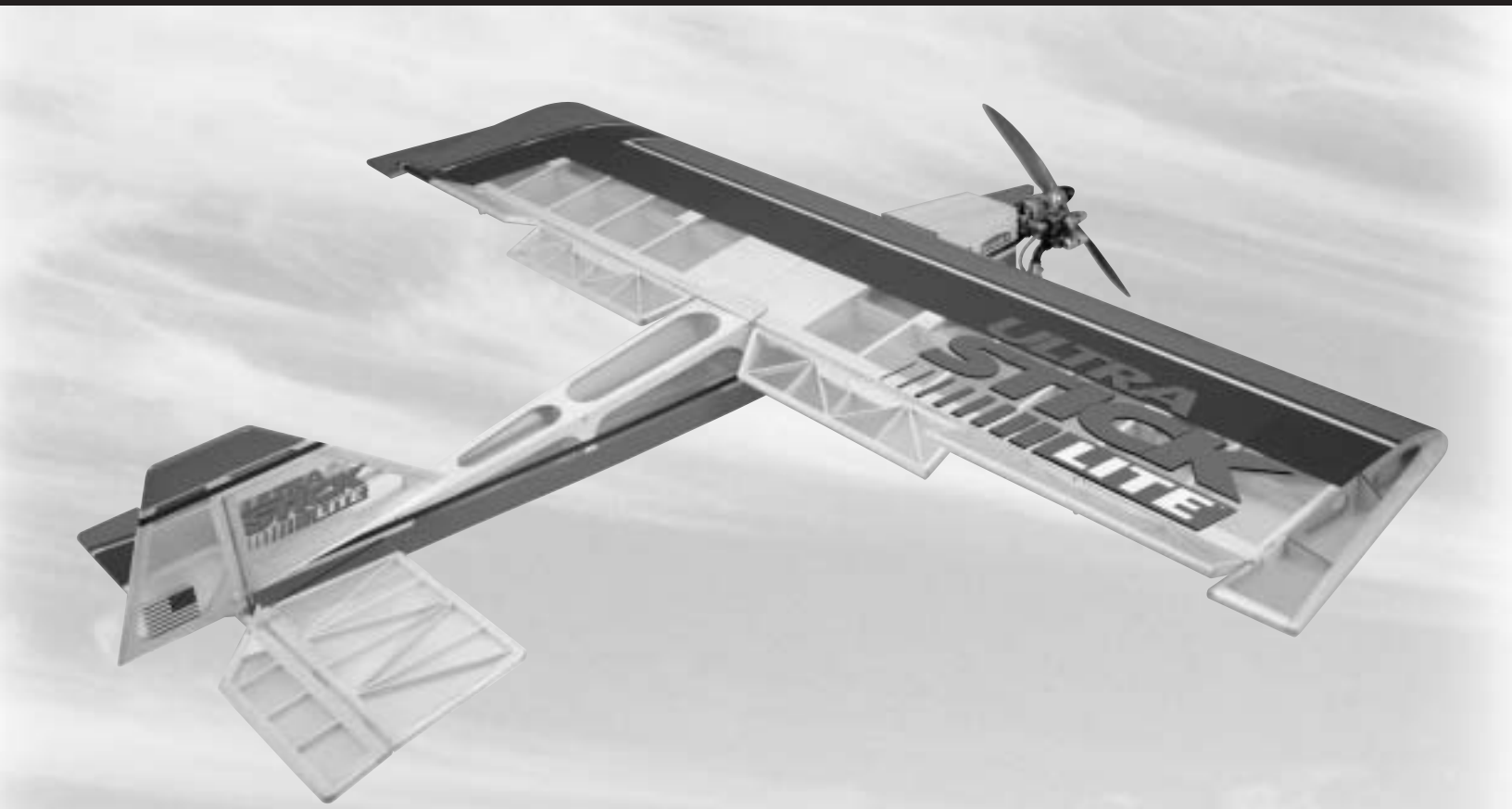
ULTRA STICK LITE™

HANGAR 9®
WE GET PEOPLE FLYING

ASSEMBLY MANUAL

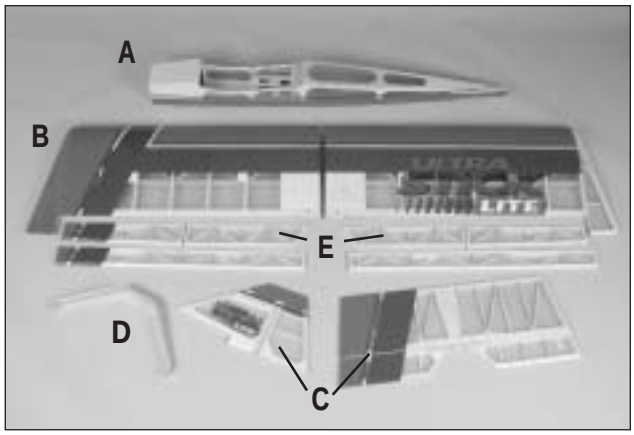


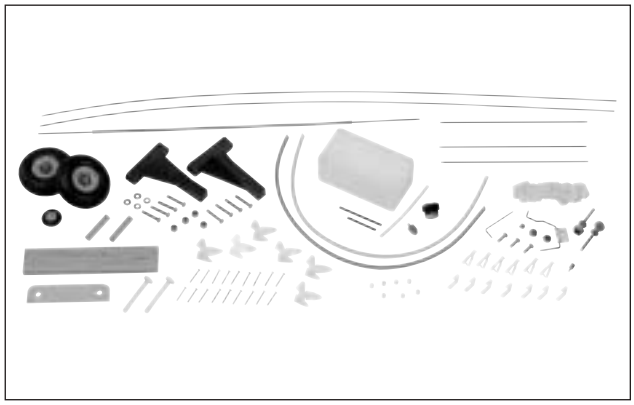
Specifications

Wingspan:	76 in (1676mm)
Length:	55 in (1397mm)
Wing Area:	2 AIL: 1210 sq in (5934.5 sq dm)
	4 AIL: 1230 sq in (6025.5 sq dm)
Weight (approximate):	9–11 lb (2.7–3.15 kg)
Recommended Engines:	2-cycle: 1.08–.150 cu in
	4-cycle: 1.00–1.80 cu in

Table of Contents

Contents of Kit





Large Parts

A. Fuselage	HAN2327
B. Wing Set with Joiner	HAN2326
C. Tail Set	HAN2328
D. Landing Gear	HAN2329
E. Quad-Flap Set	HAN2330

Additional items sold separately

Decal Set (not shown)	HAN2331

Additional Required Equipment

Radio Equipment

- 4-channel radio system (minimum)
  (6 if using Quad Flaps)
- 4 standard servos (JRPS537 recommended or equivalent)
  (6 servos required if using Quad Flaps)

Recommended JR™ Systems

- PCM10X
- XP8103
- X-378
- XP662
- XF631
- XF421

JR XP8103

JR PCM10X

Recommended Engines

- 1.08–1.50 2-stroke
- 1.00–1.80 4-stroke

MDS 1.48 Pro (Ring)
MDSE14800

Saito™
180 Golden Knight AAC
SAIE180 GK

Additional Required Tools and Adhesives

Tools

- Canopy Scissors
- Drill
- Drill Bit: 1/16", 3/32", 1/8", 7/32", 1/4"
- Flat blade screwdriver
- Hobby knife
- Phillips screwdriver (large and small)
- Pliers
- Square

Adhesives

- 6-minute epoxy
- 30-minute epoxy
- Thin CA (cyanoacrylate) glue
- Thick CA (cyanoacrylate) glue
- CA remover/debonder
- Pacer Z-42 Threadlock
- Canopy glue (RC-56)
- Masking tape (3M blue recommended)

Other Required Items

- Epoxy brushes
- Felt-tipped pen or pencil
- File
- Foam: 1/2"
- Measuring device (ruler, tape measure)
- Mixing sticks for epoxy
- Paper towels
- Petroleum jelly
- Rubbing alcohol
- Sanding bar
- Sandpaper (medium)
- String
- T-pins
- Wax paper

Other Items Needed (not included in the kit)

- Propeller (consult engine instructions)
- 537 Standard Servo (JRPS537) or equivalent (4–6)
- 12” Servo Lead Extension (JRPA098) (2)
- 24” Servo Lead Extension (JRPA102) (2)
- Large Arms w/Screws (JRPA212) (3)
- Extra RX Pack 1100mAh 6V Flat (JRPB4250)

Warning

An RC aircraft is not a toy! If misused, it can cause serious bodily harm and damage to property. Fly only in open areas, preferably at AMA (Academy of Model Aeronautics) approved flying sites, following all instructions included with your radio and engine.

Before Starting Assembly

Before beginning the assembly of the Ultra Stick™ Lite, remove each part from its bag for inspection. Closely inspect the fuselage, wing panels, rudder and stabilizer for damage. If you find any damaged or missing parts, contact the place of purchase.

If you find any wrinkles in the covering, use a heat gun or covering iron to remove them. Use caution while working around areas where the colors overlap to prevent separating the colors.

Using the Manual

This manual is divided into sections to help make assembly easier to understand and to provide breaks between each major section. In addition, check boxes are provided to help you to keep track of each step completed. Steps with two boxes indicate that the step will require repeating, such as for a right or left wing panel, two servos, etc. Remember to take your time and follow the directions.

Warranty Information

Horizon Hobby, Inc. guarantees this kit to be free from defects in both material and workmanship at the date of purchase. This warranty does not cover any parts damage by use or modification. In no case shall Horizon Hobby's liability exceed the original cost of the purchased kit. Further, Horizon Hobby reserves the right to change or modify this warranty without notice.

In that Horizon Hobby has no control over the final assembly or material used for the final assembly, no liability shall be assumed nor accepted for any damage of the final user-assembled product. By the act of using the product, the user accepts all resulting liability.

Once assembly of the model has been started, you must contact Horizon Hobby, Inc. directly regarding any warranty question that you have. Please do not contact your local hobby shop regarding warranty issues, even if that is where you purchased it. This will enable Horizon to better answer your questions and service you in the event that you may need any assistance.

If the buyer is not prepared to accept the liability associated with the use of this product, the buyer is advised to return this kit immediately in new and unused condition to the place of purchase.

Horizon Hobby
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Champaign, Illinois 61822
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www.horizonhobby.com

Section 1: Conventional Wing Assembly

Required Parts

- Left wing panel with aileron and hinges
- Right wing panel with aileron and hinges

Required Tools and Adhesives

- Paper towels
- Instant thin CA glue
- CA remover/debonder
- T-pins (one for each hinge)
- Hobby knife with #11 blade

Before beginning construction, decide what style of wing is desired (conventional or quad-flap) and what type of engine will be mounted on the model. The conventional aileron wing will be presented in this section. Each aileron will be controlled by its own servo. You will need two servos when you begin Section 3.

For a standard wing configuration, we recommend a servo that has 40 ounce inch of torque or greater, such as the JR™ 537 servo that now comes standard with JR radio systems. The JR 531 or 8101 servos are also excellent to use for aileron servos in the wing.

> **Note**: The control surfaces, including the ailerons, flaps, elevator and rudder, come with the hinges installed, but the hinges are not glued in place. It's imperative that you use a high quality thin CA glue to properly adhere the hinges and control surfaces in place.

☐ **Step 1**

Carefully remove one of the wing panels from its protective plastic. Save the plastic, as it will be used later in Section 2 to protect the wing panel surface from epoxy smears. Remove the aileron from the wing panel. Note the position of the hinges.

☐ **Step 2**

Remove each hinge from the wing panel and place a T-pin in the center outside edge of each hinge. Slide each hinge into the wing panel until the T-pin is snug against the wing.

☐ **Step 3**

Slide the aileron onto the wing until there's only a slight gap (approx. 1/32" or less). The hinges are now centered on the wing panel and aileron. Remove the T-pin and snug the aileron against the wing panel. This will ensure that the hinges are centered.

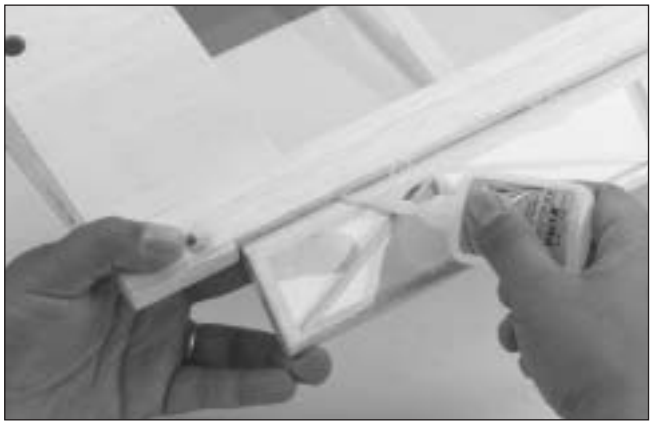
> **Note**: The hinge is constructed of a special material that allows the CA to wick (or penetrate) and distribute throughout the hinge, securely bonding it to the wood structure. Before applying CA, make sure the aileron moves freely without binding on the wing.

☐ **Step 4**

Deflect the aileron and completely saturate the hinge with thin CA glue. The aileron's front surface should lightly contact the wing during this procedure. Ideally, when the hinge is glued in place, a 1/32" gap or less will be maintained throughout the length of the aileron.

☐ **Step 5**

Turn the wing panel over and deflect the aileron in the opposite direction from the previous step. Again apply thin CA glue to each aileron hinge, making sure the CA penetrates into both the aileron and the wing.



☐ **Step 6**

Using CA remover/debonder and a paper towel, remove any excess CA glue that may have accumulated on the wing or in the aileron hinge area.

☐ **Step 7**

Repeat Steps 1 through 6 for the opposite wing half before moving on to Step 8.

☐ **Step 8**

After both ailerons are securely hinged, firmly grasp the wing and aileron to check that the hinges are securely glued and cannot be pulled apart. To do this, apply medium pressure to try to separate the aileron from the wing, using caution to be certain you don't crush the wing structure.

☐ **Step 9**

Move the aileron up and down to "work in" the hinges and check for proper movement.

Section 1a: Quad-Flap Wing Assembly

Required Parts

- Left wing aileron/flap
- Right wing aileron/flap
- Left wing panel with aileron and hinges
- Right wing panel with aileron and hinges

Required Tools and Adhesives

- Sealing iron
- Paper towels
- Instant thin CA glue
- CA remover/debonder
- T-pins (one for each hinge)
- Hobby knife with #11 blade

Note: The procedure for hinging the flap/aileron in each wing panel is the same as described for the conventional wing.

☐ **Step 1a**

Locate the plastic bag containing the flap/aileron pieces for each wing panel and remove from the package. Carefully remove one of the wing panels from the protective plastic bag. Save the plastic bag for use in Section 2. Remove the conventional aileron from the wing panel.

☐ **Step 2a**

Remove the hinges from the wing panel and place a T-pin in the center outside edge of each hinge. Slide each hinge into the wing panel until the T-pin is snug against the wing.

☐ **Step 3a**

Slide the aileron and flap control surface onto the wing panel until there's only a slight gap (approximately 1/32"). The hinges are now centered on the wing panel and the control surfaces. Remove the T-pins and snug each control surface to the wing panel. This will ensure the hinges are centered.

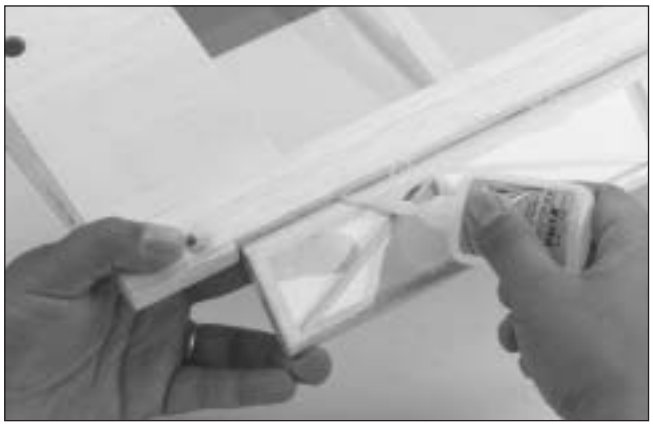
Note: The hinge is constructed of a special material that allows the CA to wick (or penetrate) and distribute throughout the hinge, securely bonding it to the wood structure. Before applying CA, make sure the flap and aileron move freely without binding on the wing or with each other.

☐ **Step 4a**

Deflect the aileron and flap and completely saturate each hinge with thin CA glue. The aileron and flap's front surface should lightly contact the wing during this procedure. Ideally, when the hinges are glued in place, a 1/32" gap or less will be maintained throughout the length of the aileron and flap.

☐ **Step 5a**

Turn the wing panel over and deflect the aileron and flap in the opposite direction from the previous step. Apply thin CA glue to each aileron hinge, making sure the CA penetrates into the aileron, flap and the wing.



☐ **Step 6a**

Using CA remover/debonder and a paper towel, remove any excess CA glue that may have accumulated on the wing aileron or flap hinge area.

☐ **Step 7a**

Repeat Steps 1A through 6A for the opposite wing panel.

☐ **Step 8a**

After both the aileron and flap control surfaces are securely hinged, firmly grasp the wing, flap, and aileron to check that they are securely glued and cannot be pulled apart. To do this, apply medium pressure to try to separate the control surfaces from the wing. Use caution to be certain you don't crush the wing structure.

☐ **Step 9a**

Move the control surfaces up and down to "work in" the hinges and check for proper movement.

> **Important**: If any binding has developed between the control surfaces, it must be removed. You may have to trim away some covering or balsa to make each control surface move freely.

Section 2: Joining the Wing Halves

Required Parts

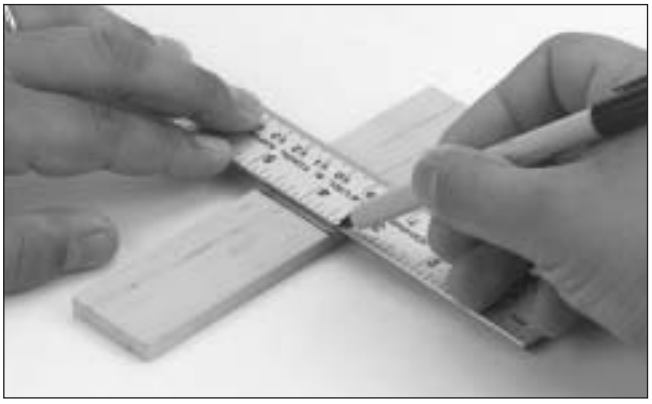
- Right/left wing panels
- Plastic wing bags (optional)
- Wing joiner brace

Required Tools and Adhesives

- 30-minute epoxy
- Mixing stick
- Masking tape
- Rubbing alcohol
- Wax paper
- Pencil
- Epoxy brush
- T-pin
- Hobby knife
- Paper towels
- Ruler

☐ **Step 1**

Locate the wing joiner. Using a ruler, determine the center of the brace and mark it with a pencil.

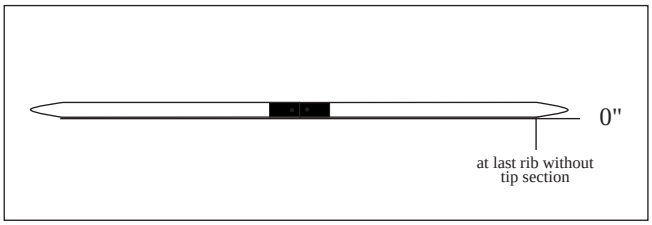


☐ **Step 2**

Trial fit the wing joiner into one of the wing panels. It should insert smoothly up to the centerline marked in Step 1. Now slide the other wing panel onto the wing joiner until the wing panels meet. If the fit is overly tight, it may be necessary to sand the wing joiner.

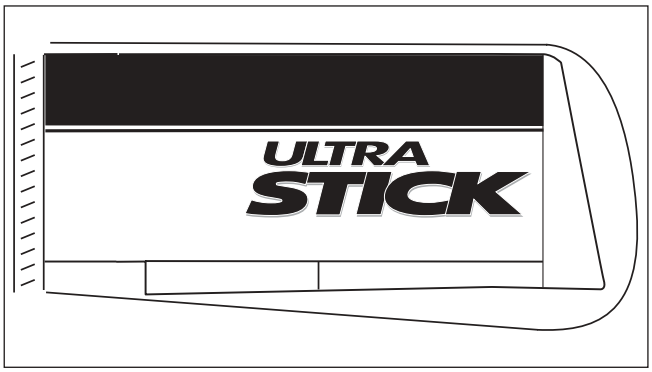
☐ **Step 3**

The Ultra Stick™ Lite is designed with "0" dihedral. Place the wing on a large flat surface. The spar, (high point of the wing), should be flat on the surface.



☐ **Step 4**

Separate the wing halves and remove the wing joiner. Once you're satisfied with the trial fit of the wing panels, you can prepare to epoxy the wing panels together.



Note: Use the plastic wing bags as a means of keeping epoxy from smearing on the wings. Just slip one on each panel and use masking tape to hold them in place.

Important: Read through each of the remaining steps of this section before proceeding to epoxy the wing halves together.

☐ **Step 5**

Mix approximately 1 ounce of 30-minute epoxy.

Note: It's extremely important to use plenty of epoxy when gluing the wing halves together.

☐ **Step 6**

Place one wing half right side up on a flat work surface. Using an epoxy brush, smear a generous amount of epoxy into the wing joiner cavity in the wing panel.

Note: It's helpful to put wax paper under the wing.

☐ **Step 7**

Coat one half of the wing joiner with epoxy up to the pencil line drawn in Step 8. Install the epoxy-coated half of the wing joiner into the wing joiner cavity up to the marked centerline. Any excess epoxy can be cleaned up with rubbing alcohol and paper towels.

Note: You will need to mix an additional 1–2 ounces of epoxy to complete the wing joining process.

