels
Configuration
Stick
Looping
Altitude
Camera
Navi-Ctrl
Navi-Ctrl 2
Output
Misc
Gyro
User
Coupling
Mixer-SETUP
Easy Setup
Min. Gas:
8
Max. Gas:
230
Compass effect:
64
Teachable Carefree
Carefree control:
0
Under voltage [0.1V]:
33
3s = 9.9V
4s = 13.2V
Help
one cell or total voltage
Voltage reference:
FC 2.1 - IC7
3,0V CRxx (Standard)
3,3V CSxx
Sender signal lost:
Emergency time [0.1s]:
90
Error-Beep:
No beep without active sender
Emergency-Gas:
45
Failsafe CH time:
0
[s] 0 - OFF
Compass error:
ignore magnet error at startup
P1 [5]=1
P2 [6]=1
P3 [7]=1
P4 [8]=1
P5 [9]=1
P6 [10]=1
P7 [11]=1
P8 [12]=1
Parameterset:
Expert view
3
Read
Write
OK
Help
Load...
Save...

7 GPS-Mode control

A total of three modes can be switched with the **GPS mode control**.

Those functions are:

- GPS_MODE_Free **(Free)**
- GPS_MODE_Position Hold **(PH)**
- GPS_MODE_Coming Home **(CH)**

As described is this function already pre-set on **Channel 6 (POTI2)**. This channel can also be changed as desired.
To use the function a 3-way switch of the transmitter should be set to that channel and also been used.
The Height switch should be switched ON while using this function.

TIPP:

- The height switch i.e. can be set to the same channel like the **GPS Mode Control**.
  This saves you not only a channel-switch on the transmitter. As soon as the function **PH** or **CH** is switched ON automatically the function to keep the height is switched ON.

Expert function:

The functions are active at a certain value. Those are as follows:

- GPS_MODE_**Free** => Value <20
- GPS_MODE_**Position Hold** => Value between 20 and 200
- GPS_MODE_**Coming Home** => Value >200

Info

For the function of PH/CH a Sat-Fix is **mandatory** necessary.
If this is not there it can be selected via a switch, but has no function.
You must still manually control the Kopter.

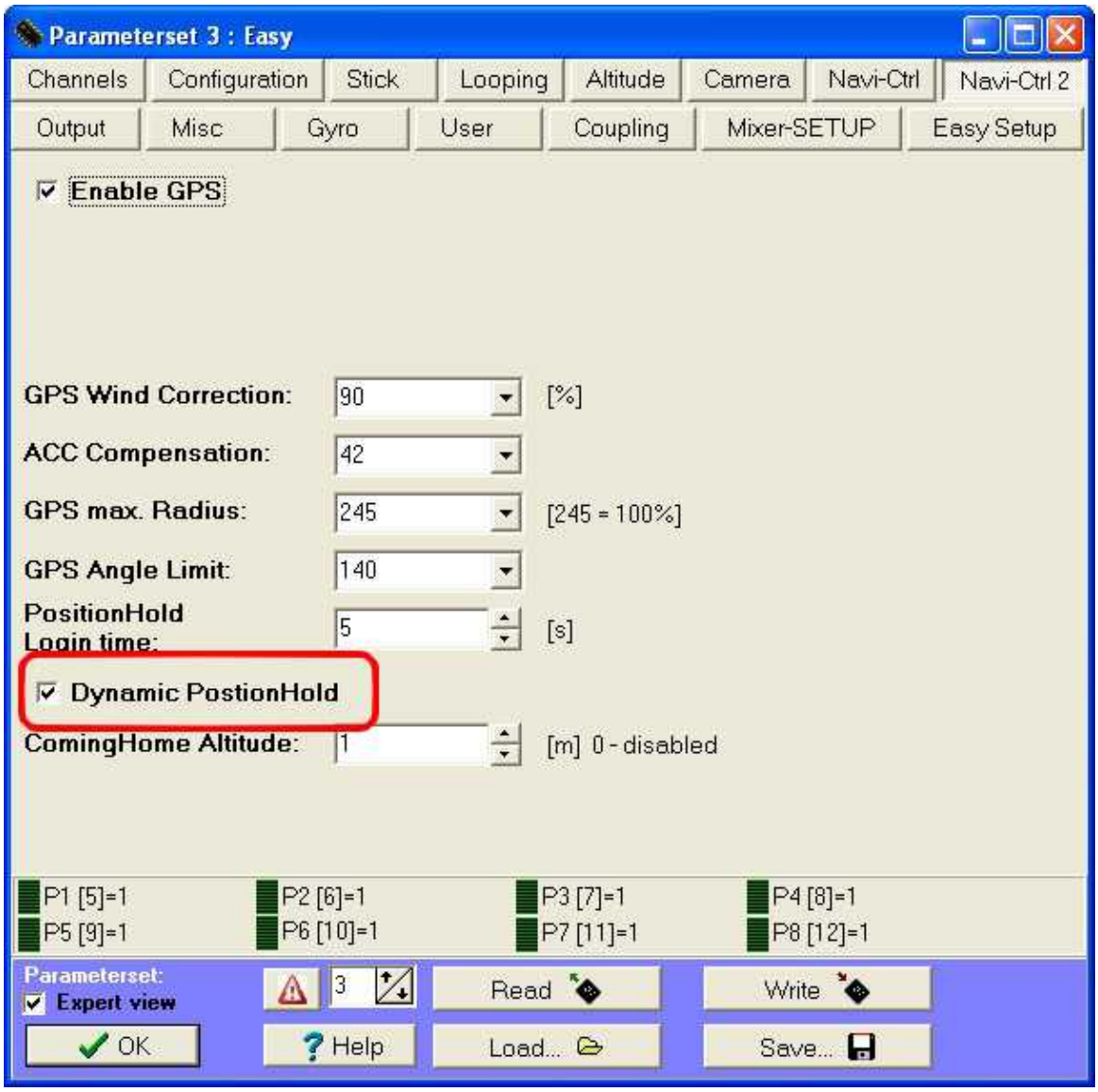
In the function PositionHold **(PH)** the Kopter remains with the support of the GPS on that position at which the function was activated.
If you switch to the function ComingHome **(CH)** the MikroKopter returns automatically back to the start point with the support of the GPS.
A switch-back to **Free** turns the functions off.

Tipp:

- If the Kopter circles in PH Mode around the activation point (a small radius is pretty much normal) a new calibration of the compass can help.
  Also to determine a better and more accurate position the mount of the GPS-Shield1.1 to the MKGPS helps alot.

7.1 Dynamic PositionHold

Either in the **EasySetup** (see picture above) or under the tab **Navi-Ctrl2** the function **Dynamic PositionHold** can be activated.



The function of the mode PositionHold **(PH)** is different if **Dynamic PositionHold** is enabled or disabled :

- Function **OFF**:
  - The Kopter will be throughout moving the Nick- / Rollstick directly controlled.
    The function PositionHold (PH) will be switched off if you move the sticks.
    At the new position and after you release the sticks the function PH will be switched on again.

Function **ON**:

- Also here you can fly the Kopter through moves with the Nick- / Rollstick to a new position. In that way PH will be not disabled/enabled but the nominal values of the GPS-coordinates will be moved.
  An more accurate and exact positioning of the Kopter is possible even in windy conditions.
  The Kopter will fly a little bit slower to the position, moves more sluggish.