☐ **Step 8**

Apply a generous amount of epoxy into the wing joiner cavity of the other wing panel.

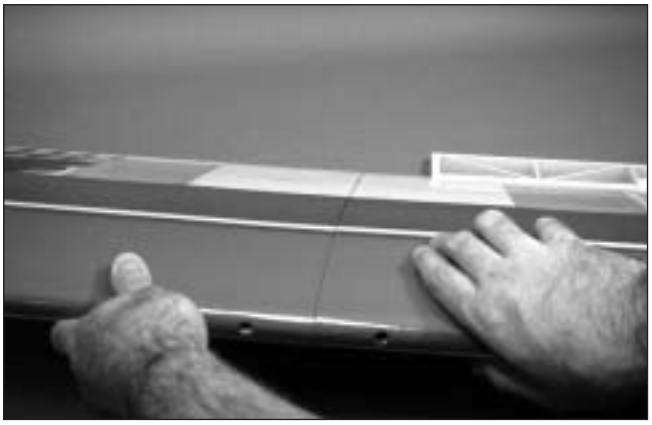
☐ **Step 9**

Install a T-pin into the wing joiner at the center mark. This will allow you to keep the brace in the center of the wing when joining the two wing halves. Next, apply epoxy to all sides of the exposed area of the wing joiner and uniformly coat both wing roots with epoxy.

Section 2: Joining the Wing Halves

☐ **Step 10**

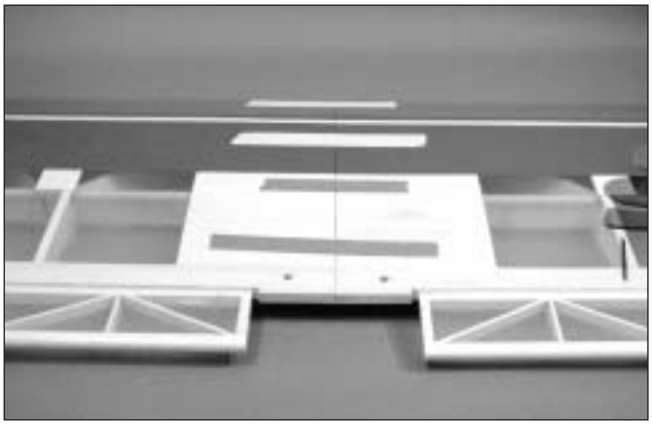
Carefully slide the two wing halves together and firmly press them together, allowing the excess epoxy to run out. Check to make sure the wing panels align properly. Wipe any excess epoxy away with rubbing alcohol and paper towels. The plastic wing bag can be removed from the wing halves after the epoxy has been applied.



Note: It's helpful to use wax paper underneath the wing center while the epoxy is curing to prevent excess epoxy from adhering to the work surface area.

☐ **Step 11**

Apply masking tape at the wing joint to hold the wing halves together securely. Place the wing right side up on a flat surface. With the wing lying flat on a surface without any dihedral, apply more masking tape to the wing center joint and recheck that the wing remains flat. Also make sure the wing halves are still properly aligned. Allow the wing joint epoxy to cure completely (overnight).



☐ **Step 12**

Once the epoxy has cured completely, remove the masking tape.

Section 3: Aileron/Flap Servo Installation

Required Parts

- Assembled wing
- 12" Servo extension (2)
  (2 additional 24" for quad-flap configuration wing)
- Standard size servos with mounting hardware (2)
  (4 for quad-flap configuration)

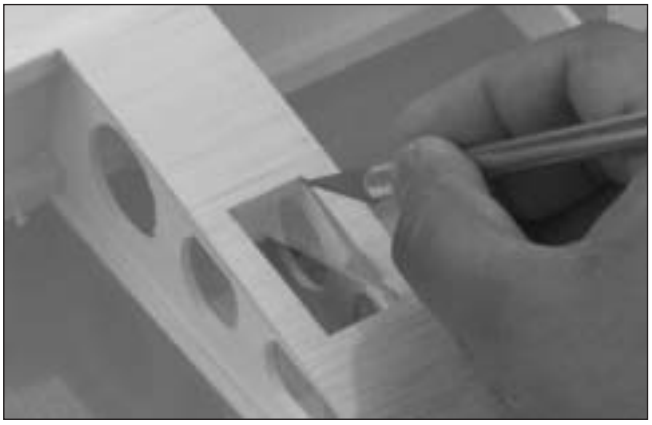
Note: The flap servo must be reversed if using a Y-harness for flaps.

Required Tools and Adhesives

- Hobby knife
- Drill
- Masking tape
- Needle-nose pliers
- Drill Bit: 1/16"
- Pencil
- String with weight on end
- Phillips screwdriver (medium)

☐ Step 1

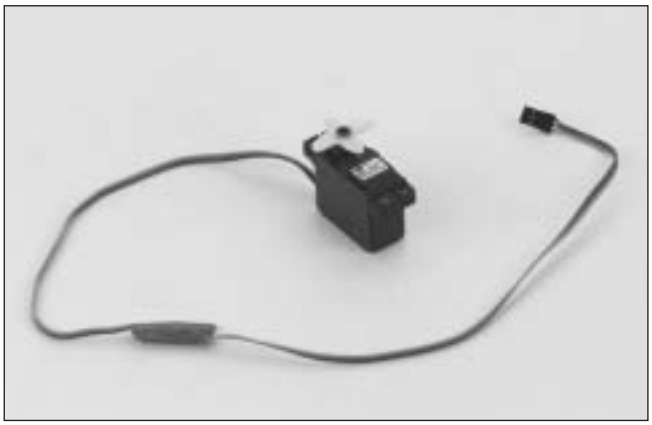
Locate the servo openings in the bottom of each of the wing halves. Use a sharp hobby knife to trim away the covering over the openings. If you're building the conventional wing, you will only cut out the openings that are closest to the wing root for the aileron servos. If you build the quad-flap wing, trim away the covering on all four servo openings in the wing. Use care not to cut away too much of the covering.



☐ Step 2

Install the recommended servo hardware supplied with your radio system onto your servos, (grommets and eyelets). Install 12" servo extensions on the flap servo lead and 24" extensions on the aileron servo leads. Secure the connectors with either masking tape or a commercial connector that prevents the servo lead connections from becoming disconnected.

> **Hint**: It's always a good idea to tape or secure the servo connectors and servo extension together to prevent the wires from becoming unplugged inside the wing.



☐ Step 3

Trial fit the servo into the servo opening. Depending upon the type of servo installed, some trimming may be required. Note that the servo is orientated so the servo output shaft is closer to the trailing edge of the wing.

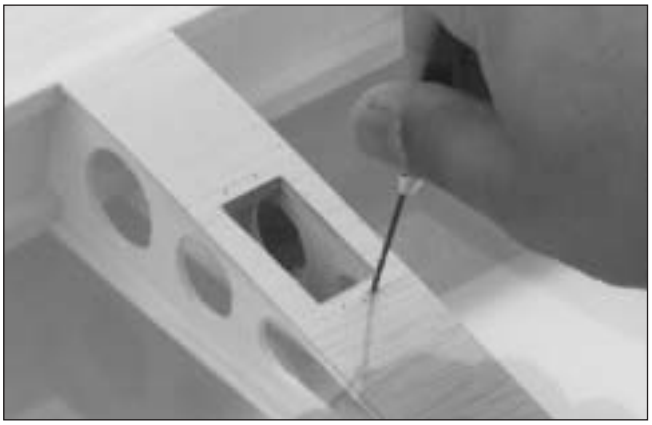
Section 3: Aileron/Flap Servo Installation

☐ **Step 4**

With the servo in place, mark the location of the servo screws and then remove the servo.

☐ **Step 5**

Using a 1/16" drill bit, drill the servo screw locations marked in Step 4.



☐ **Step 6**

Repeat the procedure for the other servo(s).

☐ **Step 7**

Before mounting the servos in the wing, it's suggested that the servo extensions be run through the wing and out the opening near the root rib.

☐ **Step 8**

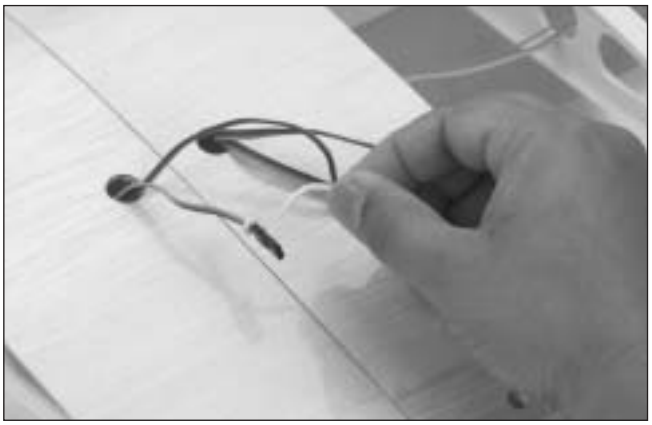
Locate the two circular servo lead exits near the center of the wing bottom. Using a sharp hobby knife, trim away the covering to expose the openings, making sure to use caution so you don't cut into the wing sheeting.

☐ **Step 9**

To thread the servo lead extensions/servo leads through the wing, we suggest using a 24" piece of string with a weight attached (such as one of the wheel collars in the kit). Thread it from the servo opening down through the wing structure and out the exit opening at the center of the wing.

☐ **Step 10**

Once the string is threaded though the wing, you can fish it out with your fingers or let the weight drop out the opening. Tape each end to the wing to keep it from falling back into the opening. When you're ready to thread the servo extension and servo lead through the wing, simply tie the string to the extension and carefully thread them through the wing by pulling the string/lead through the openings.

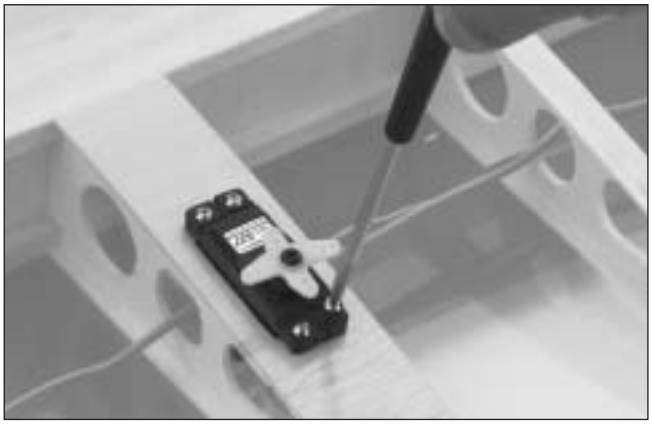


☐ **Step 11**

Tape the lead to the wing to keep it from falling back into the opening. It may be easier if you thread one servo lead at a time.

☐ **Step 12**

Securely fasten the servo in the opening with four of the servo mounting screws supplied with your radio system. We suggest you mark which lead is an aileron lead and which is a flap lead. Apply masking tape to the appropriate lead and mark either "F" for flap or "A" for aileron.



☐ **Step 13**

Repeat the procedure for the other servo(s).

> **Note**: It was intended to have each servo connected to a specific channel in the receiver, however you can use a Y-harness to connect two ailerons to one aileron channel or two flaps to one flap channel, which will require one of the flap servos to be a reversed servo. This will reduce your programming options. Please refer to Section 19 for computer radio programming for the Ultra Stick™ Lite.

Installing the linkages and control horns to the ailerons/flaps will be addressed later in the manual.

Section 4: Bolting the Wing to the Fuselage

Required Parts

- Fuselage
- Wing
- Wing-bolt plate
- Wing bolts
- Leading edge wing dowels

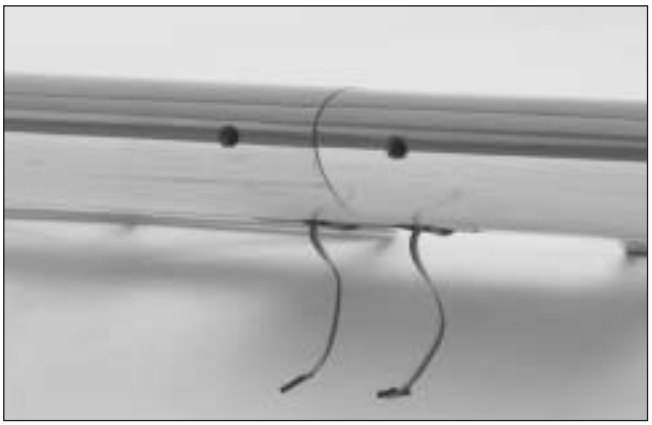
Required Tools and Adhesives

- Hobby knife
- File (round)
- Flat screwdriver
- Felt-tipped pen/pencil
- 6-minute epoxy
- Rubbing alcohol
- Paper towels
- Ruler (36” or tape measure)

Note: Your Hangar 9® Ultra Stick™ Lite comes from the factory with two predrilled holes in the leading edge of the wing for the alignment dowels, and two predrilled holes for the wing hold down bolts. The Ultra Stick Lite comes with the wing bolt T-nuts preinstalled in the fuselage.

☐ **Step 1**

Locate the predrilled leading edge dowel holes located on both sides of the center joint of the wing.



☐ **Step 2**

Locate and trial fit the leading edge wing dowels into the holes in the leading edge. There should be approximately 1/2" of dowel protruding from the leading edge of the wing, (trim the dowels as necessary). Mark each dowel where it exits the leading edge of wing.

☐ **Step 3**

Remove the wing dowels and mix about 1/2 ounce of 6-minute epoxy. Use a generous amount of epoxy in the leading edge holes and on the portion of the dowels that will be inserted into the wing. Insert dowels into the wing and wipe off any excess epoxy. Set the wing aside and allow epoxy to cure.

☐ **Step 4**

After the epoxy has cured for the leading edge alignment dowels, trial fit the wing to the fuselage by inserting the dowels into the former in front of the wing saddle of the fuselage. If the wing dowel fit is too tight, carefully enlarge the holes in the former just enough to get the wing dowels inserted.

☐ **Step 5**

Locate the wing-bolt hold-down plate. Note the wing-bolt hold-down plate has the holes already drilled out for the wing bolts. The holes in the wing bolt plate have the same spacing as the preinstalled blind nuts in the fuselage. Carefully remove the covering over the predrilled openings using a sharp hobby knife.

☐ **Step 6**

Using a ruler and felt-tipped pen, measure and mark the center of the fuselage at the tail end just above the horizontal stabilizer mounting saddle. Insert a T-pin at the mark you made.

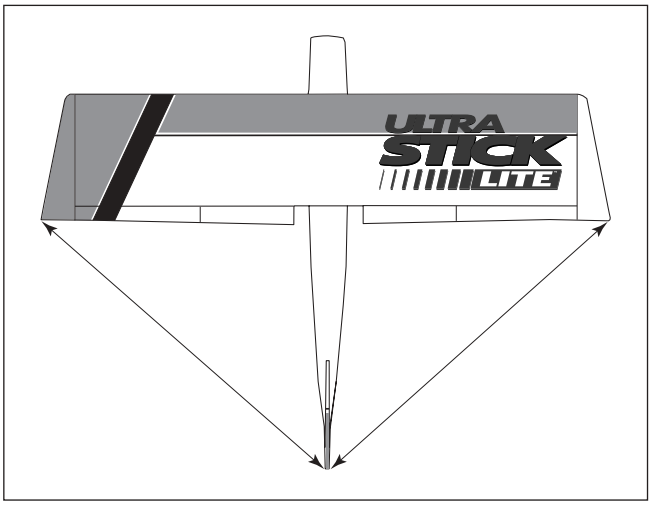
☐ **Step 7**

Insert the wing bolts through the wing-bolt plate (covered side up) and insert the bolts through the wing-bolt holes in the wing. Install the wing onto the fuselage and snug the wing bolts down finger tight.

Section 4: Bolting the Wing to the Fuselage

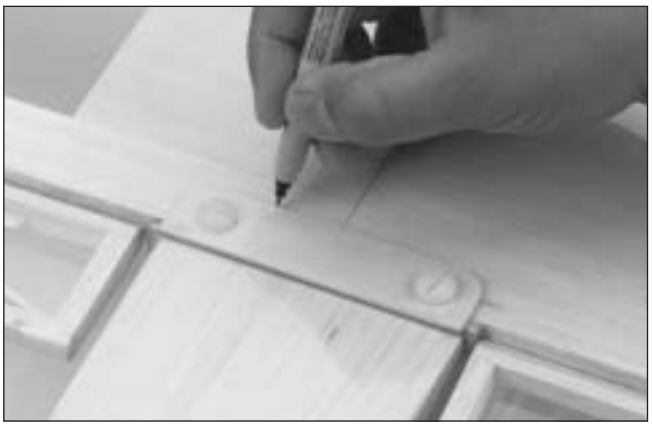
☐ **Step 8**

Check the alignment of the wing by measuring the distance from the wing tip to the T-pin you installed in Step 6. Make sure to measure from the same spot on both wing tips. Once satisfied with alignment, tighten the wing bolts securely.



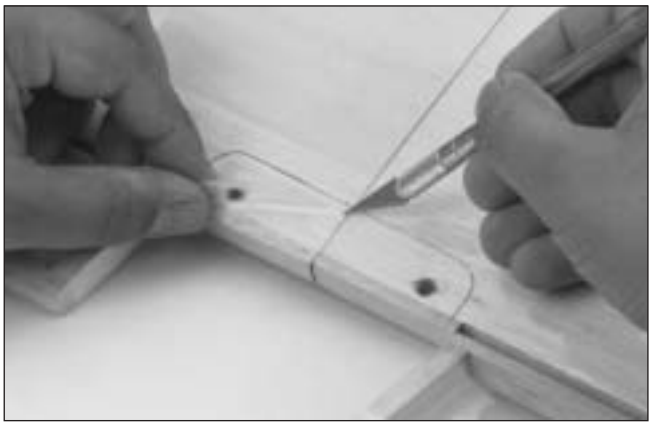
☐ **Step 9**

Using a felt-tipped pen or pencil, carefully mark around the outside of the wing bolt plate.



☐ **Step 10**

Remove the wing from the fuselage and using a sharp hobby knife, carefully trim away the covering on the wing 1/8" inside the lines you marked for the wing-bolt plate. Be sure to avoid cutting into the balsa wood.



☐ **Step 11**

Mix approximately 1/4 ounce of 6-minute epoxy and glue the wing hold-down plate onto the wing. Wipe off any excess epoxy and remove any epoxy from the wing-bolt holes. Allow the epoxy to completely cure before proceeding.

Section 5: Horizontal Stabilizer Installation

Required Parts

- Horizontal stabilizer
- Assembled wing
- Fuselage

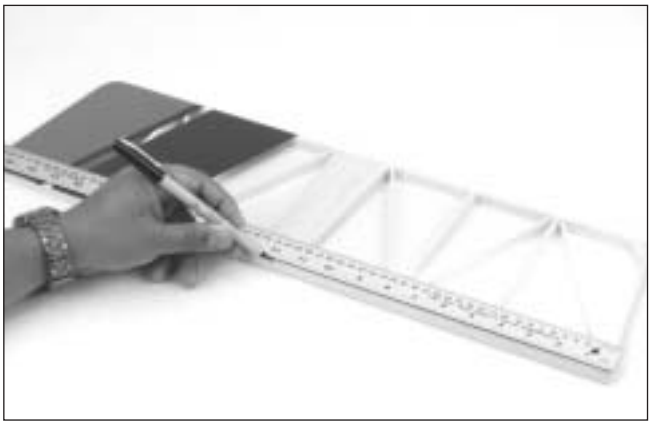
Required Tools and Adhesives

- Hobby knife
- Felt-tipped pen
- 30-minute epoxy
- Rubbing alcohol
- Epoxy brush
- Ruler
- Pencil
- Paper towels
- Mixing stick
- Masking tape

Note: Before assembling the tail, be sure the elevator and the CA hinges are removed from the horizontal stabilizer. The hinges and elevator will be installed later.

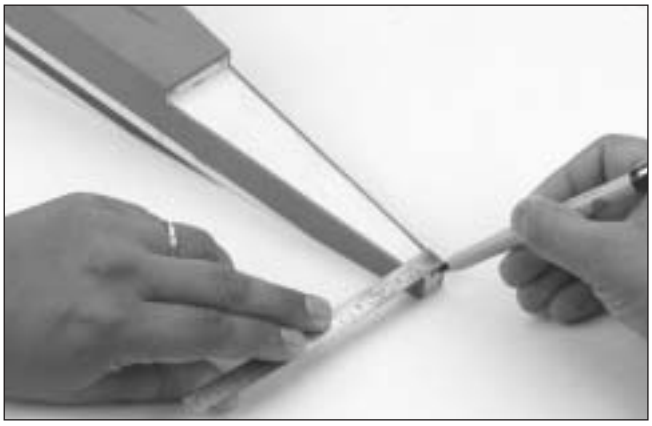
☐ **Step 1**

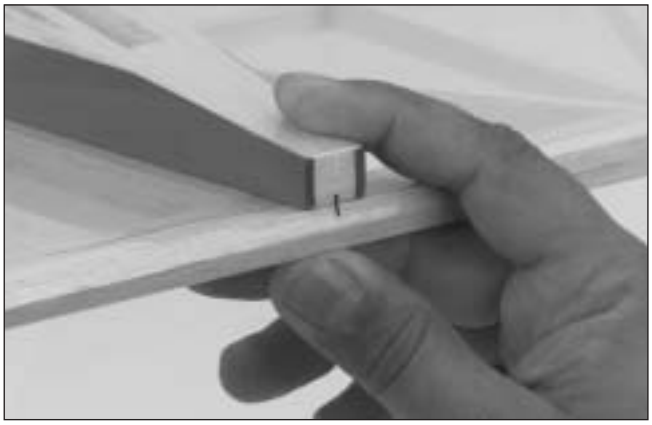
Measure and mark the center of the horizontal stabilizer on its trailing edge.



☐ **Step 2**

On the bottom of the aft end of the fuselage is a saddle cut out for the horizontal stabilizer to be mounted. Make a center mark on the back of the saddle and place the horizontal stabilizer into the horizontal stabilizer saddle. Align the two marks you made. Tape the leading edge and trailing edge of the horizontal stabilizer to the fuselage to secure it for now.





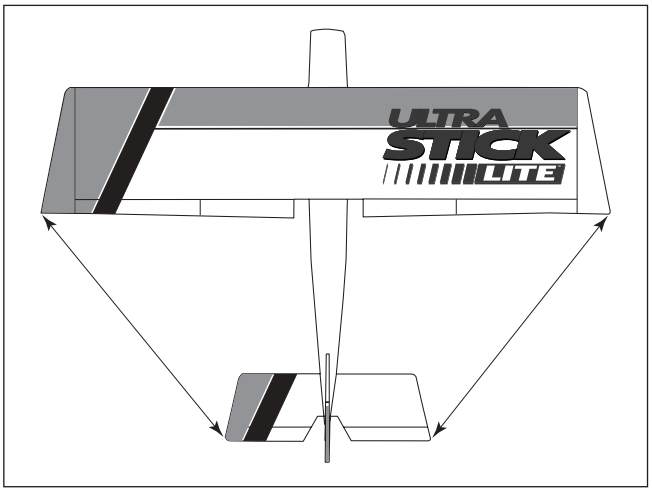
☐ **Step 3**

Install the wing onto the fuselage.

Section 5: Horizontal Stabilizer Installation

☐ **Step 4**

With the fuselage and horizontal stabilizer resting on a flat surface, align the horizontal stabilizer by measuring from fixed points on the wing to the outside of the trailing edge tip of the horizontal stabilizer. Be sure that the trailing edge of the horizontal stabilizer stays on its center mark.



☐ **Step 5**

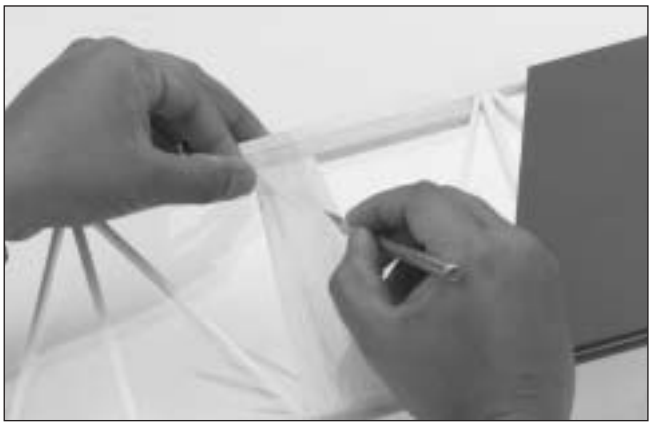
Adjust the stabilizer until you have an equal distance on both the right and left sides of the stabilizer to the wing.

☐ **Step 6**

When you're satisfied with the alignment of the horizontal stabilizer to the wing, carefully mark the position with a pencil at the junction where the horizontal stabilizer meets the fuselage. The pencil should leave a slight indentation in the covering.

☐ **Step 7**

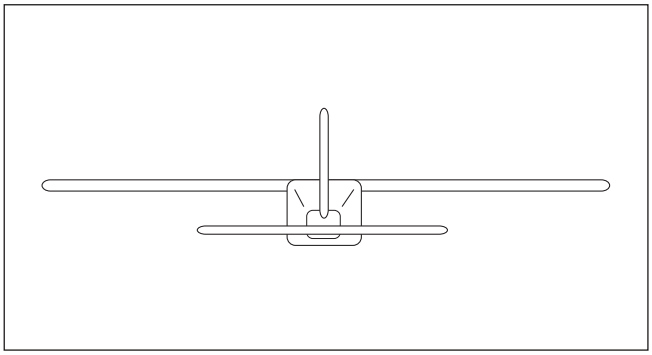
Remove the horizontal stabilizer from the fuselage and using a sharp hobby knife and a straight edge, carefully trim away the covering approximately 1/16" inside the lines you just marked.



Caution: It's extremely important that you do not press hard enough to cut into the wood structure as doing so could weaken the horizontal stabilizer.

☐ **Step 8**

Install the wing onto the fuselage. With the fuselage and horizontal stabilizer together on a flat surface, check to be sure the wing and horizontal stabilizer are parallel with each other. If adjustments to the horizontal stabilizer saddle are necessary because the wing and stabilizer are not parallel, carefully sand the horizontal stabilizer saddle to adjust. Be absolutely sure that the fuse and stabilizer are on a flat surface and the wing is installed correctly before removing any material from the saddle area.



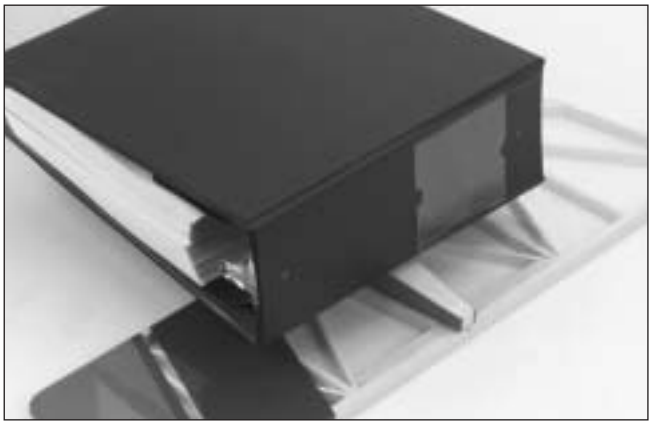
☐ **Step 9**

Mix approximately 1/2 ounce (minimum) of 30-minute epoxy to install the horizontal stabilizer to the fuselage. Using an epoxy brush or mixing stick, spread the epoxy onto the top of the horizontal stabilizer where it comes into contact with the fuselage. Coat the stabilizer saddle area of the fuselage.

Note: When joining the horizontal stabilizer to the fuselage, assemble on a firm, flat surface to ensure that they are level with each other.

☐ **Step 10**

Lay the horizontal stabilizer onto a flat surface and position the fuselage onto it, making sure it is centered and aligned as in Steps 3 and 4. Reference the bare wood you just exposed to re-align the stabilizer. Place a heavy object (one that won't damage the fuselage structure) on top of the fuselage to press the stabilizer and fuselage together.



☐ **Step 11**

Wipe off any excess epoxy using a paper towel and rubbing alcohol. Allow the epoxy to cure fully before proceeding to the next step.

Section 6: Vertical Stabilizer (Fin) Installation

Required Parts

- Vertical stabilizer
- Fuselage

Required Tools and Adhesives

- Paper towels
- Epoxy brush
- 30-minute epoxy
- Pencil
- Rubbing alcohol
- 90-degree triangle
- Mixing stick
- Hobby knife
- Masking tape

☐ **Step 1**

On the rear of the fuselage a slot is precut in the wood structure for the vertical stabilizer. Using a sharp hobby knife cut away the covering on the top rear of the fuselage where the vertical stabilizer will insert.

☐ **Step 2**

Remove the rudder and hinges from the vertical stabilizer if you have not already done so. The rudder will be hinged to the vertical stabilizer later.

☐ **Step 3**

Insert the vertical stabilizer into the slot in the top of the fuselage and make sure it's firmly seated against the top of the fuselage. Check that the rear of the vertical stabilizer (where the hinge slots are located) is aligned with the rear of the fuselage.

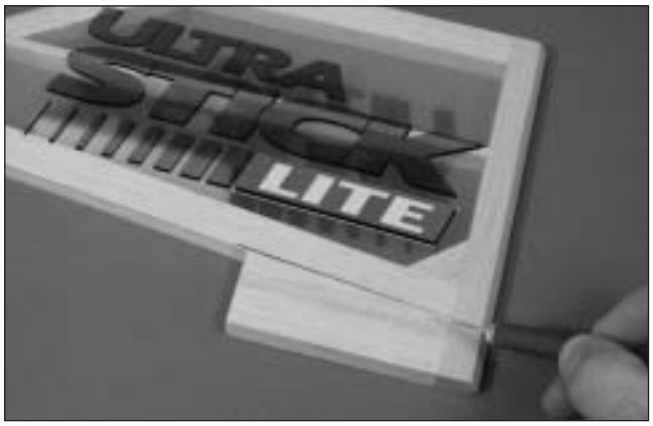
☐ **Step 4**

Use a pencil to carefully mark the position of the vertical stabilizer on both sides where it exits the fuselage. Also mark onto the fuselage where it contacts. The pencil should leave a slight indentation in the covering.

Section 6: Vertical Stabilizer (Fin) Installation

☐ **Step 5**

Remove the vertical stabilizer. Using a sharp hobby knife and straightedge, carefully cut away the covering on the vertical fin and fuselage approximately 1/16" inside the lines marked in Step 4.



Caution: It's very important that you do not press hard enough to cut into the wood structure, as doing so could weaken the vertical stabilizer.

☐ **Step 6**

Mix approximately 1/4 ounce of 30-minute epoxy and apply it to the vertical stabilizer where it comes into contact with the fuselage. Also apply epoxy to the base of the vertical stabilizer where it comes in contact with the fuselage.

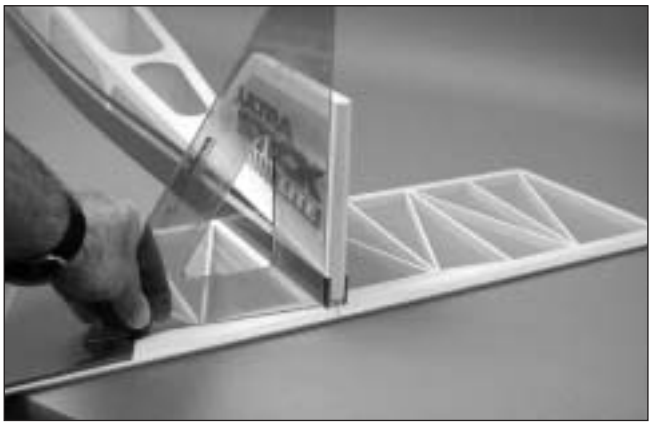
Important: It is essential the vertical stabilizer base be epoxied to the inside the fuselage to provide adequate strength. Be sure to use plenty of epoxy!

☐ **Step 7**

Insert the fin into the fuselage and wipe away any excess epoxy using a paper towel and rubbing alcohol.

☐ **Step 8**

Using a 90-degree triangle, make sure the fin is perpendicular to the horizontal stabilizer. Use masking tape to hold the vertical stabilizer in place until the epoxy cures.



Section 7: Rudder and Tail Wheel Assembly Installation

Required Parts

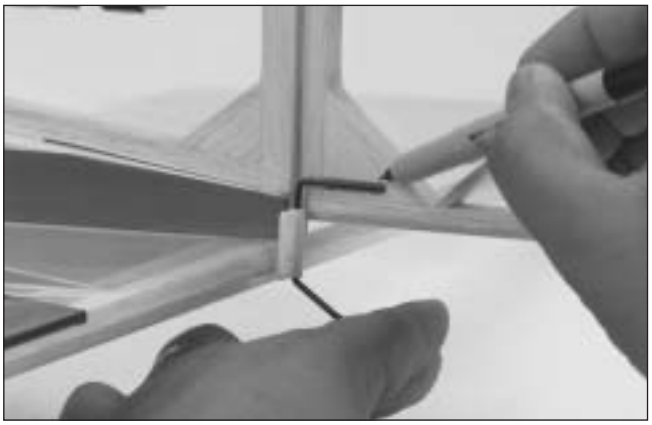
- Fuselage
- Hinges
- Tail wheel collar
- Tail wheel wire assembly
- Rudder
- Tail wheel

Required Tools and Adhesives

- Drill
- Hobby knife
- Thin CA glue
- Paper towels
- Rubbing alcohol
- Threadlock Z-42
- Masking tape
- CA remover/debonder
- Toothpicks (optional)
- Drill Bits: 3/32", 1/16"
- Felt-tipped pen
- Needle-nose pliers
- 30-minute epoxy
- Mixing stick
- Petroleum jelly or oil
- Keyhole saw blade

☐ Step 1

Trial fit the rudder on to the vertical fin with the hinges in place. Locate the tail wheel wire assembly and hold it up to the fuselage making sure the bottom of the nylon bushing is flush with the bottom of the horizontal stabilizer. Note the wire placement in relationship to the rudder. Using a felt-tipped pen, mark the position where the hole is to be drilled into the rudder. Also mark the location for the slot where the bushing tab will be epoxied into the back of the fuselage. This slot should be positioned centered on the fuselage tail.



☐ Step 2

Remove the rudder from the vertical fin and use a 3/32" drill bit to drill the hole for the tail wheel wire. Drill into the exact center of the rudder where you marked in Step 1. It may be helpful to first drill a 1/16" pilot hole as a guide.

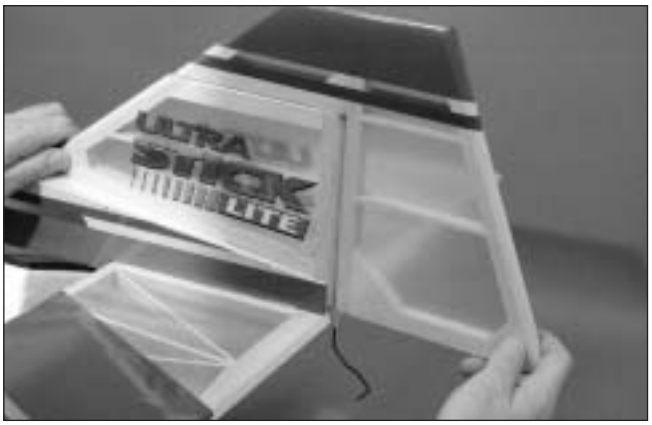
☐ Step 3

Cut a slot and groove in the back of the fuselage where the tab of the tail wheel bushing will be epoxied. There are several methods to accomplish this; we used a Dremel cutting wheel to first cut a slot in the fuselage as marked in Step 1. Next, use a keyhole saw blade to enlarge the opening for the tail wheel bushing.

Section 7: Rudder and Tail Wheel Assembly Installation

☐ **Step 4**

Trial fit the rudder and tail wheel assembly to the vertical fin. Note that the rudder will require trimming to allow clearance for the tail wheel wire/bushing. Mark the rudder and using a sharp hobby knife, trim back the rudder only a small amount and refit the rudder to the fin. Repeat this process until you achieve a perfect fit with virtually no gap between the vertical fin and rudder. Remove the rudder from the vertical fin.



☐ **Step 5**

Reinstall the hinges in the vertical fin using T-pins to ensure the hinges are centered. The hinges will be CA'd in Step 7.

☐ **Step 6**

Mix approximately 1/2 ounce of 30-minute epoxy and apply it to both the nylon bushing of the tail wheel assembly where it goes in the back of the fuselage and to the hole drilled in the rudder for the wire. A toothpick applicator may be helpful in getting the epoxy into the hole. Install the rudder and tail wheel assembly to the vertical fin and fuselage and remove the T-pins. Make sure the rudder is positioned properly (up and down). Wipe away any excess epoxy with alcohol and paper towels. Allow the epoxy to completely cure before gluing the hinges in place.

Note: Do not get epoxy on the bushing where it contacts the rudder. The rudder must move freely on the bushing.

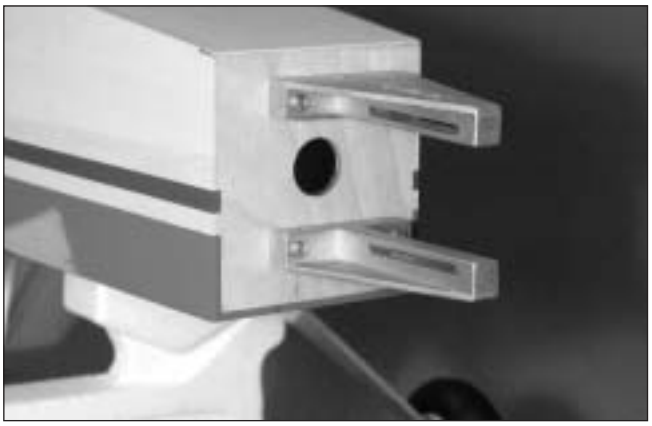
☐ **Step 7**

After the epoxy has completely cured, apply thin CA to the hinges by first deflecting the rudder in one direction, saturating each hinge, and then repeat the process by deflecting the rudder in the opposite direction. Wipe away any excess CA by using a paper towel and CA remover/debonder. Allow the glue to completely cure.

Section 7: Rudder and Tail Wheel Assembly Installation

☐ **Step 8**

Once the CA has cured, check for security of the rudder by gently trying to pull the rudder from the fin. Also move the rudder several times left and right to "work in" the hinges.



☐ **Step 9**

Slide the tail wheel onto the tail wheel wire. Next secure the wheel with the included wheel collar and setscrew. Use blue Locktite 242 to secure the setscrew in place.

Note: The wheel must rotate freely with only a small amount of side play. It may be necessary to drill out the tail wheel slightly so the wheel can spin freely.

Section 8: Hinging the Horizontal Stabilizer and Elevator

Required Parts

- Fuselage
- Hinges
- Elevator

Required Tools and Adhesives

- Thin CA glue
- Paper towels
- CA remover/debonder
- T-pins

☐ **Step 1**

Locate the elevator and hinges. Trial fit the elevator into the proper position on the horizontal stabilizer using the same hinging technique used in Section 1. Remember to remove the T-pins before applying the CA glue. Also, make sure the tail wheel is free to move its full range. You will also need to file a small notch in the elevator to clear the tail wheel wire.

Important: Do not remove more material than is necessary. Check to make sure there is sufficient elevator movement without any binding.

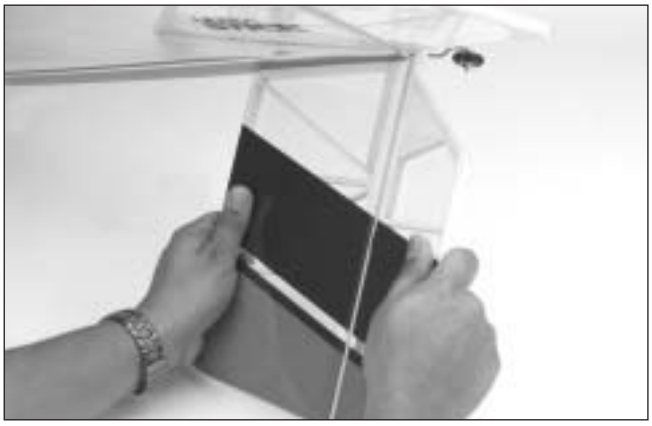
☐ **Step 2**

With the elevator aligned (left and right), apply thin CA glue to the hinges on both sides. Wipe away any excess CA with CA remover/debonder and a paper towel.

Note: Try to maintain virtually no gap throughout the length of the elevator-to-horizontal stabilizer hinge line.

☐ **Step 3**

After the hinges are dry, check to make sure they are securely in place. Try to pull the elevator from the horizontal stabilizer. Use care not to crush the structure.



☐ **Step 4**

Move the elevator up and down several times to "work-in" the hinges and check for proper movement.

Section 9: Rudder and Elevator Control Horn Installation

Required Parts

- Control horns (2)
- Control horn backplates (2)
- Control horn screws (6)
- Fuselage

Required Tools and Adhesives

- Drill
- Drill Bit: 1/16"
- Phillips screwdriver (medium)
- Ruler
- Felt-tipped pen/pencil

Important: When installing the control horns, make sure the holes in the control horns, where the pushrod attaches, are directly in line with the control surface hinge line.

☐ **Step 1**

To locate the elevator control horn position, measure over 1" from the fuselage on the top right side of the horizontal stabilizer. Mark the elevator as shown with a felt-tipped pen or a pencil. This mark will be the center of the elevator control horn location.

☐ **Step 2**

Place the center of the control horn on the elevator at the mark made in the previous step. Mark the positions for the control horns with a felt-tipped pen or pencil.

☐ **Step 3**

Remove the control horn and drill 1/16" holes through the elevator as marked. Make sure to drill these holes parallel to each other to allow the back plate of the horns to fit properly.

Section 9: Rudder and Elevator Control Horn Installation

☐ **Step 4**

Using the screws and backplate provided, attach the elevator control horn and fasten in place with a Phillips screwdriver.

☐ **Step 5**

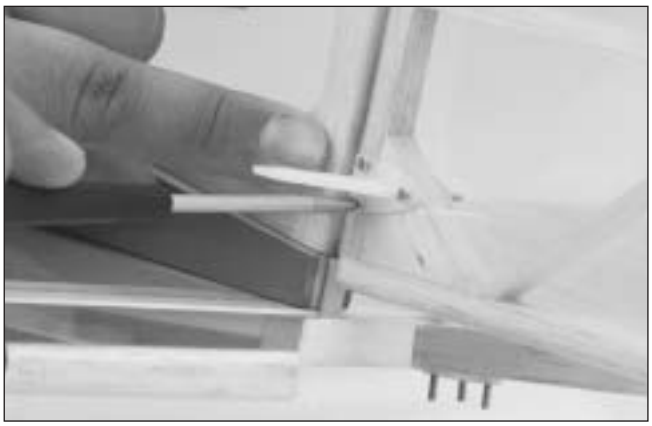
Measure 1"up from the bottom of the rudder on the left side. Mark the location with a felt-tipped pen or pencil. This mark will be the center of the rudder control horn.

☐ **Step 6**

Center the control horn over the mark you've just made. Make sure the horn is positioned over the hinge line, just like you did for the elevator. Using a felt-tipped pen or pencil, mark the mounting hole locations onto the rudder.

☐ **Step 7**

Drill these holes with a 1/16" drill bit and install the rudder control horn, using the screws and backplate provided.