8 Signal beeps

If the NaviCtrl (with Compass/MKGPS) is properly connected the FlightCtrl beeps more often. The beeps tell you as follows:

- If the switch for the GPS function will be switched from **free** to GPS_MODE_**PositionHold** or GPS_MODE_**ComingHome**
  and there is **no** Sat-Fix (LED on the MK-GPS is not flashing) it will beep 1 time per second.
  The Kopter beeps as long as a minimum number of satellites was found and a Sat-Fix was reached.
  (See also Paramter "Min Sat").

  Exception: The beeping will be more quiet if a Sat-Fix is available but a sufficient number of satellites wasn't found.

  Notes:

  - This beep takes place even if GPS is disabled.
    (If GPS is deactivated set also the value for "GPS Mode Control" to Zero (0).)

- 1x beep *beep* - when changing the GPS-Modes (free - PH - CH)
- 1x beep *beep* - when logging new target-coordinates

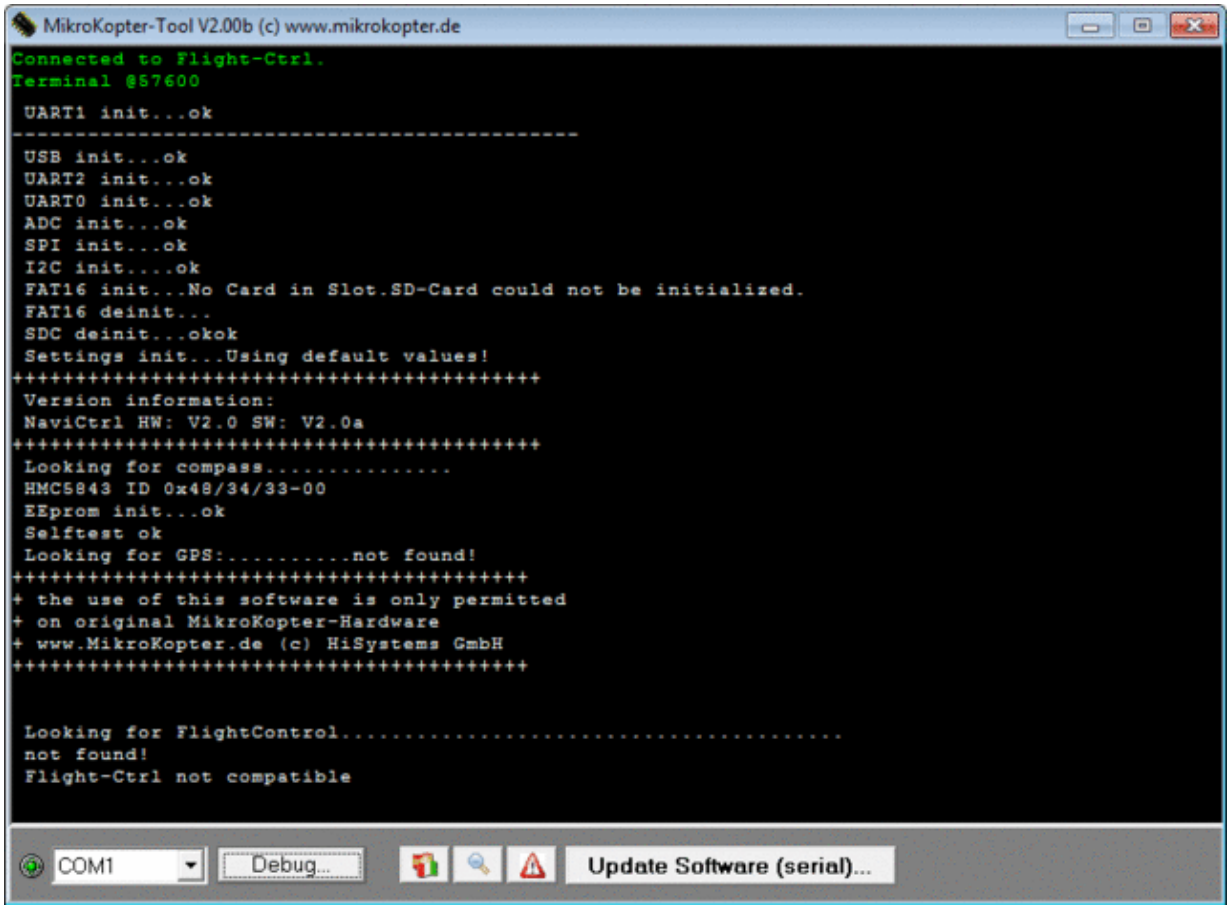
9 LED-indication

On the NaviCtrl you can find 2 LEDs, 1x red and 1x green. The red LED indicates you a failure.
To show you the respective failures the NaviCtrl **must** be hooked up to the MK-Tool. The failure will be shown there.


The red LED stays on also if the compass is not calibrated! A failure message is displayed as "error6".

10 Functional test

Here you need to open the Terminal Window in the KopterTool. If the NaviCtrl is hooked up single over the connector **Debug** and connected with the MK-USB and a closed jumper on the MK-USB
you should see the following initializing sequence of the NaviCtrl:



TIPP

Is the NaviCtrl on the Kopter mounted with the FlightCtrl, the MK3Mag and the MKGPS, those assemblies should be also seen during initializing.
Here the jumper shouldn't be on the MK-USB and the Kopter should be supplied with power over a Lipo or an external power-supply.

11 How do you start?

11.1 Calibration of the compass

Important: When first operated, the MK3Mag needs to be correctly calibrated! Otherwise the NaviBoard will show you "Err:6 bad compass value".

Now it is (since Version FC:0.84) very easy to calibrate the compass with a "clicking sound" .
This method has the advantage that you doesn't have to hold the Kopter "perfect" horizontally.

IMPORTANT

The Nick- and Roll axis refers to the FlightCtrl, and **not** on the Mixer you use! The arrow of the FlightCtrl shows the Nick axis!

The Kopter should be calibrated outside, away from magnetic influences!
So please **do not** calibrate the Kopter directly next to a house, near power poles or metallic / magnetic surfaces.
Also, please take your cell etc. out of your pocket.

The earth's magnetic field is not the same everywhere. That's the reason why you should calibrate the compass new if you change the place where you fly.
(e.g. from Germany to USA or from north to south America)

The calibration will be done in several steps:

Step	Function	Example View / Function
Step 1 Initiate compass calibration	**Nick down** then **Throttle up + Yaw left** (The Kopter beeps 1x)	On a transmitter in **MODE 2** it lokks like in that way:

		
Step 2 Start Calibration	**Pull Nick down 1x** (The Kopter beeps 2x and the clicking starts begins)	

Calibration of the **X-Axis** (Nick-Axis)	The Kopter with the front (Arrow direction of the FlightCtrl) pointing to the South or North. Then rotate the Kopter a couple times over the Nick-Axis until the buzzer stops with the clicking starts.	
Calibration of the **Y-Axis** (Roll-Axis)	**Rotate the Kopter by 90°** The clicking starts again. Rotate the Kopter a couple times over the Roll-Axis until the buzzer stops with the clicking starts.	