Section 10: Main Landing Gear Installation

Required Parts

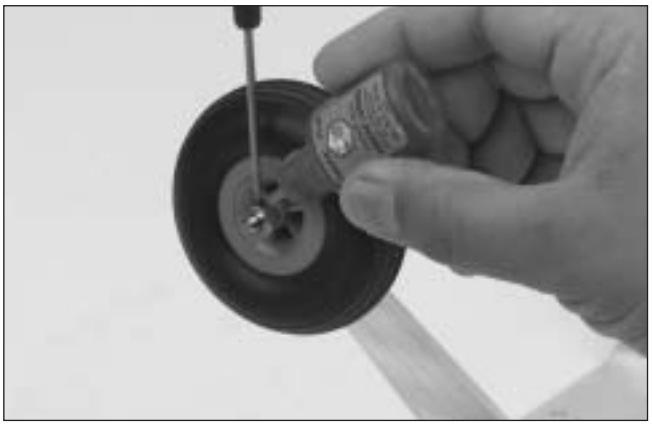
- Main landing gear
- Wheels, 2 ¾" (2)
- Fuselage
- Washers (2)
- Landing gear axles with locknuts (2)
- Wheel collar with screw (2)
- Landing gear bolts (2)

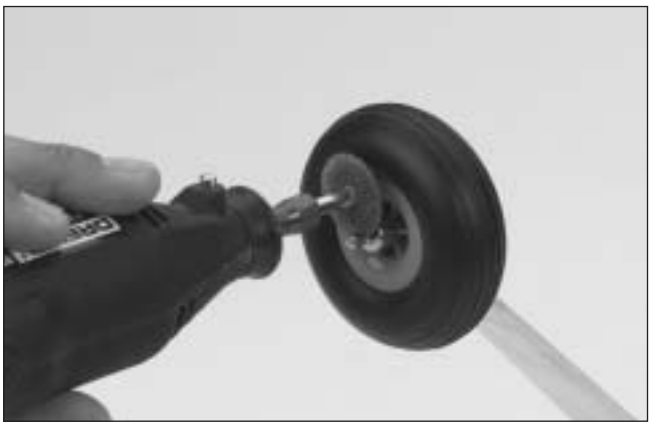
Required Tools and Adhesives

- Hobby knife
- Moto-tool
- Phillips screwdriver
- Threadlock

☐ **Step 1**

Attach the axles to the aluminum landing gear, using the locknuts provided. Slide on the wheel and use the wheel collar to secure the wheel on the axle.





Note: It is always a good idea to use Locktite 242 on the wheel collar setscrews to keep them from coming loose.

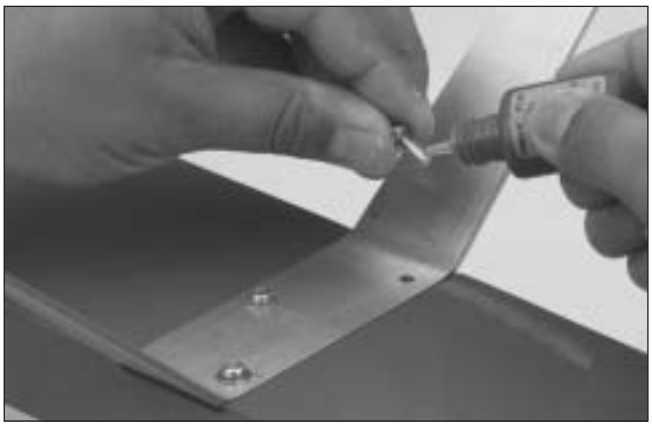
Note: You can use a Moto-tool to cut the extra length off the axle. Be very careful not to get the axle too hot during the cutting process or you may melt the wheel hub.

☐ **Step 2**

Locate the three predrilled mounting holes in the bottom of the fuselage for mounting the landing gear. The blind nuts are also preinstalled from inside the fuselage. If the covering is over the holes, use a sharp hobby knife and carefully remove the covering over the predrilled holes.

☐ **Step 3**

Bolt the landing gear onto the fuselage with the included hardware. Thread the mounting bolts into the preinstalled blind nuts and securely tighten.



Note: It is a good idea to use Locktite 242 on the landing gear mounting bolts.

Section 11: Fuel Tank Assembly

Required Parts

- Metal tubes (2)
- Fuel pickup tubing
- Metal caps (2)
- 3mm screw
- Clunk (fuel pickup)
- Fuel tank
- Rubber stopper

Required Tools and Adhesives

- Hobby knife
- Medium Screwdriver

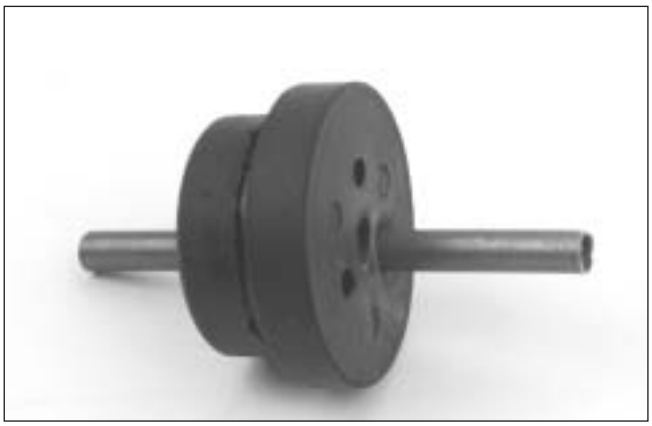
☐ **Step 1**

Locate the tank parts.

Note: The stopper provided with the Ultra Stick™ Lite has three holes that are not completely through the stopper. You will only be using two holes: one for the fuel pickup and one for the fuel vent. Make sure not to open the third hole, as this will cause a fuel leak.

☐ **Step 2**

Locate the rubber stopper. Insert the short brass fuel tube into one of the holes in the stopper so that an equal amount of tube extends from each side of the stopper. This tube will be the fuel tank pickup that provides fuel to the engine.



☐ **Step 3**

Slide the smaller of the two caps over the tube on the smaller end of the rubber stopper. The small end will be inserted into the fuel tank. The larger cap is placed on the other side of the rubber stopper that makes the cap. Insert the 3mm screw through the large cap and rubber stopper. Loosely thread the screw into the small cap as shown.

Section 11: Fuel Tank Assembly

☐ **Step 4**

Locate the longer brass fuel tube and bend it as shown using your fingers. This will be the fuel tank vent tube.

☐ **Step 5**

Slide the vent tube into one of the two remaining holes in the stopper from the tank (small cap) side.

☐ **Step 6**

Locate the short piece of silicone fuel tubing and the fuel tank clunk. Install the clunk onto one end of the silicone tubing and the other end onto the brass fuel tank pickup tube (straight tube) in the stopper.

☐ **Step 7**

Carefully insert the assembly into the fuel tank. Note the position of the vent tube. It must be at the top portion of the fuel tank to function properly. Also, it may be necessary to shorten the length of the fuel pickup tubing to make sure the clunk does not rub against the back of the fuel tank. You should be able to turn the tank upside down, which allows the clunk to freely drop to the top of the tank.

☐ **Step 8**

Tighten the 3mm screw carefully — do not over tighten. This allows the rubber stopper to form a seal by being slightly compressed, thus sealing the fuel tank opening.

Important: Be sure to differentiate between the vent and the fuel pick-up tube. Once the tank is mounted inside the fuselage, it will be difficult to tell the tubes apart. We have included two different color pieces of fuel tubing to help you tell them apart. We suggest using the green tubing for the fuel line to the carburetor of your engine and the red tube for the vent tube.

> **Note**: The fuel tank will be installed into the fuselage after the engine mount is installed.

Section 12: Mounting the Engine

Required Parts

- Throttle pushrod tube
- Engine
- Hangar 9™ engine mount w/hardware
- Protective foam (not included)
- Fuselage
- Assembled fuel tank

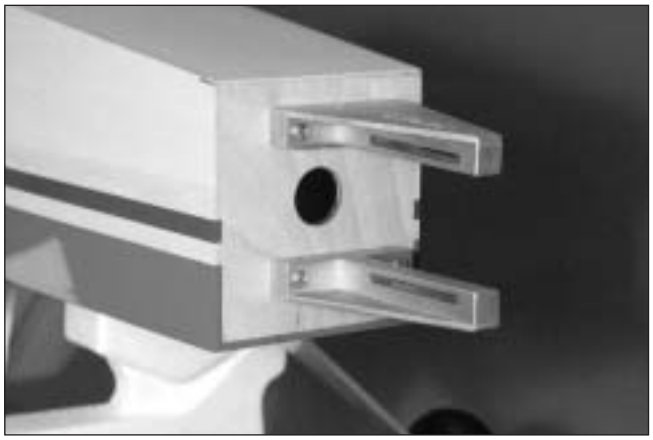
Required Tools and Adhesives

- 6-minute epoxy
- Threadlock
- Phillips screwdriver

Note: When the engine is properly mounted to the Ultra Stick™ Lite, the distance from the firewall to the front of the engine drive washer should be 5 ¼" to 5 ½".

☐ **Step 1**

Locate the nylon engine mount rails and temporarily install the mounts using the four engine mount screws and washers as shown. Note that the engine is mounted with the cylinder head to the right of the fuselage.

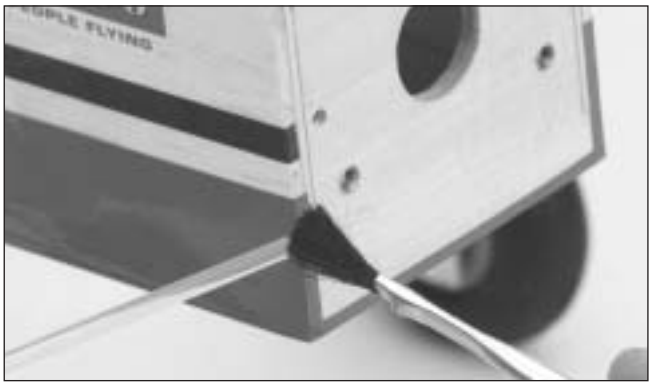


☐ **Step 2**

Place your engine onto the installed mounting rails and measure the distance from the firewall to the engine drive washer (5 ¼" to 5 ½"). Temporarily install the engine to the rails using four 8-32 bolts, four washers and four lock nuts. Leave the bolts loose enough to allow the engine to slide on the engine mount.

☐ **Step 3**

Locate the throttle pushrod tube included with the kit. Drill a 1/8" hole in the firewall at the mark you made in Step 2. Mix a small amount of 6-minute epoxy and glue the pushrod tube through the firewall leaving approximately 1/8" protruding through the firewall. Allow the epoxy to cure before proceeding.



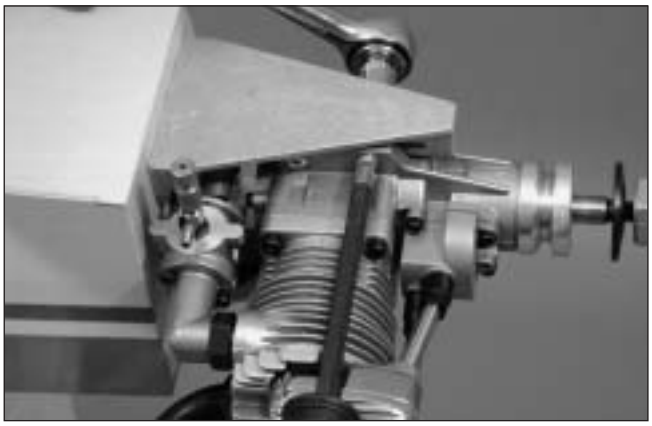
Section 12: Mounting the Engine

☐ **Step 4**

Before installing your engine and engine mount, insert the fuel tank into the fuselage. The two pieces of fuel tubing should exit through the center hole in the firewall. Use foam (not included) under and behind the fuel tank and/or around the fuel tank to secure it in place.

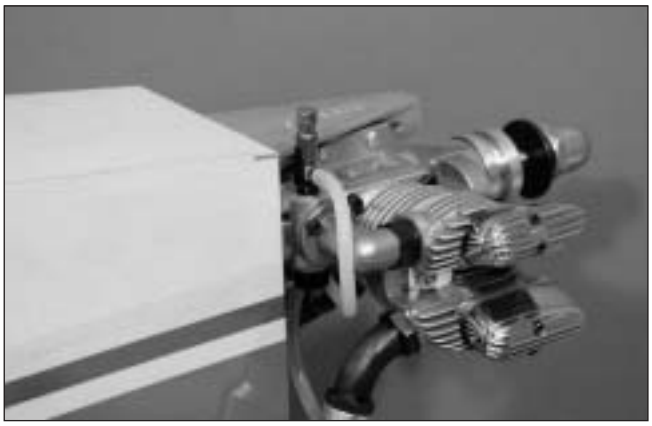
☐ **Step 5**

Using Locktite Z-42 on the engine mount screws, install the engine mount to the firewall. Mount the engine using the supplied hardware (four screws, washers, and locknuts).



☐ **Step 6**

Install the fuel pick-up line to the carburetor. The fuel tank vent line will be installed onto your engine's muffler.



Section 13: Radio System Installation

Required Parts

- Fuselage
- Radio packing foam (not included)
- Antenna tube (optional, not included)
- Radio system with 3 servos and hardware (not included)

Required Tools and Adhesives

- Hobby knife
- Drill bit: 1/16"
- Drill
- Phillips screwdriver (medium)

Note: Before installing the servos in the servo tray, we suggest the servo leads be identified by marking masking tape with the appropriate letter to designate each servo: T = Throttle, R = Rudder and E = Elevator).

☐ **Step 1**

Install the rubber grommets and eyelets in three servos, per the instructions with your radio equipment. Position the servos in the fuselage servo tray as shown, noting that the elevator servo is positioned on the right side of the fuselage. Mark the location of the servo mounting screws, remove the servos, and drill pilot holes for the screws using a 1/16" drill bit. Screw the servos in place using the 12 servo screws included with the servos.

Hint: To strengthen the servo screw mounting holes, place a drop of thin CA on each hole and allow to dry before mounting the servos to the servo tray.

☐ **Step 2**

Use radio packing foam (not included, available at your local hobby shop) when installing the receiver and battery.

☐ **Step 3**

Be sure to attach the servo leads to the receiver prior to installing the receiver into the fuselage (see Radio Set-Up section). Route the antenna back through the fuselage using an antenna tube (not included) or route it outside the fuselage back to the stabilizer. If using an antenna tube, lightly tape the receiver antenna to the outside of tube (or route inside of tube) and route the antenna tube inside the AFT section of the fuselage. Be sure to avoid the elevator and rudder linkages.

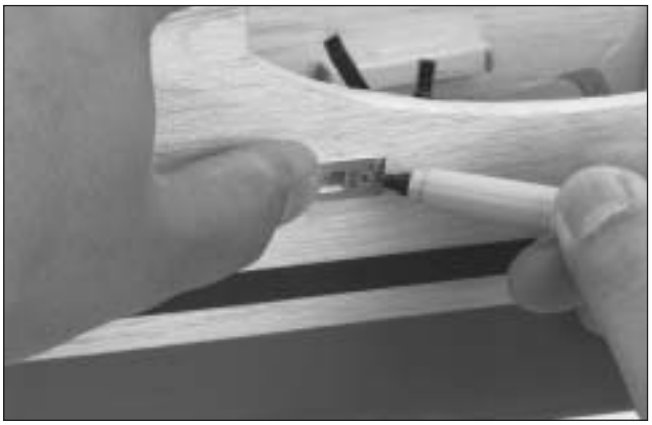
Section 13: Radio System Installation

☐ **Step 4**

Wrap the receiver battery in foam and place it in the fuselage area forward of the servo tray and receiver. We suggest using layers of foam to hold the battery. Using a sharp hobby knife, cut a solid layer of foam the size of the compartment area that is in front of the servo tray. Cut another layer of foam that is identical in size, however, cut an opening the center that is the size of the battery pack. Cut another layer of foam identical in size to the compartment and place on top of the battery. Cut slits in the foam to allow the battery lead to exit the foam.

☐ **Step 5**

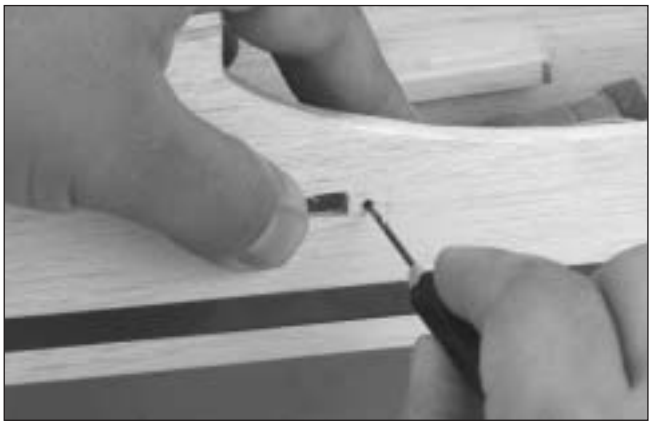
The switch should be mounted on the left side of the fuselage, away from the exhaust of the engine.



Hint: Use the switch plate as a template. Look inside the fuselage and pick a location to mount the switch in the opening of the fuselage side doubler. (Mount only through the fuselage sheeting, not through the ply doubler.)

☐ **Step 6**

Using a 1/16" drill bit, drill two mounting holes for the switch as marked. Using a hobby knife, carefully cut out the opening for the switch between the screw holes.



☐ **Step 7**

Reposition the switch plate as shown and place the switch on the inside of the fuselage. Using the two screws supplied with the switch, attach the switch to the fuselage. Plug in the switch to the receiver/receiver battery.

Section 14: Aileron and/or Quad-Flap Linkage Installation

Required Parts

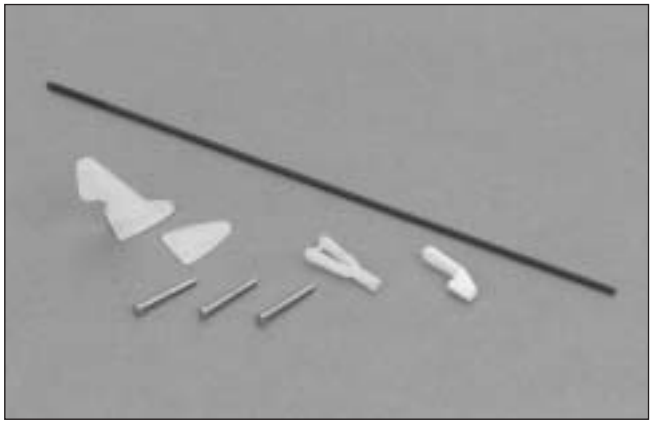
- Wing assembly w/servos installed
- 7 ½" rods, threaded on one end (2 for conventional wing, 4 for quad flaps)
- Clevis (2 for conventional aileron, 4 for quad flaps)
- Wire keepers (2 for conventional aileron, 4 for quad flaps)
- Control horn (2 for conventional wing, 4 for quad flaps)
- Control horn mounting screws
- Clevis keepers (2 for conventional wing, 4 for quad flaps)

Required Tools and Adhesives

- Phillips screwdriver
- Drill Bit: 1/16"
- Thin CA glue (optional)
- Drill
- Felt-tipped pen

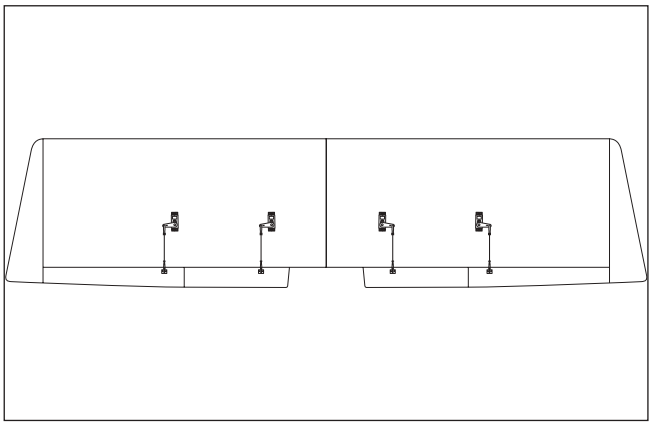
☐ **Step 1**

Locate the short rods threaded on one end, clevis, and wire keepers. You will also need a control horn, control horn backplate, and mounting screws to mount the control horn to the control surface. Instructions will refer to construction of just one linkage and control horn. Assembly and installation for both ailerons and/or all four will follow this same sequence.



☐ **Step 2**

Before assembly and mounting the linkages/control horns, it's a good idea to center the wing servos. Connect them to the receiver, turn on your transmitter, then the receiver. Once the servos have moved to their electrical center, you can position the servo control arm so that it will be approximately 90 degrees to the linkage when it's attached. Adjusting the linkages in or out can do fine-tuning of the servo arm position. It's important that the mechanical adjustments are made as closely as possible before attempting to make any electrical adjustments through the transmitter programs.



Important: The aileron/flaps servo arms should be positioned outboard toward the wing tips. Failure to do this can cause radio programming difficulties, resulting in the flaps or ailerons moving in the wrong direction.

Note: If you are using a Y-harness to connect servos to a receiver and if you are setting up a quad-flap configuration, refer to the "Radio Set-Up" section of this manual for further instruction on position of the servo control arms.

Section 14: Aileron and/or Quad-Flap Linkage Installation

☐ **Step 3**

The control horn should be positioned so the holes the clevis connects into are over the hinge line of the control surface.

☐ **Step 4**

Once satisfied with the horn location, (it should be a straight line from the servo arm to the horn), mark the location with a felt-tipped pen.

☐ **Step 5**

Using a 1/16" drill bit, drill the screw holes for mounting the control horn. Use caution to drill straight through at a 90-degree angle to the control surface.