Step 3 Finish the calibration of the X and Y-Axis	**Pull Nick 1x down** (The Kopter beeps 3x)	
Step 4 Start calibration of the Z-Axis	**Pull Nick 1x down** (The Kopter beeps 4x and the clicking starts begin again)	

Calibration of the **Z-Axis** (Yaw-Axis)	INFO: Here it doesn't matter if the Kopter shows with the X or Y-Axis towards South (North). Rotate the Kopter a few times over the Roll- or Nick-Axis until the buzzer stops with the clicking starts.	
Step 5 Finish the calibration of the Z-Axis.	**Pull Nick 1x down** The Kopter confirms it with 2 beeps	

3. Now that the Kopter "beeped" 2x after a successful calibration that part is done.

- If everything is OK the red LED stops lighting after a few seconds on the NaviCtrl V2.0 with integrated compass.
  If you use a NaviCtrl V1.1 with MK3Mag the red LED on the MK3Mag lights permanently.

DONE!

11.2 Videos

(German version)

(English version)

If the calibarion fails (compass still reports "invalid compass value"), you can take a look here: **MagnetError**

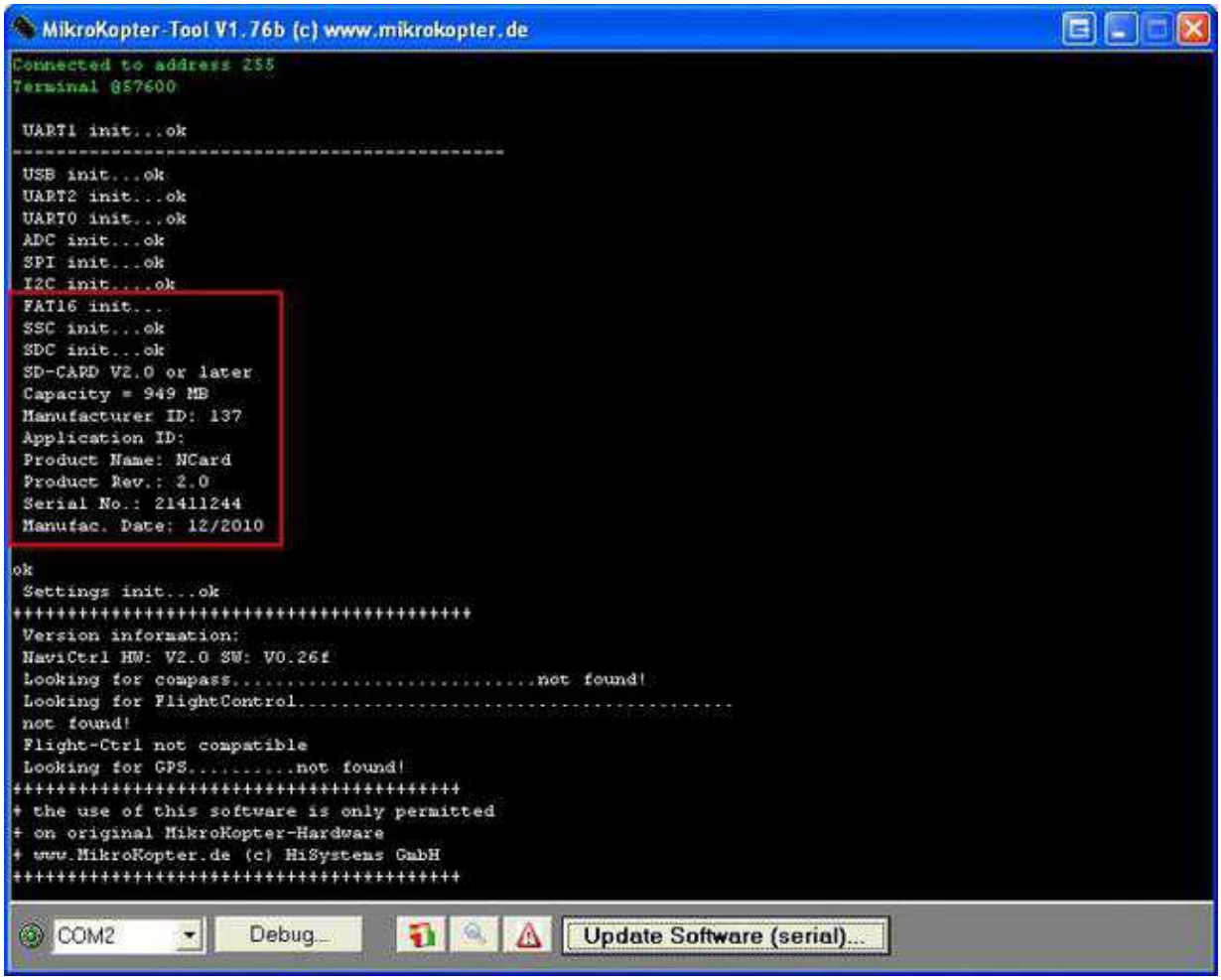
11.3 First Start

If you want to try out those functions you need to have a lot of space and a bunch of open sky.

1. As discribed above activate the GPS-Function (and CareFree) and assign the switch(es) at the transmitter.
2. Switch ON the MikroKopter and ensure a radio contact between transmitter and receiver.
3. Wait for the first Sat-Fix.
   - LED at the MKGPS glows as long as there is no Sat-Fix and **flashes** if a Sat-Fix is available.
   - If the GPS-Switch on the transmitter is on PH or CH the Kopter beeps as long as required in a tact of a second until the minimum of numbers of satellites has been found.
   - Beeps are more quiet if the Fix is there but not all 6 satellites were found.
   - With a confirmation beep the beeping stops as soon as the Sat-Fix is there.
4. Control of the communication between NaviCtrl and FlightCtrl.
   - The Kopter beeps in intervals as long as the GPS has no Fix *(it beeps only if you are on **PH** or **CH**, in the FREE-Mode it will not beep).*
   - if the GPS-Switch at the transmitter will be switched it must beep short each time.
5. Wait until the GPS has a Sat-Fix and the LED on the MKGPS flashes.
6. Switch to **GPS_MODE_Free**!
7. Start engines.
   - Hover some seconds and (if necessary) fine-adjust the MikroKopter at the transmitter so that the Kopter can hold the position by itself.
   - Now bring the Kopter into your desired height and activate the height control.
8. Switch to the GPS_MODE **PositionHold (PH)**.
   - Position will be logged *(will be acknowleged through a beep).*
   - GPS should work now and the Kopter should hover with a difference of a few meter on its position.