☐ **Step 6**

Attach the control horn to the aileron (flap) using the screws and the control horn backplate. Be careful not to accidentally puncture the covering with the screwdriver.

☐ **Step 7**

Thread a 2-56 clevis on the threaded end of the control rod. Screw the clevis on a minimum of 7-10 turns. Install the clevis with wire on the control horn into the third hole from the mounting base. Be sure to install the clevis keeper (fuel tubing) over the clevis.

Section 14: Aileron and/or Quad-Flap Linkage Installation

☐ **Step 8**

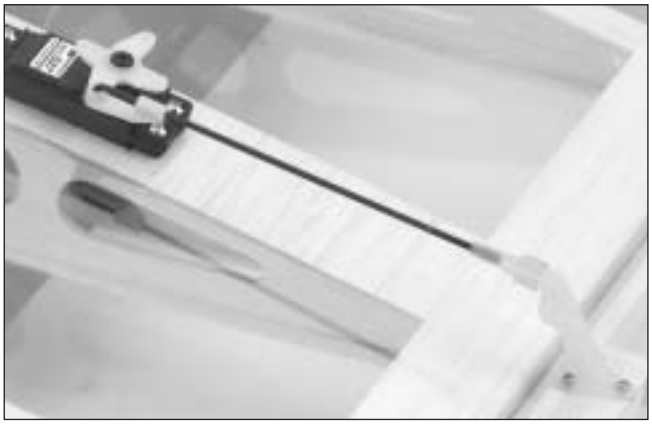
With the linkage attached to the control horn, center the control surface and hold the linkage wire directly over the electronically centered servo arm. Place a mark on the rod directly over the hole (second hole from the end of arm) in the servo control arm that it will connect to.

☐ **Step 9**

Remove the clevis from the control horn. Make a 90-degree bend in the rod at the marked location and cut off the excess rod, leaving 5/16" of rod past the 90-degree bend.

☐ **Step 10**

Attach a wire keeper to the end of the rod with the 90-degree bend. Insert the 90-degree bend through the second hole from the end of the servo arm and install the end of the wire keeper over the end of the wire. Install the clevis back onto the control horn. Be sure to slide the silicon clevis keeper on the end of the clevis.



☐ **Step 11**

Repeat the process for the remainder of the aileron/flaps linkages.

Section 15: Rudder, Elevator and Throttle Pushrod Installation

Required Parts

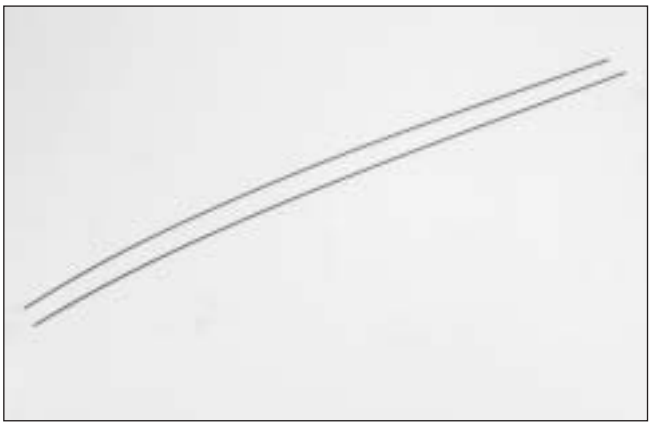
- Control horn (2)
- Wire keeper (2)
- Easy connector
- Fuselage
- Clevis (2)
- Clevis keeper (2)
- 19 ½" pushrod wire, 1.5mm
- 30" pushrod wire, 2-56 threaded on one end (2)

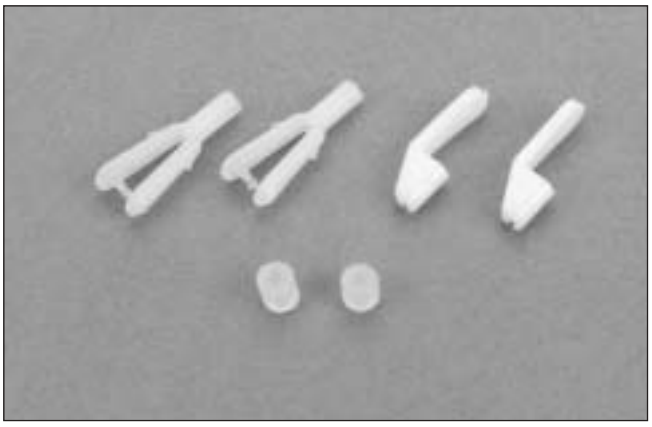
Required Tools and Adhesives

- Felt-tipped pen/pencil
- Needle-nose/Z-bend pliers
- Hobby knife

☐ Step 1

Locate one of the long 30" pushrod wires threaded on one end, a 2-56 clevis, wire keeper, and a clevis keeper. The rudder and elevator pushrods are made using these parts shown below. The throttle linkage will be made from the shorter 19 ½" rod.



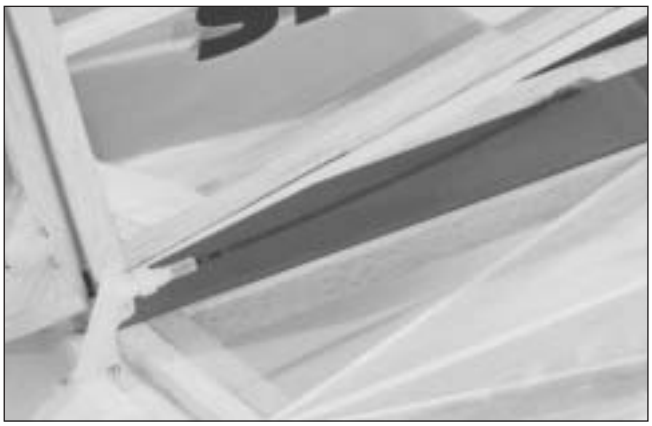


☐ Step 2

Note that the pushrod wire guide tubes are preinstalled in the fuselage. On the aft end of the fuselage find the pushrod exits for the rudder and elevator pushrod. Using your hobby knife, carefully cut away the covering over the pushrod exit on the top left side of the fuselage next to the vertical stabilizer and the opening on the right side of the fuselage where the elevator pushrod will exit. Be careful not to cut the pushrod guide tube.

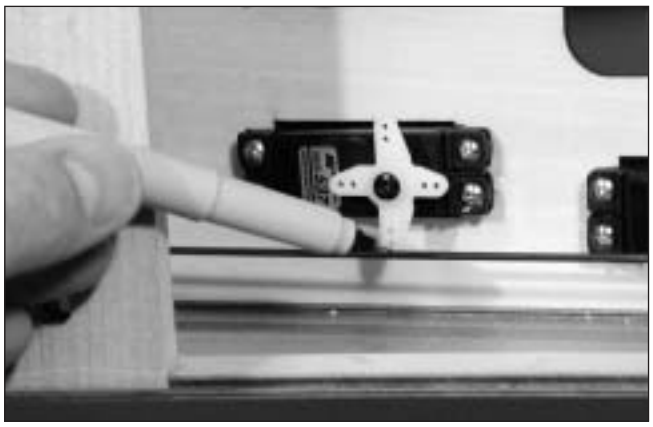
☐ Step 3

Insert one of the 30" pushrod wires through the guide tube with the threads exiting the tube at the aft end of the fuselage. Screw on a clevis 7–10 turns and snap it onto the control horn.



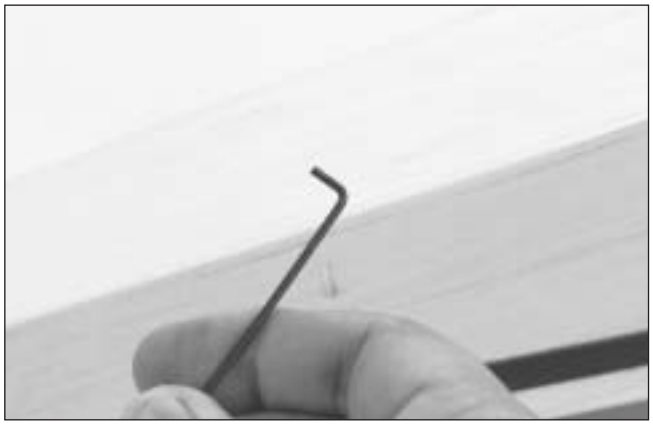
☐ **Step 4**

With the clevis attached to the control horn, center the control surface and hold the pushrod wire directly over the electronically centered servo arm. Place a mark on the rod directly over the hole (second hole from the end of arm) in the servo control arm it will connect to.



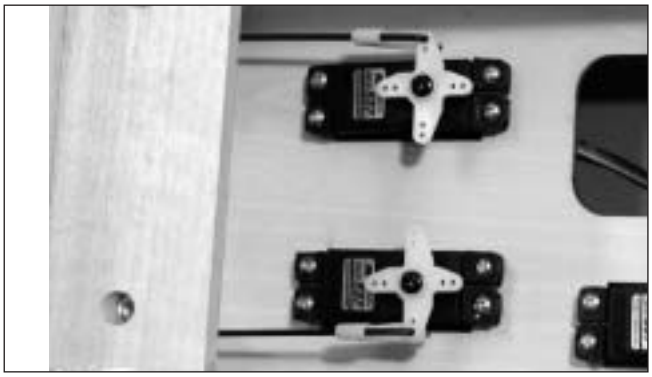
☐ **Step 5**

Remove the clevis and slide the pushrod wire out of the guide tube. Make a 90-degree bend in the rod at the location you just marked and cut off the rod leaving 5/16" extending out from the 90-degree bend.



☐ **Step 6**

Attach a wire keeper to the end of the rod with the 90-degree bend you just made. Insert the threaded end of the pushrod wire through the wire guide tube from the wing saddle opening of the fuselage. Install the 90-degree bend through the second hole from the end of the servo arm and install the end of the wire keeper over the end of the wire.



☐ **Step 7**

Install the clevis back onto the pushrod wire and connect it to the control horn. Be sure to slide the silicone clevis keeper onto the end of the clevis before attaching the clevis to the control horn. After the clevis is attached to the control horn, slide the clevis keeper onto the end of the clevis to insure it will not prematurely open.

☐ **Step 8**

Repeat the process for either the rudder or elevator, whichever one you have not done.

Installing the Throttle Pushrod

The sequence to install the throttle pushrod in this manual is for most four-stroke engines. Installation may vary depending on the type/brand of engine you use to power your Ultra Stick™ Lite.

Section 15: Rudder, Elevator and Throttle Pushrod Installation

☐ **Step 9**

Locate the smaller 1.5mm, 19 ½" pushrod and thread a clevis onto the threaded end. Insert the rod into the throttle pushrod tube previously installed.

☐ **Step 10**

Install the easy connector to the throttle servo arm by inserting the bottom post through the second hole from the end in the throttle arm. Install the snap washer on the easy connector stem, securing it to the arm.

☐ **Step 11**

Connect the clevis end of the pushrod to the throttle arm.

☐ **Step 12**

Turn on your radio system and center your transmitter's throttle stick and trim and center your throttle servo arm. Put the throttle arm of your engine to the 1/2 open/closed position.

☐ **Step 13**

With your radio system on, the throttle controls centered, and throttle arm in the 1/2 open/closed position, secure the throttle pushrod wire to the easy connector by tightening the screw in the top of the connector to the pushrod wire. Trim off the excess wire.

Section 16: Control Throw Recommendations

The following control throw recommendations offer positive response and are a good place to begin setting up the aircraft. After you have become more familiar with the flight characteristics of the Ultra Stick™ Lite, adjust the control throws to meet your flying style.

	Low Rate	High Rate
Aileron	3/4" up	1 ¼" up
	3/4" down	1 ¼" down
* Both wing types		
Elevator	1" up	1 ½" up
	1" down	1 ½" down
Rudder	2 ½" right	4" right
	2 ½" left	4" left
Flaps	1 ½" down	

Section 17: Balancing the Ultra Stick Lite

An important part of preparing the aircraft for flight is properly balancing the model. This is especially important when various engines are mounted.

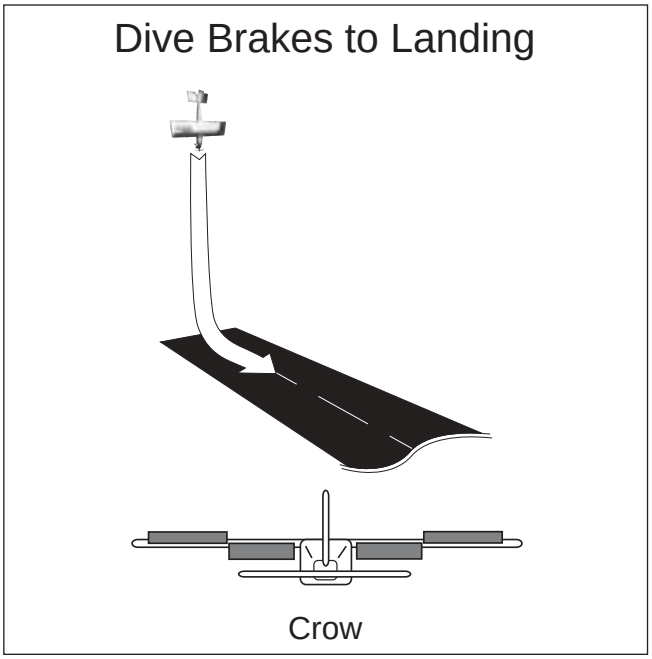
Caution: Do not inadvertently skip this step!!

The recommended Center of Gravity (C.G.) location for the Ultra Stick™ Lite is 4 ⅛" behind the leading edge of the wing. If necessary, move the battery pack or add weight to either the nose or the tail until the correct balance is achieved. Stick-on weights are available at your local hobby shop and work well for this purpose.

Section 18: Quad Flaps

The quad-flap option allows your Ultra Stick™ Lite to perform in ways that are just not possible with the conventional ailerons-only setup. With the quad flaps and a computer radio, different wing configurations can be programmed to extend the flight performance envelope. It's also a great way to learn more about your computer radio. Some of these configurations include the following:

Crow



Crow

What is Crow?

Ailerons up, flaps down, elevator down

What does Crow do?

Crow is a very high drag configuration that is commonly used as dive brakes to prevent the airplane from building up speed during steep descents/dives. Crow is great for bleeding off excess airspeed and/or altitude, making short landings from high altitudes possible. With a little practice, it's easy to shoot landings in front of yourself from 500 feet or more of altitude and just 100 feet downwind from where you're standing. Just deploy Crow, push the nose straight down, and then pull elevator to level at about 10 feet and land right in front of yourself at a slow walking speed. The drag caused from Crow will prevent the Ultra Stick Lite from gaining speed on the down line and, when the airplane is pulled to level, it will slow to a crawl within a short distance.

Another favorite maneuver that Crow allows is to fly nose high at very slow speeds with a high angle of attack (nearly 45°). Use full-up elevator and jockey the throttle position to maintain level flight. This maneuver is sometimes called a Harrier. With Crow activated, the Ultra Stick Lite has reduced tendency to tip stall. This is because the up ailerons at the tips of the wings (washout) help to keep the wing tips from stalling. Use the rudder only to steer the Ultra Stick Lite during this maneuver. If you turn off the Crow at these slow, high-angle-of-attack speeds, as there may not be enough airspeed to fly in the conventional mode. Anytime Crow is activated, the nose pitches up slightly, so it's recommended to mix some down elevator (about 1/4") whenever Crow is used.

First Flight Profile with Crow

On the first test flights, deploy the Crow at fairly high altitudes at various throttle settings to get a feel for the effects of Crow. You'll likely notice some reduction in roll control (ailerons) and the extra drag will drastically slow the airplane, no matter what throttle position or maneuver you're doing. Check to see if the nose pitches up or down and adjust the elevator-mixing value after landing if necessary. Try some steep descents with Crow and notice that the Ultra Stick Lite builds up very little speed on the way down. Shoot some landings with Crow activated. You'll likely come up way short on your first few full Crow landings, so don't be surprised if you've got to add throttle. With a little practice, you'll confidently be able to do full-up elevator, tail-first landings.

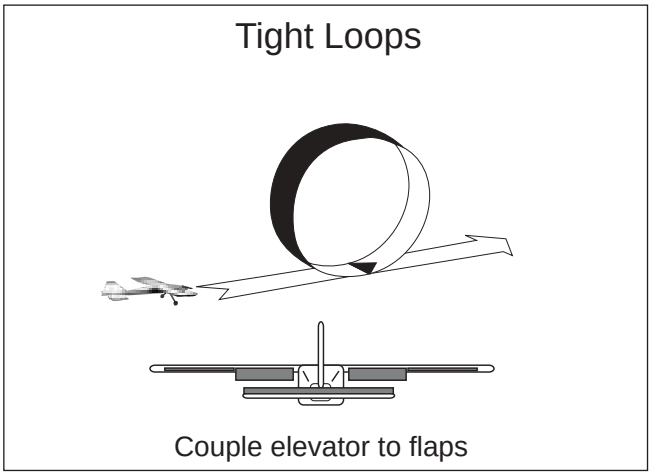
On your first attempts to do the Harrier, start high. Deploy Crow and throttle back to idle; then, start adding up elevator smoothly. As full-up elevator is reached, increase the throttle, just enough to maintain altitude. You can fly around in the nose-high attitude using rudder only to steer and, with some practice, you'll be doing Harrier landings with ease.

What to Watch For

In Crow, the wing tips are effectively washed out because the up ailerons reduce the tendency to tip stall, making for very stable slow flight when the airplane is upright. When inverted or doing outside maneuvers, this washout effectively becomes wash-in (ailerons are down) and a tip stall can occur. Be careful when flying inverted or doing outside maneuvers with Crow deployed, as an unexpected tip stall could occur. Also, when doing high angle-of-attack flight or the Harrier at very slow speeds, it's recommended that you keep the Crow turned on.

Crow allows the Ultra Stick™ Lite to actually fly slower and at higher angles of attack than in the conventional configuration.

Elevator-to-Flaps



An up-elevator command causes the flaps to go down, while a down-elevator command causes the flaps to go up.

What does elevator-to-flap do?

Elevator-to-flap mixing causes more aggressive pitching when elevator is applied, making for tighter inside and outside loops. Using the recommended throws, the Ultra Stick Lite is capable of very tight 15-foot diameter loops.

First Flight Profile

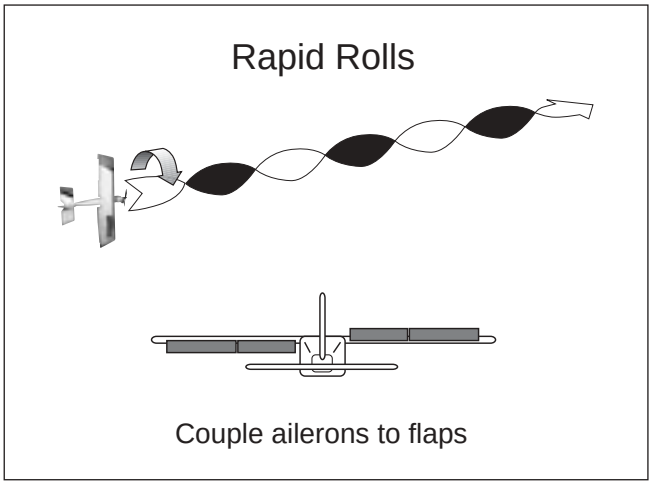
It's a good idea to start up high, then turn on the elevator-to-flap mixing to get accustomed to the increased pitch (elevator) sensitivity. You may find it necessary to increase the elevator expo to tame the aggressiveness around center. Now try some full up loops first with the mixing on and then off to see just how effective elevator-to-flaps can be. With practice, you can bring these tight loops right down to the deck and even do tight head-high outside loops.

Things to Watch For

The only real place you may run into trouble here is getting used to the increased pitch sensitivity and thus over-control the airplane. Just take it easy, staying at least two mistakes high until you're comfortable with the way the Ultra Stick Lite responds.

Later you may want to try differing amounts of flap travel with elevator to see the effects.

Aileron-to-Flaps



An aileron input causes the flaps to operate in the same direction as ailerons (i.e. a right aileron input causes the right aileron and right flap to go up and the left aileron and left flap to go down).

What does it do?

Aileron-to-flap mixing gives a more aggressive roll rate for doing rapid rolls. This mix also increases the rotation rate of snaps, spins or any other maneuver that uses ailerons.

Section 18: Quad Flaps

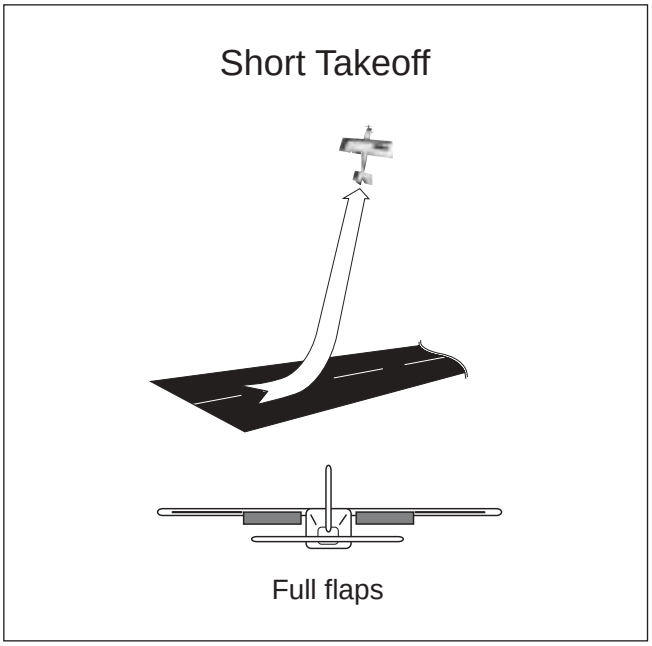
First Flight Profile

Start high and turn on the aileron-to-flap mix. Now do a couple of full-deflection, high-rate rolls and note the difference in roll rate. You should see about a 30% increase in roll speed. Now try a couple of snaps (full up, full right aileron and full right rudder). You'll find snaps and spins tighter, faster and more aggressive.