12 MicroSD-Card

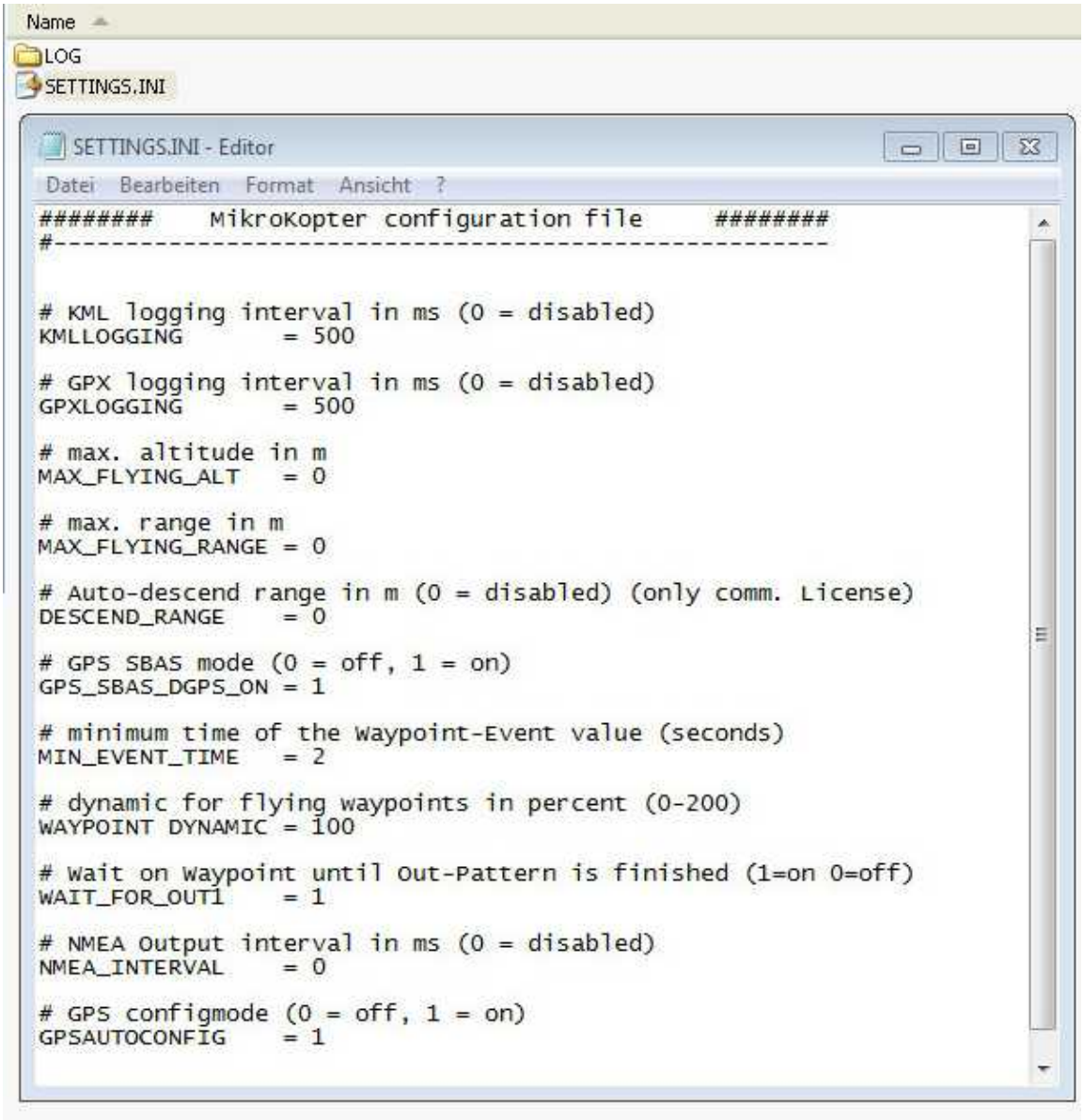
Into the NaviCtrl you can place a **Micro SD-Card** in the size up to **2GB** (in **FAT16** formatted).
Here you can save the flight-route and other datas of the Kopter in KML-Format and GPS-Format.
The SD-Card will be plugged in as you can find under **Connections** into the NaviCtrl.
A detected and initialized Micro SD-Card you can see in the initialization of the NaviCtrl.



If you want to read or change the data on the Micro SD-card, it must be removed from the NaviCtrl and plugged into an appropriate card slot on the PC.

12.1 SETTINGS.INI

On the SD-Card from the NaviCtrl there will be automatically a file generated named **Settings.ini** with the following content:



- **KMLLOGGING = 500** (Interval (in ms) the logging of the KML-Datas. Default = 500.)
- **GPXLOGGING = 1000** (Interval (in ms) the logging of the GPX-Datas. Default = 1000.)
- **MAX_FLYING_ALT = 0** (Input of the max. flight-altitude. Default = 0. **See INFO**)
- **MAX_FLYING_RANGE = 0** (Input of the max. flight-radius. Default = 0. **See INFO**)
- **DESCEND_RANGE = 0** (Input of the safety-radius for the max flying range. Default = 0. **See INFO**)
- **GPS_SBAS_DGPS_ON = 1** (Switch on/off DGPS receiving. Default = 0.)
- **MIN_EVENT_TIME = 2** (Adjustable trigger. See: Delay Time)
- **GPSAUTOCONFIG = 1** (1 = the NC writes its own GPS-Configuration (temporary) into the MKGPS. Default = 1.)

INFO
Important settings for license user!

MAX_FLYING_ALT Here you can enter a maximum altitude which is required for i.e. a special license for the commercial use.

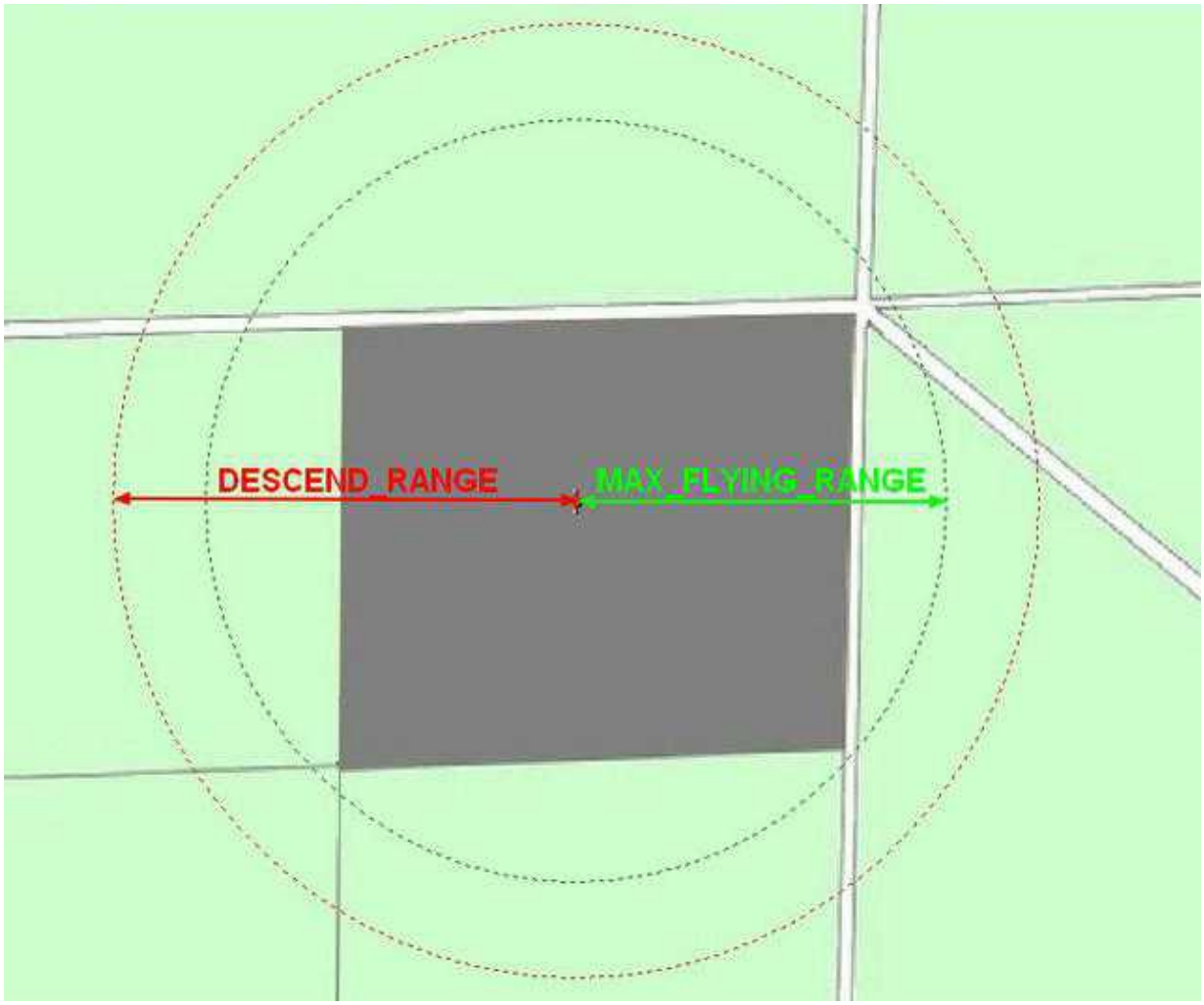
If the Kopter reaches that set up altitude mnessage 29 "ERR:Max Altitude" appears over the telemetry display.
If you do not react to this message and you climb further up, 10mtr. above the set up max. altitude the Kopter will switch automatically to the set emergency-throttle/gas Link and sink.
After reaching the regular set up altitude again the Kopter will switch automatically back from emergency-throttle/gas to normal operation.