What to Watch For

Be careful not to over-control the ailerons on your first attempts.

Short Takeoff Flaps



The flaps are set to a down position.

What does it do?

Short takeoff flaps create a high-lift wing that allows the Ultra Stick™ Lite to do very short takeoffs, in some instances (from asphalt with a powerful engine) within the length of the fuselage.

First Flight Profile

After you have become comfortable with the flight characteristics of your Ultra Stick Lite, it's time to give the short takeoff flaps a try. On the runway drop the flaps, then punch the throttle and hold some up elevator. Be ready for the Ultra Stick Lite to break ground and head for the skies! It's important to release up elevator when the airplane breaks ground, then turn off the flaps to resume flights. On later flights, try holding full up elevator to shorten the roll out even more.

What to Watch For

On your first flap takeoffs, you may be surprised at just how quickly the Ultra Stick Lite pops off the ground, especially with a strong engine. Be ready to release any up elevator quickly. Also, you'll notice that the flap causes the nose to pitch up a bit. We normally don't recommend mixing in elevator compensation (a bit of down elevator), as the intention of short takeoff flaps is to get off the ground in as short a distance as possible. Just turn off the flap shortly after takeoff.

Section 19: Radio Programming Guide

Following is a programming guide that provides step-by-step illustrations on how to program quad-flap configurations for JR's XP652/642, XP783/347/388S, XP8103, and 10X/10SxII/10Sx radios, as well as for Futaba's 8-channel 8UA/S radio.

Once you understand your computer radio, you'll soon discover that there are many other possible programming configurations (e.g., right rudder causes the right aileron to go up and the right flap to go down, causing a severe right yaw). We challenge you to try as many possibilities as you can think of — just remember, start high!

If you come up with any interesting ideas, we'd like to hear from you.

Note: If you have a computer radio that's not listed, please consult the instructions included with that radio or contact the radio's manufacturer for programming information.

Programming Guide — JR XP652/642

Programming Your JR™ XP652/642 in 10 Easy Steps

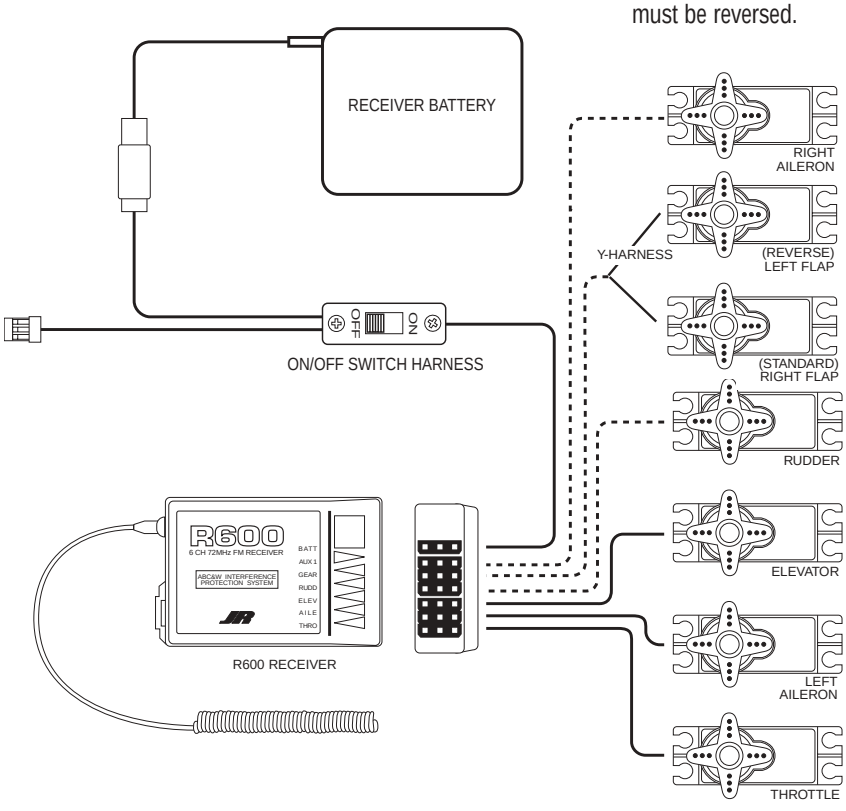
JR's XP652 and XP642 feature the same base level of programming, so the procedure for setting up quad flaps for each radio is identical.

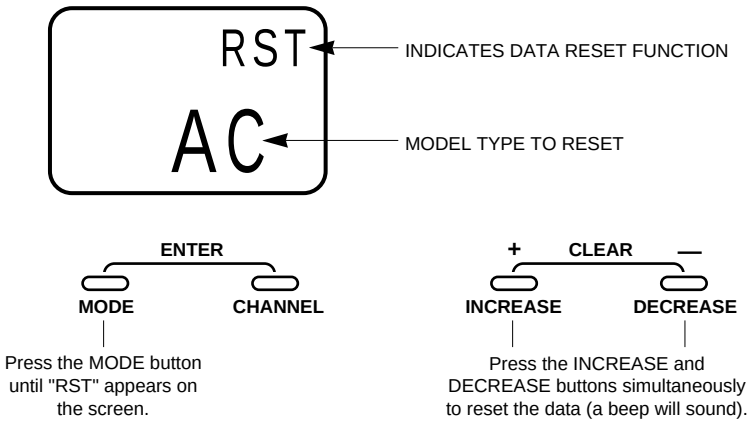
Note: Because these are 6-channel radios, it's necessary to use one reversed servo and a Y-harness to connect the flap servos in the wing. This allows the Crow, takeoff flaps, and elevator-to-flap configurations to be used. However, the aileron-to-flap configuration is only available with 7-channel or more computer radios.

First, it's important to plug each servo into the correct port in the receiver.

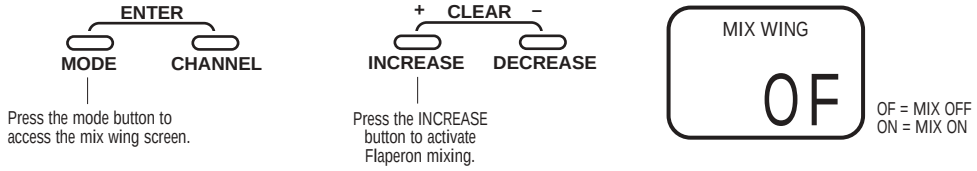
Note: When setting up a new aircraft, it's important to reset the programming to the factory defaults.

Note: One flap servo must be reversed.

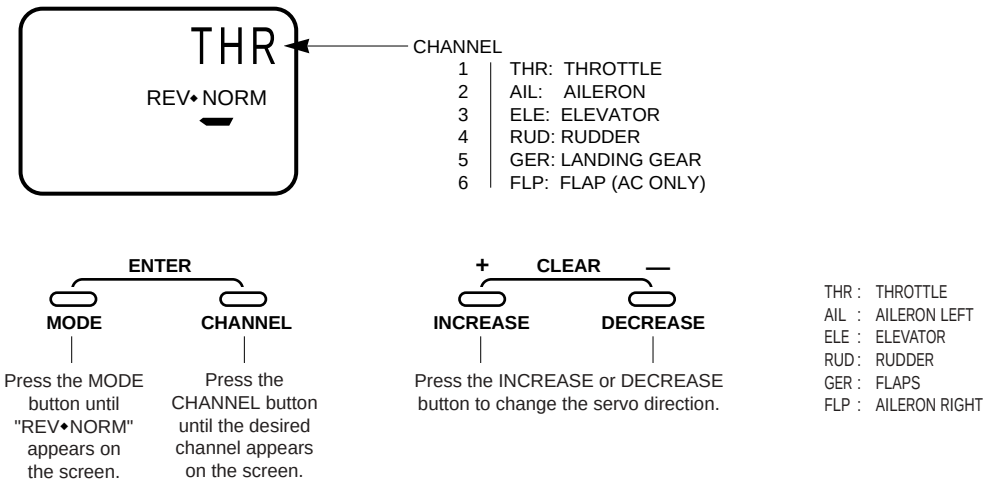




Step 1. Resetting the programming to factory defaults: Hold down both the *Mode* and *Channel* keys and turn on the radio to enter System Setup mode. Now press the *Mode* key until "RST" appears on your screen. Now press the *Increase* and *Decrease* keys simultaneously to reset the programming to factory defaults.

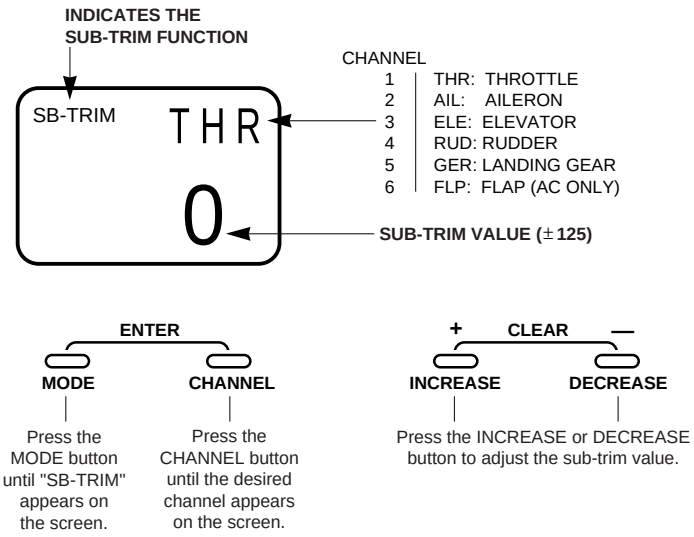


Step 2. Setting wing type to flaperons: In System Setup mode, press the *Mode* key until the "MIX WING" screen appears. (See above) Now press the *Increase* key until "FPR ON" appears on the screen.

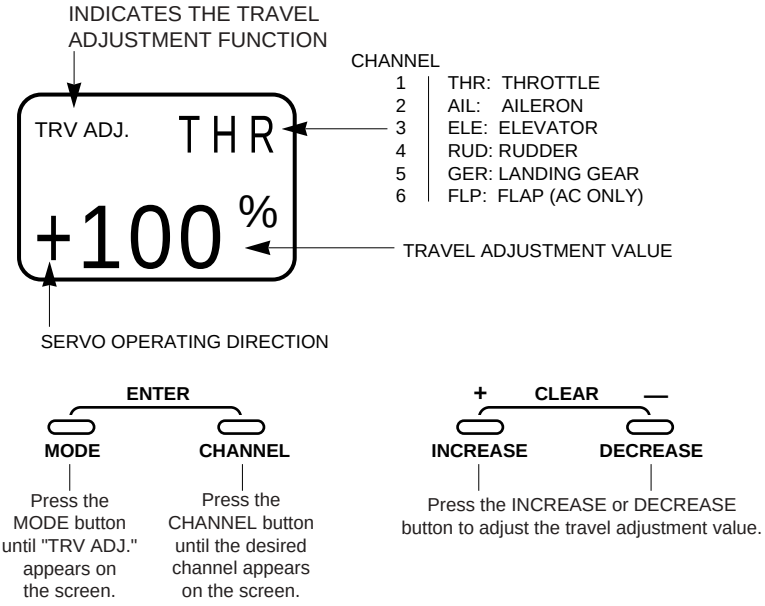


Step 3. Set reversing switches: Turn the transmitter off then back on again. Now press the *Mode* and *Channel* key simultaneously to access the Function mode. Now press the *Mode* key to access the "REV-Norm" screen. Press the *Channel* key to access each channel, then check that the selected channel is moving in the correct direction (e.g., a right aileron command causes the right aileron to go up and the left aileron to go down). To change the servo direction, press the *Increase* key. Check all channels and adjust as necessary.

Note: With the gear channel pulled toward you, the flaps should go down. With the flap switch pulled toward you, both ailerons should go up.



Step 4. Sub-trim: With the flap and gear switches in the rearward position and the mechanical trims centered, reposition any of the servo arms if necessary such that all control surfaces are at neutral or as close to neutral as possible. Now press the *Mode* key to access the SB-TRM function. The *Channel* key allows you to select the desired channel, while the *Increase* and *Decrease* keys change the center position. Adjust the sub-trim as necessary until all control surfaces are neutral.



Step 5. Set travel adjust: Press the *Mode* key until "TRV ADJ." appears on your screen. Pressing the *CH* key will allow access to each channel. Adjust the travel of each channel to the following using the *Increase* or *Decrease* keys.

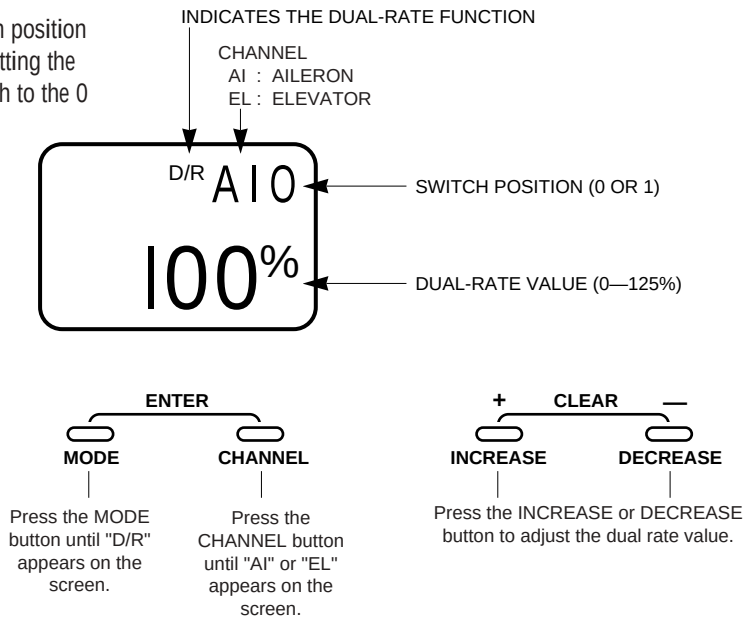
Important: Move the flap switch to the rearward position. Adjust the FL. Travel adjust to 0%. Reposition the servo arm so that the ailerons are neutral. If necessary, readjust the aileron sub trims slightly.

Note: To get the most performance out of your Ultra Stick™ Lite, long servo arms (1 inch) like JRPA215 are recommended. This provides for large control throws, allowing for more aggressive maneuvers. To achieve the control throws listed below, long servo arms may be necessary.

Note: Use the Dual Rate function to achieve these throws (see page 52).

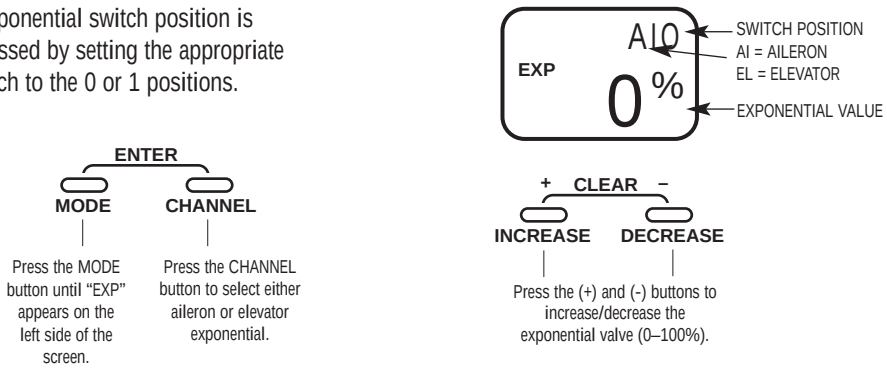
Throttle — Full throttle to full closed
Aileron — 1¼" up, 1¼" down
Elevator — 1½" up, 1½" down
Rudder — 4" right, 4" left (rudder throws measured at bottom)
Flaps — 1½ down when the gear switch is pulled for-ward (adjust with GEAR channel travel adj.)

Note: The dual-rate switch position is changed/accessed by setting the appropriate dual-rate switch to the 0 or 1 positions.

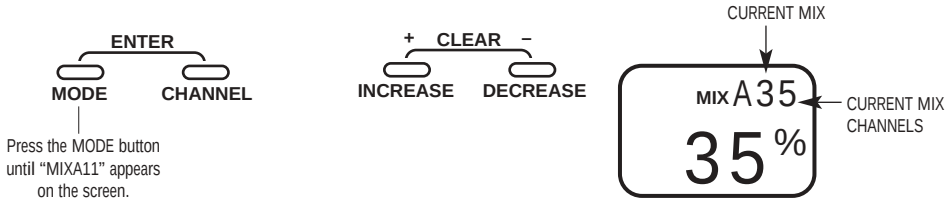


Step 6. Adjusting the dual rates: Press the *Mode* key until the dual-rate screen appears. The *Channel* key allows you to select the aileron or elevator channel while the respective dual-rate switch allows you to select position 0 or 1. Adjust the high rate to 100% and the low rate to 50% using the *Increase* and *Decrease* keys. First flights should be attempted on low rates.

Note: The exponential switch position is changed/accessed by setting the appropriate dual-rate switch to the 0 or 1 positions.



Step 7. Using exponential: Exponential is used to reduce the sensitivity of control around center while still providing full control authority when the control stick is fully deflected. Because the Ultra Stick™ Lite uses large control throws, it's a good idea to give Expo a try, even if you've never used it before, to help prevent over-controlling. Press the *Mode* key until "EXP" appears on your screen. Use the *Channel* key to select the aileron or elevator channel, then use the exponential switch to access position 0 or 1. Separate expo values can be programmed for position 0 and 1. Press the *Increase* or *Decrease* keys to program the desired expo value for the selected channel and switch position. We recommend starting with an expo value of 25% on elevator and 30% on ailerons. Then, on subsequent flights, adjust the value until the desired control feel is achieved.

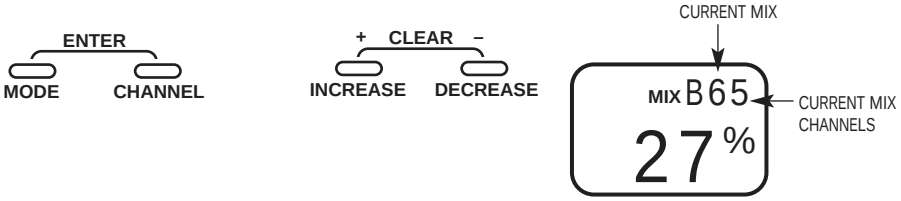


Step 8. Mixing elevator-to-flaps: Press the *Mode* key until the "MIX A11" screen appears. This is programmable MIX A and it allows you to mix any channel to any other channel or even to itself. Press the *Channel* key until the "MIX Ach" appears. This screen will allow you to select the master (elevator) and slave (in this case GEAR because GEAR is being used to deploy flaps). Elevator is channel 3, so press the *Increase* key until the screen reads "31." The first digit (3) is now the master channel (elevator). Now press the *Decrease* key until "35" appears in the screen. The second digit (5) is now the slave channel (gear, which we have Y-harnessed to flaps). This gives us an elevator-to-flap mix. Press the *Channel* key twice until "0%" appears on the screen. Now hold up elevator and press the *Increase* key until 35% is achieved. An up elevator command should result in the flap going down. If the flaps go up instead, this 35% value needs to be -35%.

Press the *Decrease* key until -35% is achieved. Now holding down elevator, press the *Increase* or *Decrease* key so that the flap goes up 35%.

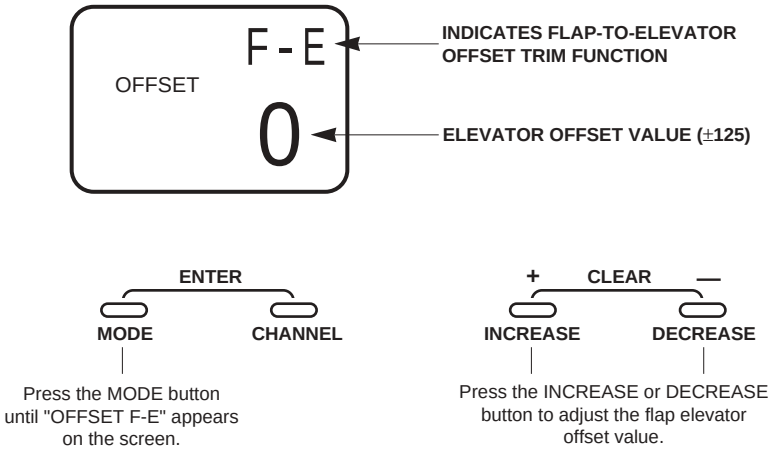
Note: It's possible to assign this mix to be turned off/on using a selected switch. Press the *Channel* key until "MIX-ASW" appears. Pressing the *Increase* key will allow you to assign this mix:

F1 = flap switch
A = aileron dual-rate switch
E = elevator dual-rate switch
ON = always on



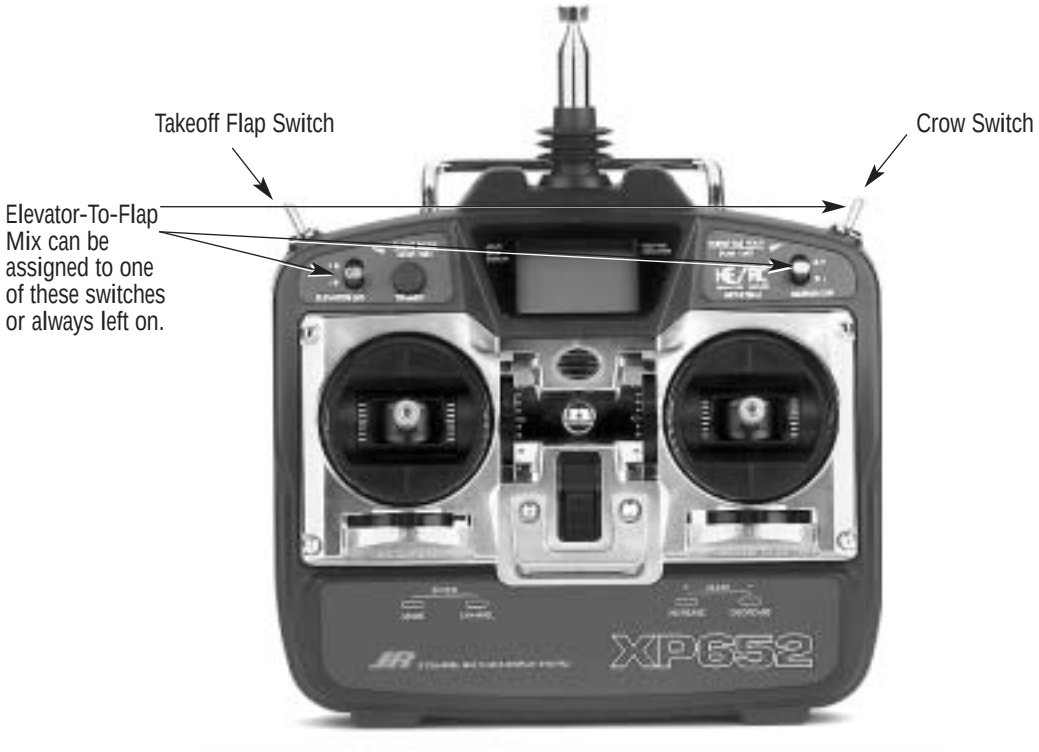
Step 9. Crow mixing: We've already done 1/3 of the work in crow mixing above when we activated the flaperons and adjusted the ailerons to go up when the flap switch is pulled in Steps 2 and 5. Now we need to add down flaps and some down elevator. To get down flap when the flap switch is pulled, we're going to mix flap as master to gear as slave. Press the *Mode* key until "MIXB11" appears on the screen. Now press the *Channel* key to access the "MIXBch" screen.