User without a license get also after reaching the max. altitude the same message but they are able to climb further up.

More informations about this you will find here: Max.Altitude - Example

MAX_FLYING_RANGE Here you can enter a max. flight-radius which is required for the special license and commercial use.
INFO: This value should be smaller as the under "DESCEND_RANGE" entered radius!!!
If the Kopter reaches this radius GPS will be automatically activated. The Kopter will be flown back automatically over the function "ComingHome" into the set up flight-radius.
Here you will see an appropriate message over the telemetry display.

DESCEND_RANGE Here byou can enter a max. flight-radius which is required for the special license and commercial use.
If the Kopter is leaving this radius it will turn automatically with 80% hovering-throttle/gas into a descent flight.
INFO:
The Kopter should not reach that radius with a small set up "MAX_FLYING_RANGE" under normal circumstances.



For user without a license is the setting "DESCEND_RANGE" with no function.

TIP: To change those values you should insert and open the SD-Card directly in ab appropriate slot on your PC. Here you can do the adjustment with an editor.
TIP: License User should activate in the Settings "Miscellaneous (Misc)" the function "SD card missing". (For your convenient information: In France, i.e., with the beginning of 2012 are those settings now obligation for commercial user and the Kopter MUST come down if it is out of a 150mtr. radius!)

Attention

1. If you need to change those datas please **do not use** Logging-times under 500ms - that can affect the navigation and lead to failures!

2. **After an Update of the NaviCtrl** please clear the **SETTINGS.INI** on the SD-Card.
The new Software will set a new file with the needed values.

12.2 stored data - folder "LOG"

During flight the Kopter will create once a folder "LOG" and save some informations (for each flight) on the micro-SD-card in a .KML and a .GPX file.

These are:

- ele
- time
- sat
- Altimeter
- Variometer
- Course
- Groundspeed
- VerticalSpeed
- FlightTime
- Voltage
- Current
- Capacity
- RCQuality
- RCRSSI
- Compass
- NickAngle
- RollAngle
- NCFlag
- ErrorCode
- TargetBearing
- TargetDistance
- RCSticks
- GPSSticks
- Actual Waypoint
- Value of the WP-Event
- Nick- and Roll-Servo-Value

You can take a look on this informations with the programm **"GPX-Viewer"** or **"MK_GPX** (Link)

12.3 Presentation of the flight data in Google Earth

In Google Earth you can display and see the saved flight-datas of the Kopter. In the actual Google Earth Version (>6.1) you can display the flight-route
by loading the .KML or the .GPX-file.

Tipp
If you open a .KML file with "Google Earth" and see only red stripes, you have to edit the .KML file. Here in this file you can change the coordinates like you see here:

- **Example:**
  - Wrong: +7.1234567,+53.1234567, 0.000
  - Right: +7.1234567,+53.1234567,0.000

Since software version v0.26g (NaviCtrl) the changes are already included in the KML-log.

(The flight-route will be also displayed in the height if you set up in the properties of the file the **Height** to **Relativ to ground**.)

13 Parameter

The practice has shown that the default parameters (settings) are already sufficient for almost all MikroKopter.
Who wants to do a little bit fine-tuning that can be done in the settings. You can do that in the tabs NaviCtrl and NaviCtrl2.

14 Debug-Interface

To the **Debug**-Interface the MK-USB will be hooked up there. Here you can set up the NaviCtrl, download new software or you can get failure information over the KopterTool.

For the data transfer between the Kopter and the PC you can use also a **Bluetooth-Module** or a **Wi232-Module**.
The module will be hooked up also to the **Debug**-Interface of the NaviCtrl. A second module (Bluetooth or Wi232) to receive the datas will be connected to the MK-USB.

14.1 NMEA

Since the Software-Version 2.00a (for NaviCtrl) we can also use the format **NMEA** (e.g. for Cameras witht Datalogging). The output is at 57600 baud. The records are sent with RMC & GGA. You can get the data on PIN9 of the *Debug* connection of the NaviCtrl.
NOTE: To use the NMEA you need a plugged microSD card (max. 2GB/FAT16) and the entry "NMEA_INTERVAL" in the Settings.ini must have a value entered. If you already have a microSD card in! NaviCtrl used muss after a software update the existing settings.ini it are deleted so that a new one can be created with the parameters.

15 Upgrading software

1. Connect the NaviCtrl over the 10- and 6pole connection plug with the FlightCtrl (see MK-Tower)
2. Connect the MK-USB to the **Debug**-Interface of the NaviCtrl - **DO NOT** place the jumper on the MK-USB.
3. Now switch ON the Kopter**.**
4. Start the KopterTool and click in the Terminal Window (Button *Firmware Update and Terminal*) on **Update Software (serial)**. Then choose the .hex-file.
5. The Update-sequence starts and should be done after approx. 1-2 minutes. At the end you can see debug-datas in the Terminal**.**

Further information for the Update (also if an update fails) you can get here: SoftwareUpdate

INFO

For updating the software you should always use the MK-USB.
If you use for the data-transfer a Wi232 Module or a Bluetooth Module the update can be faulty!

INFO

To flash the bootloader is not necessary and also not possible.
If the processor is defect you can buy a new one with the appropriate bootloader in the Shop.

16 Error Codes

If you use the GPS-System (NaviCtrl + Compass + MKPGS) on your Kopter and you calibrate the Gyros, you can see for a short time "error 6" + "error 3" in your Telemetry-Display.
This is normal. Because the connection between FlightCtrl and NaviCtrl is briefly interrupted when you calibrate the Gyros .

For all other Failure codes you can find here some Tipps to resolve it: ErrorCodes

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- KategorieMK-Baugruppe/en

SECTION 2: Pixhawk

pixhawk

AUTOPILOT

QUICK START GUIDE

3D Robotics

PARTS

1 Pixhawk
2 Buzzer
3 Safety switch
4 Micro-SD card and adapter
5 Micro-USB cable
6 Six-wire cable x2
7 Power module
8 I²C splitter module
9 Four-position I²C splitter cable
10 Three-wire servo cable
11 Mounting foam

GETTING STARTED

With the help of APM firmware, Pixhawk turns any RC plane, copter, or rover into a full-featured personal drone. Once you have a fully-assembled frame, follow this guide to install Pixhawk.

1. Mount
2. Connect
3. Load firmware
4. Calibrate

1 MOUNT

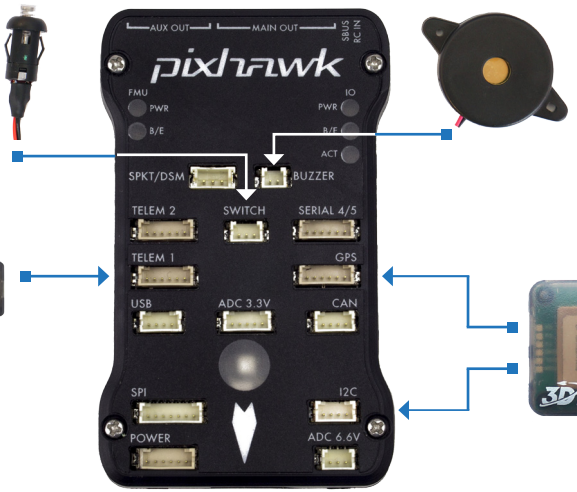
Use the provided foam to mount Pixhawk as close as possible to your vehicle's center of gravity. Make sure to orient the board with the arrow pointing forward.

Attach the foam squares to the corners of the board.

Vehicle front

2 CONNECT

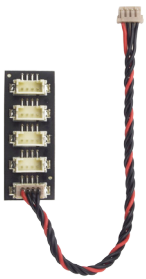
(Required) Connect the buzzer and safety switch.



(Optional) Connect a 3DR Radio to Pixhawk's Telem port using the 6-wire cable provided with your 3DR Radio Kit to receive data and communicate with the autopilot in flight.

(GPS or GPS+Compass required) Connect a 3DR GPS+Compass to provide the autopilot with positioning data during flight. This kit includes a 6-wire cable to connect the GPS ports. Connect the MAG to the I²C port using the 4-wire cable provided with the 3DR GPS+Compass.

(Required) Connect the 3DR Power Module to the Power port using the 6-wire cable to direct power from your lithium polymer (LiPo) battery to the autopilot.



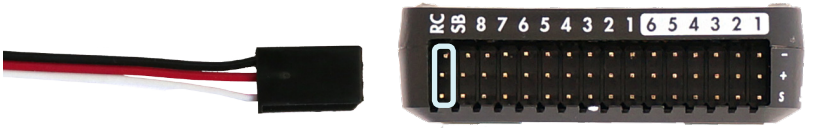
(Optional) The I²C splitter expands the I²C port to allow up to four additional peripherals to connect to Pixhawk. Use the 4-wire cable to connect the I²C splitter and add a compass module, external LED, digital airspeed sensor, or other peripherals to your vehicle.

LOAD SD CARD INTO PIXHAWK

If the SD card is not preloaded into Pixhawk, insert the micro-SD card into the slot at the bottom end of the board.

CONNECT RADIO CONTROL

FOR PPM RC RECEIVERS AND FUTABA S.BUS RECEIVERS



Connect the ground (-), power (+), and signal (S) wires to the RC pins using the provided 3-wire servo cable.

FOR SPEKTRUM SATELLITE RECEIVERS

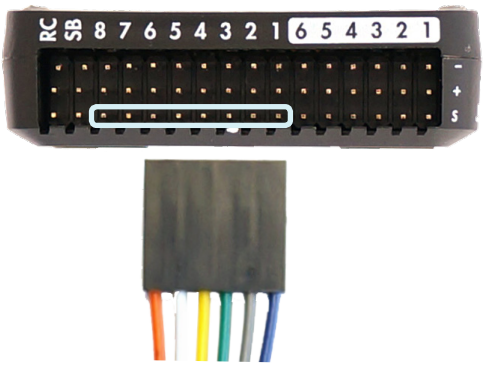
For a Spektrum DSM, DSM2, or DSM-X Satellite RC receiver, connect to the SPKT/DSM port.

For a complete list of RC systems compatible with Pixhawk, visit the APM wiki page here.

FOR PWM RECEIVERS

Purchase a PPM Encoder module to connect a PWM RC receiver to Pixhawk at store.3dr.com.

CONNECT OUTPUTS



FOR COPTERS

Connect each signal wire from the PDB to the main output signal (S) pins by motor number. Connect one wire for each motor to the corresponding pin.

Pin 1 = Motor 1
Pin 2 = Motor 2
Pin 3 = Motor 3
Pin 4 = Motor 4
Pin 5 = Motor 5
Pin 6 = Motor 6
Pin 7 = Motor 7
Pin 8 = Motor 8

FOR PLANES

For planes, connect the control channel wires to the main output signal pins.

Pin 1 = Aileron
Pin 2 = Elevator
Pin 3 = Throttle
Pin 4 = Rudder

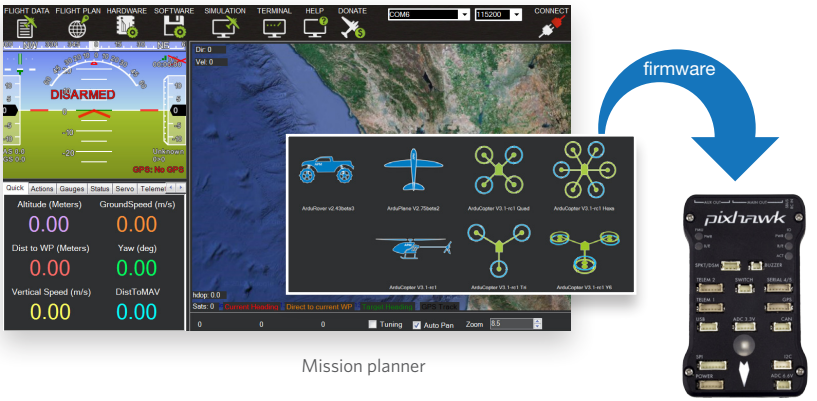
FOR ROVERS

For rovers, connect the throttle and steering wires to the main output signal pins.