Press the *Increase* key until "61" appears, then press the *Decrease* key until "65" appears in the screen. This programs channel 6 (flaps) as master and channel 5 (gear) as slave. Now press the *Channel* key until "MIX65 0%" appears on the screen. With the flap switch pulled forward, press the *Increase* key or *Decrease* key until the flaps go down 1½".



Step 10. Elevator Offset: To set the necessary down elevator with Crow, press the *Mode* key until "OFFSET F-E" appears on the screen.

With the flap switch in the forward position, press the *Increase* or *Decrease* key until the elevator goes down 5/8."

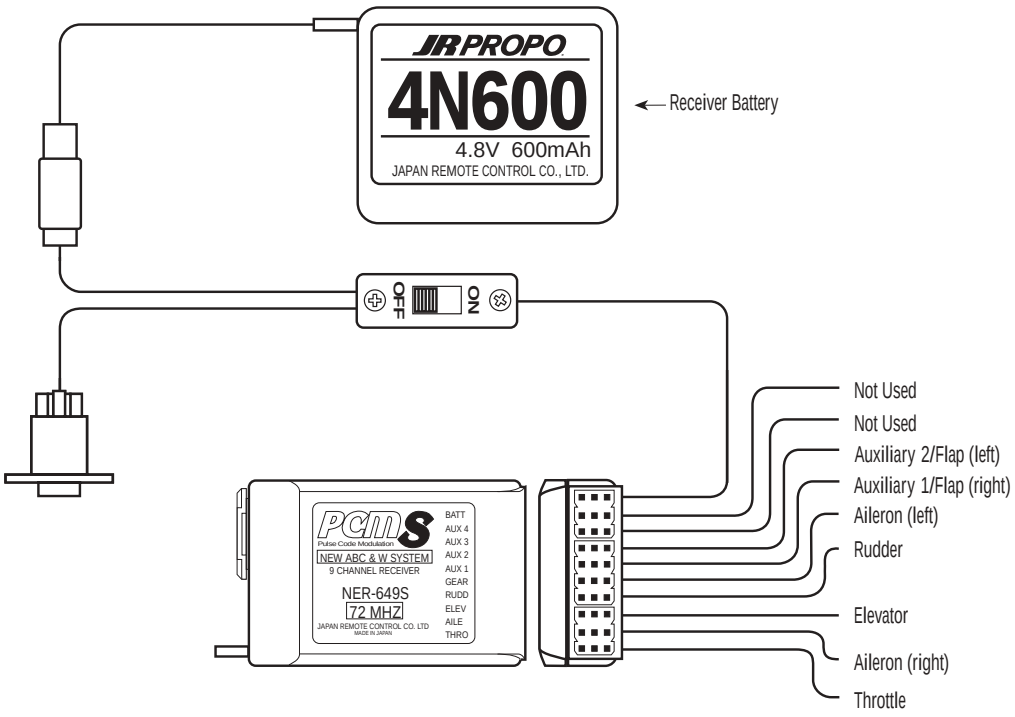


Note: The takeoff flaps should be retracted before using the Crow function to prevent any over-travel of the flap servos.

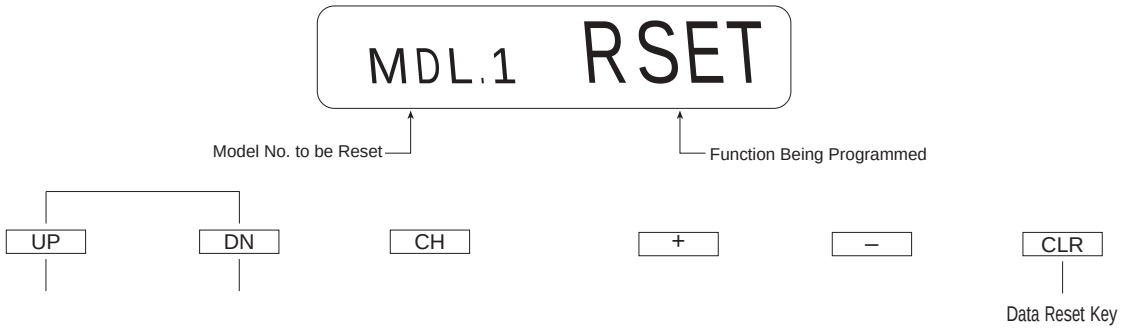
Programming the JR XP783, XP347 and XP388S in 15 Easy Steps

JR's XP783, XP347 and XP388S all feature the same base level programming, so the procedure for setting up quad flaps for each radio is identical.

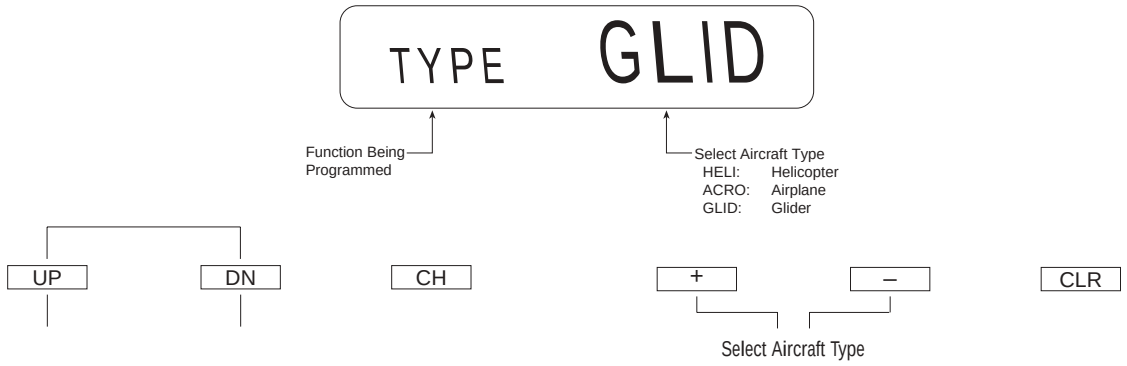
Note: Most of the quad-flap features needed for the Ultra Stick™ Lite are already preprogrammed in the glider (referred to as GLID) software included in these three radios. While the Ultra Stick™ Lite is not a glider, there are several built-in features in the glider programming that make quad-flap easier to program and use. We strongly suggest using the GLID model type programming that's included in these radios.



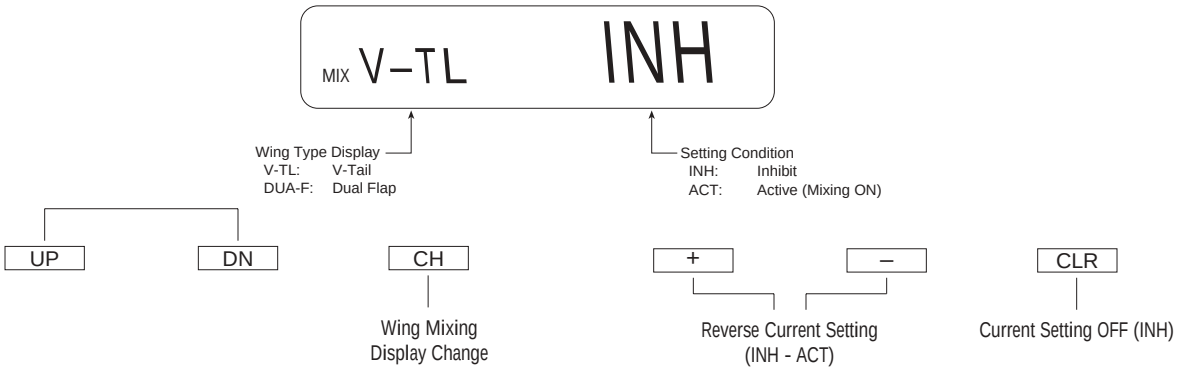
When setting up a new aircraft, it's important to reset the programming to the factory defaults.



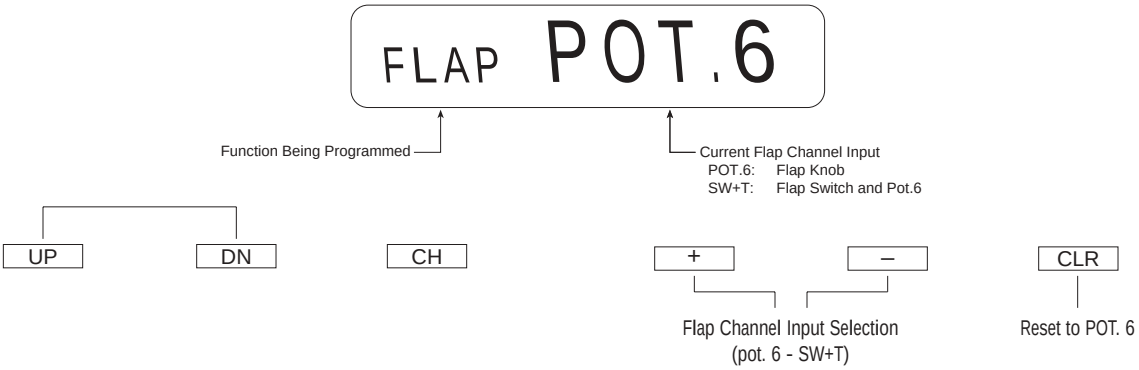
Step 1. Resetting the programming to factory defaults: Hold down both the *Up* and the *Down* keys simultaneously and turn on the radio to enter System Setup mode. Now press the *Up* key until "RSET" (reset) appears on the screen. Pressing the *CLR* key will reset the programming to the factory defaults.



Step 2. Selecting model type (GLID): In System Setup mode, press the *Up* key until the "TYPE" screen appears. Now press the (+) key until "GLID" appears on the screen.

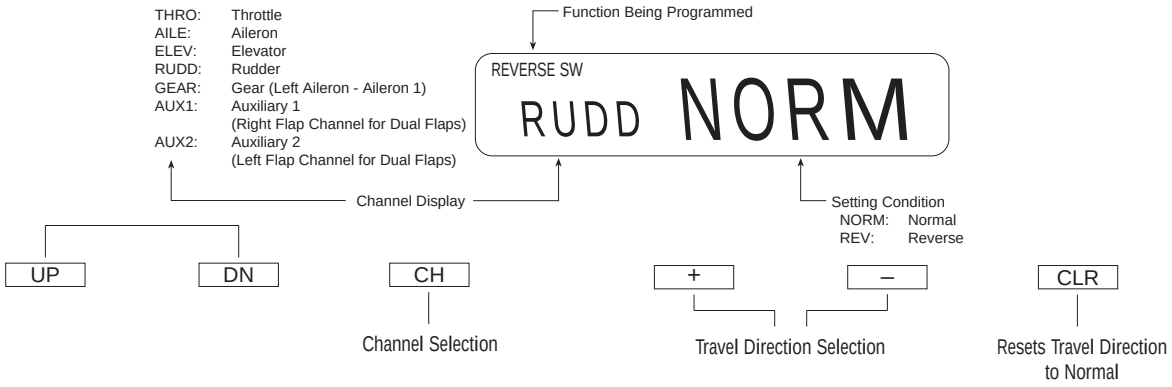


Step 3. Activating dual flap: In System Setup mode, press the *Up* key until the "V-TL INH" screen is displayed. Press the *CH* key to access the mix "DUA.F" screen. Press the (+) key to activate (ACT) the dual-flap function.



Step 4. Assigning the flaps to the flap switch: In System Setup mode, press the *Up* key until "FLAP POT.6" appears on the screen. Press the (+) key so that "SW+T" appears.

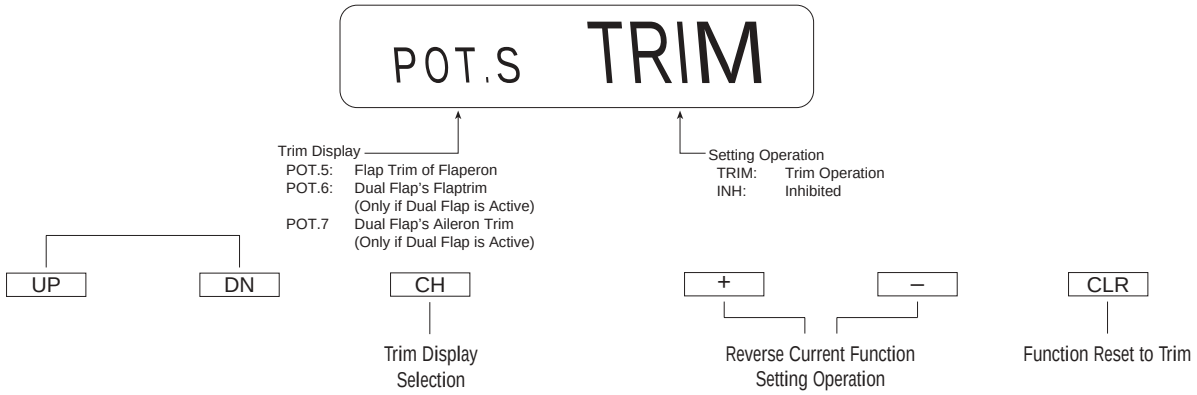
Note: With the JR X347 the flaps are automatically assigned to the switch. This step should be ignored.



Step 5. Setting servo reversing: Turn the transmitter off, then back on again. Press the *Up* and *Down* keys simultaneously to access the Function mode. Press the *Up* key until the "REV" function appears on the screen. Press the *Channel* key to select each channel and check that the servo direction is operating correctly for each channel. To change the direction of the selected channel, press the (+) or (-) key. Check and adjust all channels as necessary.

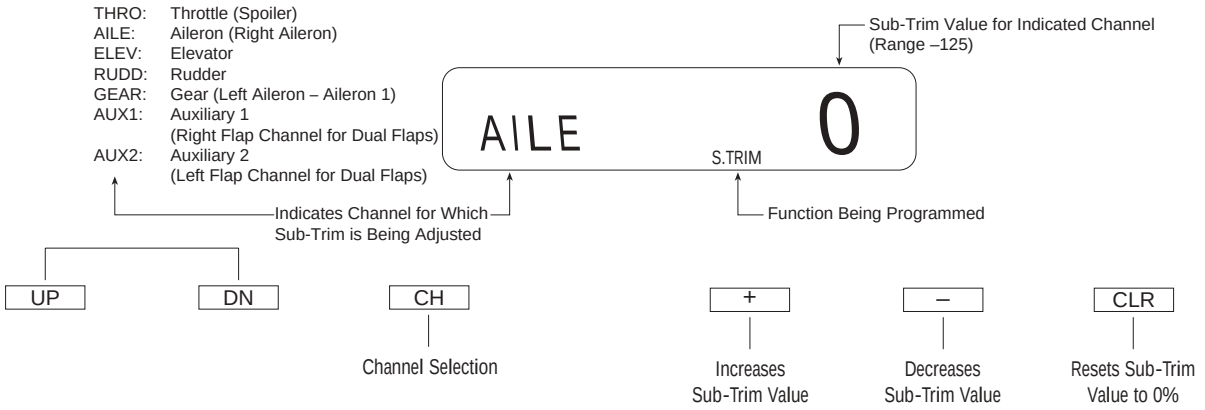
Note: When the three-position flap switch is pulled down, the flap should come down. If they go up, reverse the direction of channel 6 (AUX 1) and/or 7 (AUX 2).

Note: Because the GLID model programming is being used, the transmitter refers to the throttle function as SPOI or spoilers. Any time "SPOI" is displayed, it functions as throttle.



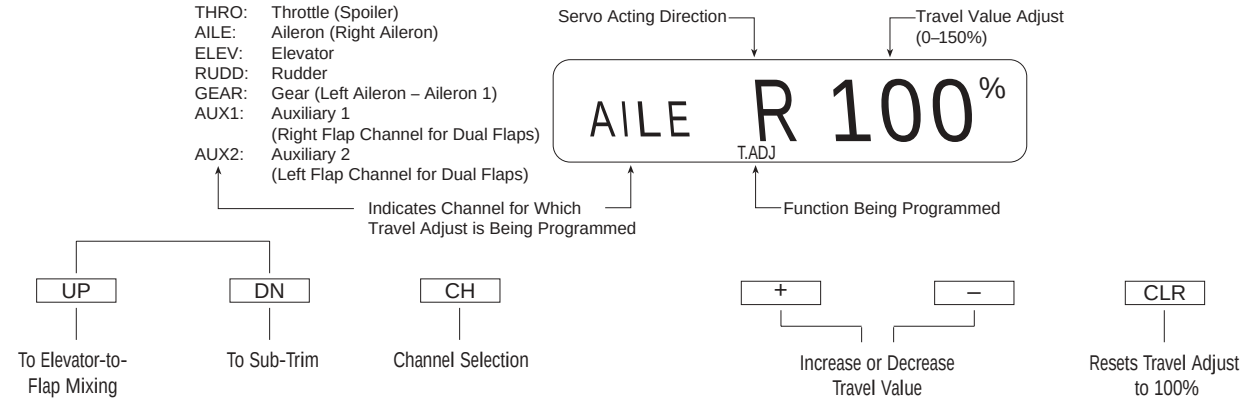
Step 6. Turning off the trim knobs: In Function mode, press the *Up* key until the "POT.5 TRIM" screen appears. Pressing the *CH* key will advance through the three available trim pots: 5, 6, and 7. Inhibit all three by pressing the (+) key when each one is selected. This will prevent any unwanted control movement should the knobs be moved.

Note: With the 347, POT.6 is not available.



Step 7. Adjusting the sub trims: Turn on the transmitter and receiver and center the trims. Move the flap switch in the upper position. Now reposition all the servo arms so that all the control surfaces are as close as possible to their neutral positions.

In System Setup mode, press the *Up* key until the "S.TRIM" screen appears. Now press the *Channel* key to access the desired channel and press the (+) or (-) key to perfectly center each control surface.



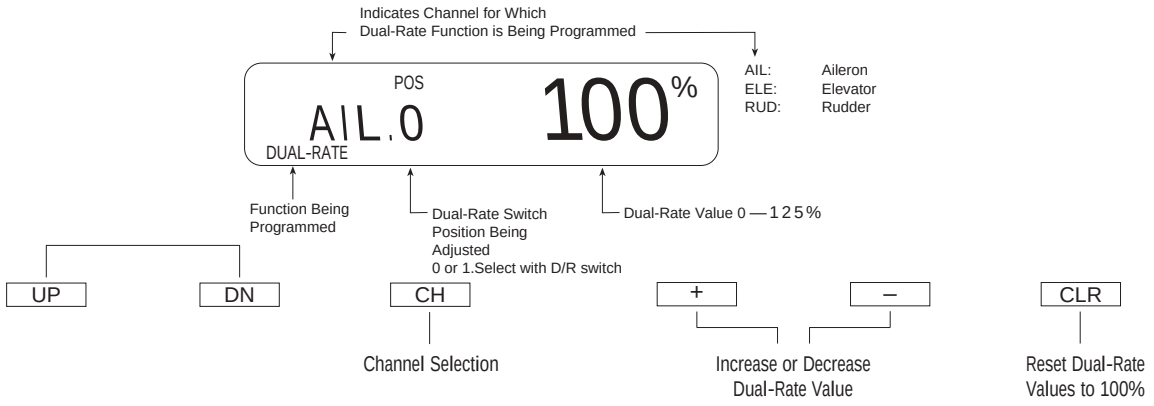
Note: The throttle is referred to as "SPOI" in the glider mode.

Step 8. Setting Travel Adjust: Press the *Up* key until the "T.ADJ" screen appears. Pressing the *CH* key will allow access to each channel. Adjust the travel of each channel to the throws shown below using the (+) or (-) key. Move the corresponding control stick in the desired direction to adjust the travel amount in that direction.