Pin 3 = Throttle
Pin 4 = Steering

3 LOAD FIRMWARE

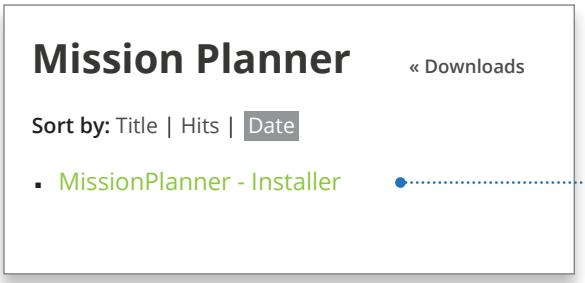
APM firmware is the brains of your autopilot operation and must be installed before using Pixhawk.
To load firmware onto Pixhawk, install a mission planner application on your ground station computer. Choose either Mission Planner (Windows) or APM Planner for (Windows, OS X, and Linux).
Both applications are available for free download from ardupilot.com.



Mission planner

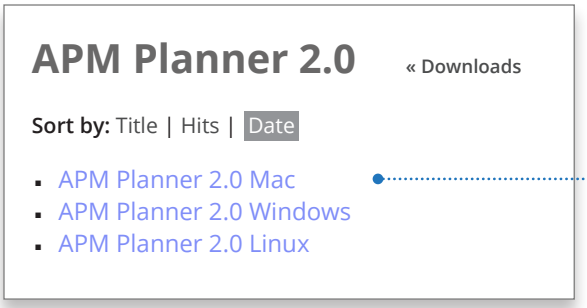
Download Mission Planner (Windows)

Ardupilot.com → Downloads → Mission Planner



Download APM Planner (Windows, OS X, and Linux)

Ardupilot.com → Downloads → APM Planner 2.0



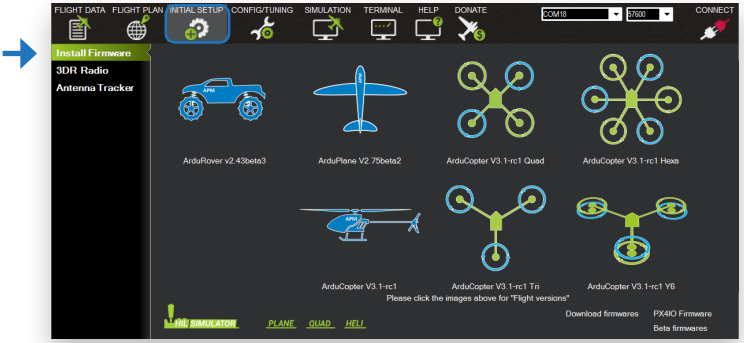
INSTALL PLANNER

After selecting the correct file, read the safety information and select Download.

Open the file to run the setup wizard. Proceed through any security warnings, and install all suggested drivers. When the installation is complete, open the application, and connect Pixhawk to your computer using the micro-USB cable.

Your computer will automatically install the correct drivers. Do not select Connect at this time; Pixhawk can only load firmware while unconnected to Mavlink.

Select Initial Setup, Install Firmware, and select your vehicle.



When prompted, follow the directions to load the firmware. Once the status bar shows that the download is complete, power cycle the board by disconnecting and reconnecting the USB.

If you hear a musical tone, your firmware installation is complete. If you hear a series of tones followed by three beeps, disconnect the USB and reconnect while holding down the safety button. Upon restart, listen for a series of tones followed by two beeps indicating that your firmware has loaded successfully.

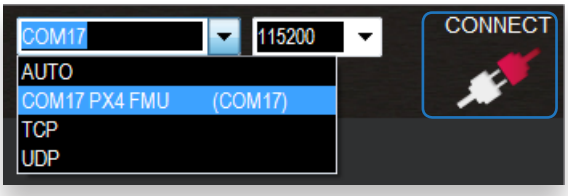
Everything is OK:
musical tone

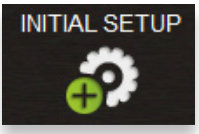
Pixhawk needs your attention:
beep BEEP beep... BEEP BEEP BEEP

beep BEEP beep...
BEEP BEEP

4 CALIBRATE

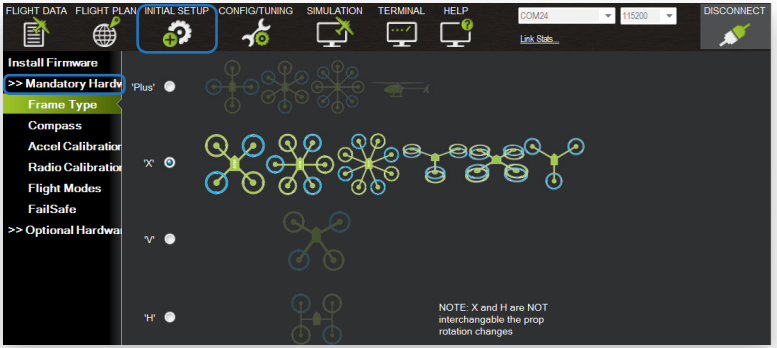
With Pixhawk connected to your computer, select the communication option from the drop-down menu for PX4 FMU, set the rate to 115200, and select the Connect icon. Select Initial Setup and Mandatory Hardware to access the calibration wizards.





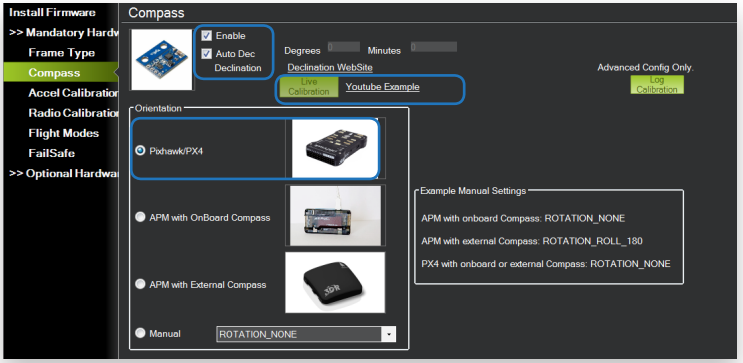
Remove propellers before performing calibration.

SELECT FRAME TYPE (COPTERS ONLY)



For copter, select your frame orientation.

CALIBRATE COMPASS

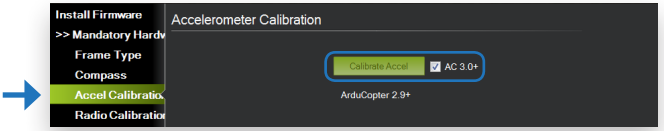


Select the options to enable the compass; to allow automatic declination calculation; and to specify Pixhawk. Select Live Calibration to launch the wizard, and follow the prompts.

Show Me

videos demonstrating live calibration techniques at 3dr.com/learn.

CALIBRATE ACCELEROMETER

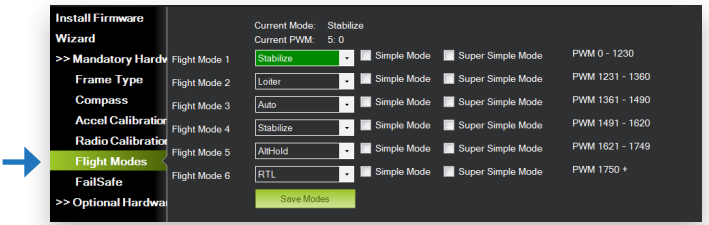


Select Accel Calibration, check the box for AC 3.0+, select Calibrate, and follow the prompts to calibrate Pixhawk's accelerometer. Make sure to wait a couple of seconds before and after changing the positions of the vehicle.

RC CALIBRATION

Select Radio Calibration to teach Pixhawk to work with your RC transmitter. Turn on your transmitter, select Calibrate Radio, and move all sticks and switches to their extreme positions. Select Click when Done once the red bars are set for all available channels.

SELECT FLIGHT MODES



Move each switch on your transmitter to its available positions. The mission planner will indicate the currently selected position with green highlighting. Select a mode for each switch position, and select Save Modes to assign.

LED MEANINGS

Flashing red and blue: initializing. Please wait.

Double flashing yellow: error. System refuses to arm.

Flashing blue: disarmed, searching for GPS. Autonomous, loiter, and return-to-launch modes require GPS lock.

Flashing green: disarmed, GPS lock acquired. Ready to arm. Quick double tone when disarming from the armed state.

Solid green plus single long tone: armed and ready to fly!

Flashing yellow: RC failsafe activated.

Flashing yellow plus quick repeating tone: battery failsafe activated.

Flashing yellow and blue plus high-high-high-low tone: GPS glitch or GPS failsafe activated.

SAFETY SWITCH MEANINGS

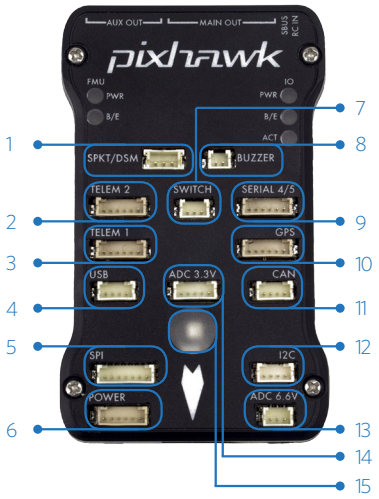
Quick, constant blinking: performing system check. Please wait.

Intermittent blinking: system ready. Press the safety button to activate.

Solid: ready to arm. Proceed to the arming procedure.

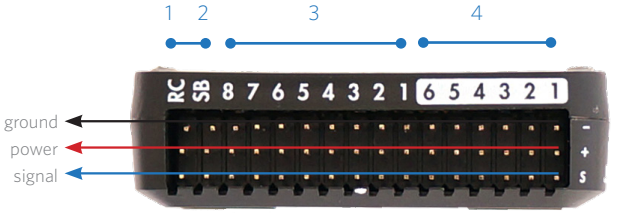
Learn more
about LED meanings and buzzer tones at 3dr.com/learn.

PORTS



1 Spektrum DSM receiver
2 Telemetry (radio telemetry)
3 Telemetry (on-screen display)
4 USB
5 SPI (serial peripheral interface) bus
6 Power module
7 Safety switch button
8 Buzzer
9 Serial
10 GPS module
11 CAN (controller area network) bus
12 I^2C splitter or compass module
13 Analog to digital converter 6.6 V
14 Analog to digital converter 3.3 V
15 LED indicator

1 Input/output reset button
2 SD card
3 Flight management reset button
4 Micro-USB port



1 Radio control receiver input
2 S.Bus output
3 Main outputs
4 Auxiliary outputs

IMPORTANT NOTE

Please note that these instructions describe basic setup for Pixhawk and do not represent the complete set of configuration procedures required to build a copter, plane, or rover.

For more information on ESC calibration, battery monitoring, failsafes, mode descriptions, and more, visit ardupilot.com. Do not operate your vehicle without a complete understanding of the online instructions.

SPECIFICATIONS

Processor

32-bit ARM Cortex M4 core with FPU
168 Mhz/256 KB RAM/2 MB Flash
32-bit failsafe co-processor

Sensors

ST Micro 16-bit gyroscope
ST Micro 14-bit accelerometer/magnetometer
MEAS barometer
MPU6000 accelerometer/magnetometer

Power

Ideal diode controller with automatic failover
Servo rail high-power (7 V) and high-current ready
All peripheral outputs over-current protected, all inputs ESC protected

Interfaces

5x UART serial ports, 1 high-power capable, 2x with HW flow control
Spektrum DSM/DSM2/DSM-X Satellite input
Futaba S.BUS input and output
PPM sum signal
RSSI (PWM or voltage) input
I^2C, SPI, 2x CAN, USB
3.3 and 6.6 ADC inputs

Dimensions

Weight 38 g (1.3 oz)
Width 50 mm (2.0")
Height 15.5 mm (.6")
Length 81.5 mm (3.2")

SUPPORT

For more information about Pixhawk and other documentation, visit 3dr.com/learn. For more instruction on using APM firmware and planner software, visit ardupilot.com.

For customer support, contact us at help@3dr.com or call our support line at +1 (858) 225-1414 Monday through Friday, 8 am to 5 pm, PST.

SAFETY

Operating a powered vehicle of any kind can be a lot of fun, but it carries certain inherent risks. Regulations governing the use of powered vehicles, including aircraft, vary from locale to locale, even within the same country or district. It is your responsibility to ensure that you understand and comply with all local laws and regulations.

Safety basics:

- Never operate the vehicle or software in a way that could be dangerous to you, other people, or property.
- Always keep propeller arcs free of objects and body parts while the vehicle is live.
- Keep in mind that software and hardware failures happen. Although we design our products to minimize such issues, you should always operate with the understanding that a failure could occur at any time and without warning. Accordingly, you should take the appropriate precautions to minimize danger in case of product failure.
- Never use the software or hardware for manned vehicles.
- Always operate within local laws and regulations.
- Do not operate the aircraft if you are under the age of 18.

Additional safety information:

- Be sure to maintain safe distances between people and your aircraft.
- Never operate your aircraft if your ability to do so with the utmost attention to safety is impaired in any way. Do not operate your aircraft while tired, under the influence of drugs or alcohol, or otherwise unable to operate it with the highest attention to safety.
- Environment conditions can change rapidly and can make operation difficult. If this occurs, land your aircraft and discontinue use immediately. Do not operate your aircraft if operating conditions are not ideal. This includes, but is not limited to, rain, snow or excessive wind.
- Always ensure the battery cable is disconnected from the aircraft until you are ready to fly, and ensure that your batteries are fully charged prior to use.
- Always turn on the transmitter and ensure the throttle stick is all the way down before connecting the battery.
- After landing, disarm your vehicle immediately and disconnect the battery cable.
- Do not turn off the transmitter until after you have disconnected the battery.
- Always remove the propellers while testing the motors.
- When the battery is connected, always assume the vehicle is live and the motors are armed.
- Do not attempt to fly longer than the battery's safe capacity.
- Do not operate the vehicle with excess weight attached.
- Ensure that all vehicle components are well maintained before each flight. Ensure that components are firmly attached and operating properly.
- Replace any worn or damaged components before each flight. Never operate with any damaged or worn components.
- SAFETY IS THE FIRST PRIORITY. Take all precautions necessary to ensure your own safety as well as the safety of other people and property.

DISCLAIMER

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