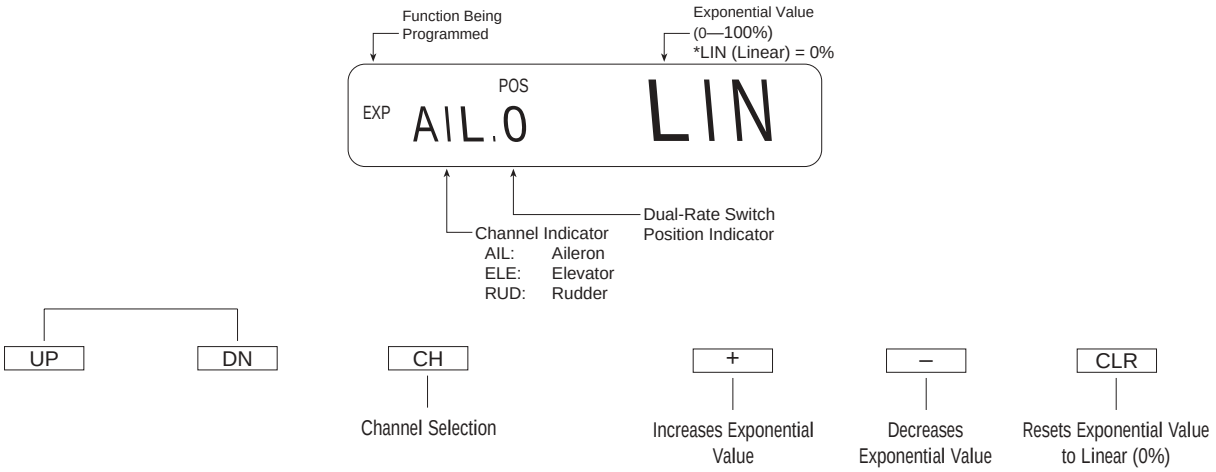
Note: To get the most performance out of your Ultra Stick™ Lite, long servo arms (1") are recommended. This provides for large control throws for more aggressive maneuvers. To achieve the control throws listed below, long servo arms may be necessary.

Note: Adjust the right flap travel first, then the left flap.

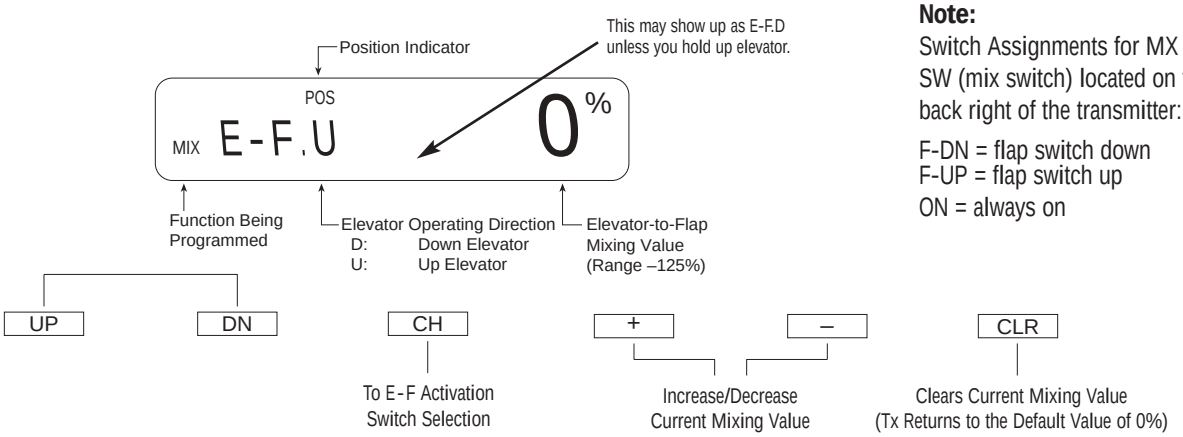
Throttle — Full open to full closed with trim
(Referred to as "SPOI" in GLID mode)
Aileron — 1 ¼" up, 1¼" down
Elevator — 1½" up, 1½" down
Rudder — 4" right, 4" left
Full Flaps — 1½" down



Step 9. Adjusting the dual rates: Press the *Up* key until the "DUAL-RATE" screen appears. The *CH* key allows the selection of the aileron, elevator or rudder channels, while the respective dual-rate switch allows you to select position 0 or 1. Adjust the high rate for each channel to 100% and the low rate to 50% using the (+) or (-) keys. The first flights should be attempted using low rates.



Step 10. Using exponential: Exponential is used to reduce the sensitivity of control around center while still providing full control authority when the control stick is fully deflected. Because the Ultra Stick™ Lite uses large control throws, it's a good idea to give expo a try, even if you've never used it before, to help prevent over-controlling. Press the *Up* key until the "EXP" screen appears. Use the *Channel* key to select the aileron, elevator or rudder channel, then use the corresponding dual-rate switch to select position 0 or 1. Separate expo values can be programmed for position 0 and 1. We recommend an expo value of 30% on aileron and 25% on elevator and rudder for the first flights, then on subsequent flights, adjust the value until the desired control feel is achieved.

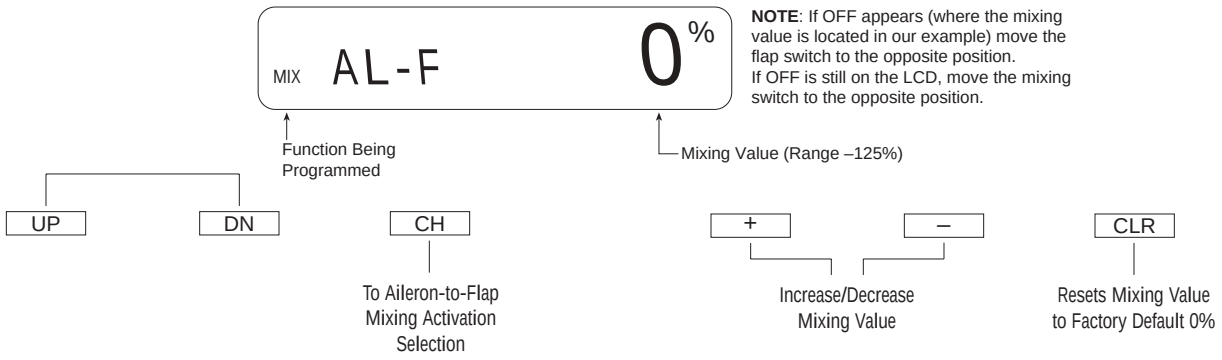


Note:
Switch Assignments for MX SW (mix switch) located on the back right of the transmitter:

F-DN = flap switch down
F-UP = flap switch up
ON = always on

Step 11. Mixing elevator to flap: With the flap switch in the upper position, press the *Up* key until "MIX E-F.U" appears on your screen. This is the elevator-to-flap mix. Press the *CH* key to access the "EF: SW"screen. This screen allows you to select which switch will be used to turn on/off the elevator-to-flap mixing. Pressing the (+) key will select one of the following switches: MX SW = mix switch (located on the back right of the transmitter), F-DN = flap switch down, F-UP = flap switch up, or ON = always on. (See note.) We suggest selecting the mix switch MXSW so the elevator-to-flap mix can be turned on and off independently of the flaps. After selecting MXSW, press the *CH* key to access the "MIX E-F.U" screen. With the Mix switch in the forward position, hold up elevator and press the (+) key until a 35% value is achieved. Up should result in down flaps. If the flap goes up, then reverse the 35% value from a +35 to a -35 using the (-) key. Now hold down elevator and press the (+) key until 35% is achieved. The flaps should go up. Reverse the value if necessary until up elevator gives down flaps and down elevator gives up flaps. Later you can experiment with more or less flap throw by changing this value. 35% is a good, safe place to start.

Note: The XP347 doesn't allow the elevator-to-flap mixing to be assigned to another switch. Instead it remains on the flap up position.

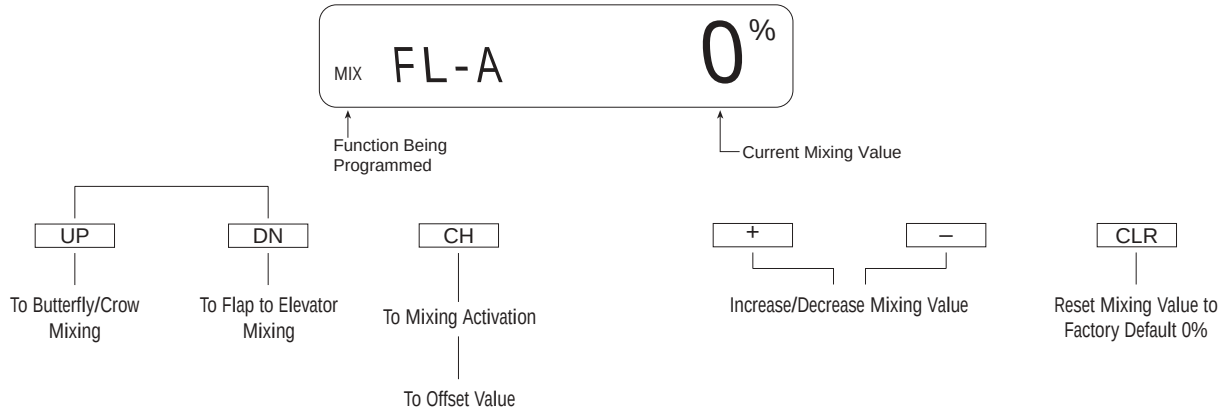


Step 12. Aileron-to-flap mixing: Press the *Up* key until the mix "AL-F" (aileron-to-flap mix) screen appears. Press the *CH* key to access the "MIX AF: SW" screen. This screen allows you to select which switch is used to turn on/off the aileron-to-flap mix. Pressing the (+) key will select one of the following switches: MXSW = mix switch located on the back right of the transmitter, F-DN = flap switch down, FU+D = flap switch up and down, and ON = always on. (See note.) We recommend putting the aileron-to-flap mix on the mix switch so the mix can be turned off independently from the flaps. After selecting MXSW, press the *CH* key to return to the "MIX AL-F" screen. Now press the (+) key until +100% value is reached. Now the flaps should move in unisonin the same direction with the ailerons. If they move in opposite directions, press the (-) key until a -100% value is reached.

Note: When programmed, the aileron-to-flap mixing is always on when using an XP347.

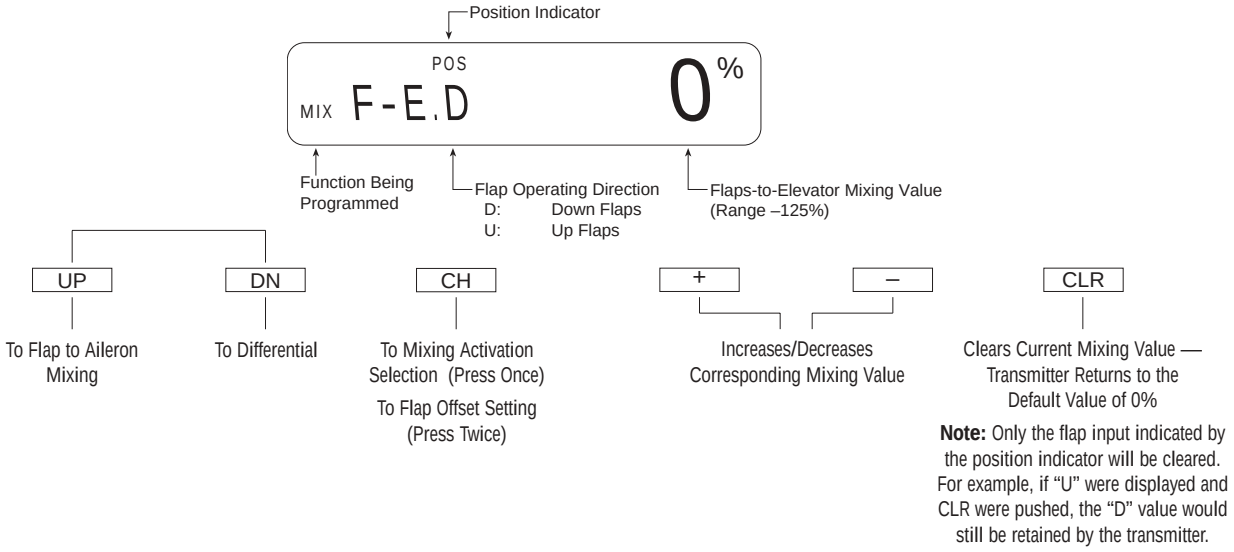
Note: If "OFF" appears (where the mixing value is located in our example), move the flap switch to the opposite position. If "OFF" is still on the LCD, move the mixing switch to the opposite position.

Step 13: Setting up Crow: Crow will be assigned to the flap switch and will be activated when the switch is in the down position. We've already set the flaps to the proper down position in Step 7 travel adjust. Now we need to add the ailerons up 3/4" and the elevator down 5/8".



Step 14. Flap to ailerons mixing: Press the *Up* key until the "MIX FL-A" screen appears. Now press the *CH* key to access the "MIX FA: SW" screen (flap-to-aileron switch selection). Press the (+) key until "F-DN" (flap-down) appears on the screen. Now press the *CH* key twice to return to the "FL-A" screen. Move the flap switch to the down position. Next press the (+) key until both the ailerons go up 3/4". If the ailerons go down, press the (-) key.

Note: With the XP347, the flap-to-aileron mix is always on when programmed.



Step 15. Flap-to-elevator mixing: In Function mode, press the *Up* key until "MIX F-E" appears on the screen. Next press the *CH* key to access the "FE: SW" (flap-to-elevator switch selection) screen. Press the (+) key until "F-DN" (flap down) appears on the screen. Now press the *CH* key twice to return to the "MIX F-E" screen. With the flap switch in the down position, press the (+) key until the elevator comes down 1/4". If the elevator goes up, use the (-) key to reverse this.

Flap Switch
UP = Normal
MID = Takeoff flaps
DOWN = Crow

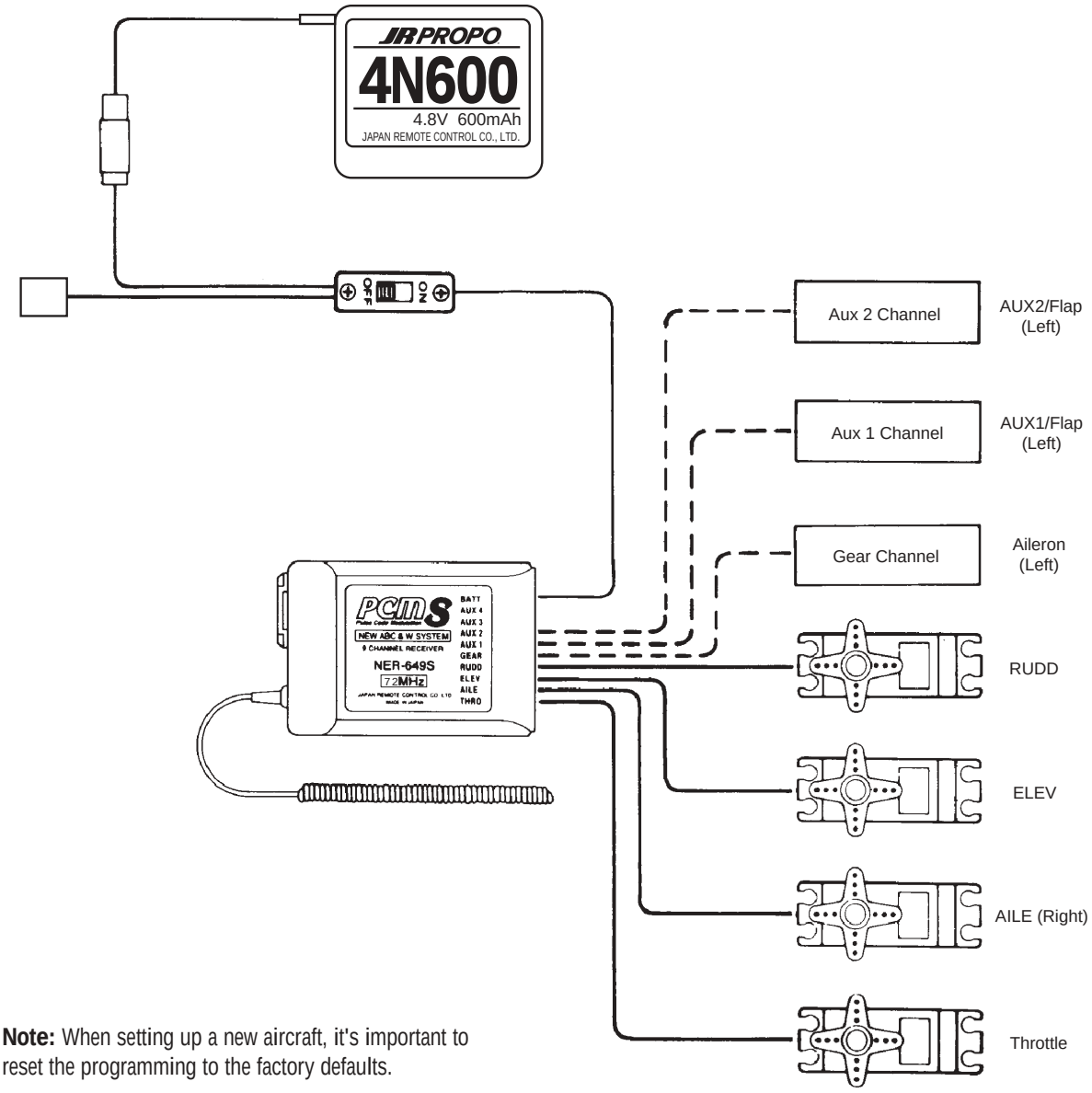
Mix Switch
Turns on/off aileron-to-flaps and elevator-to-flaps mixes

Programming Guide — JR™ XP8103

Programming JR's XP8103 in 14 Easy Steps

First, it's important to plug each servo into the correct port in the receiver.

Note: Most of the quad-flap features needed for the Ultra Stick™ Lite are already preprogrammed in the glider (referred to as GLID) software included in the XP8103. While the Ultra Stick Lite is not a glider, there are several built-in features in the glider programming that make quad-flap easier to program and use. We strongly suggest using the GLID model type programming that's included in these radios.



Note: When setting up a new aircraft, it's important to reset the programming to the factory defaults.

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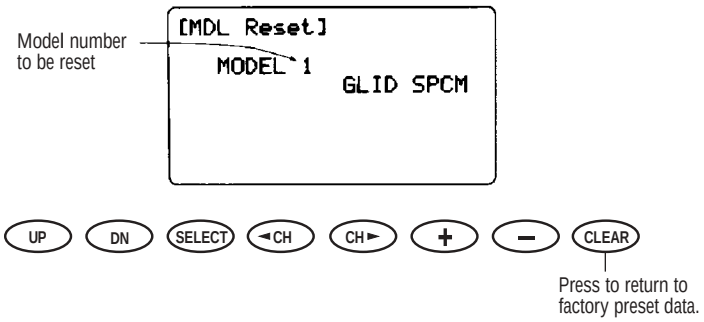
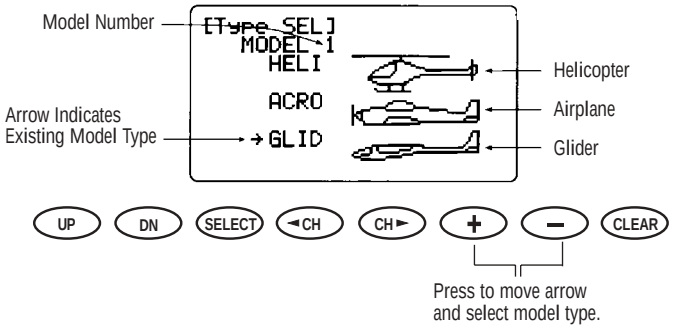
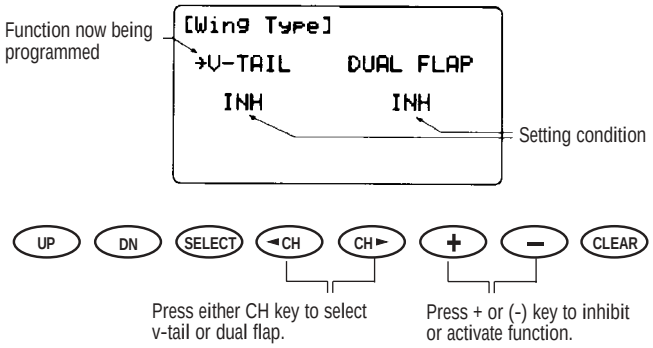


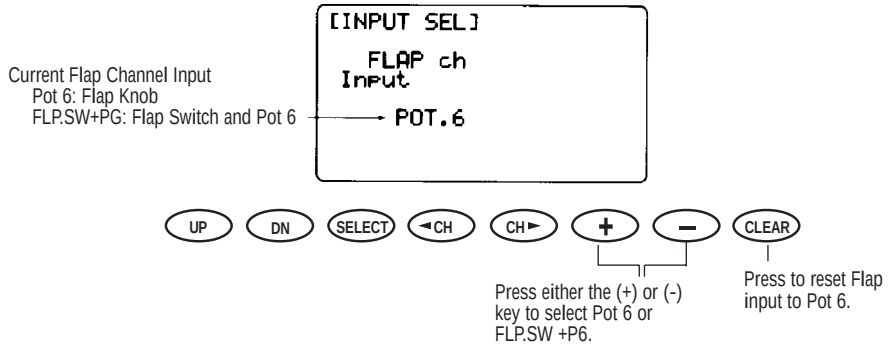
Step 1. Resetting the programming to factory defaults: Hold down both the *Up* and the *Down* keys and turn on the radio to enter System Setup mode. Now press the *Up* key three times to move the cursor to the "MDL Reset" menu (Model Reset). Press the *Up* and *Down* keys simultaneously to enter the "MDL Reset" screen. Now press the *CLR* key to reset the programming to the factory defaults.



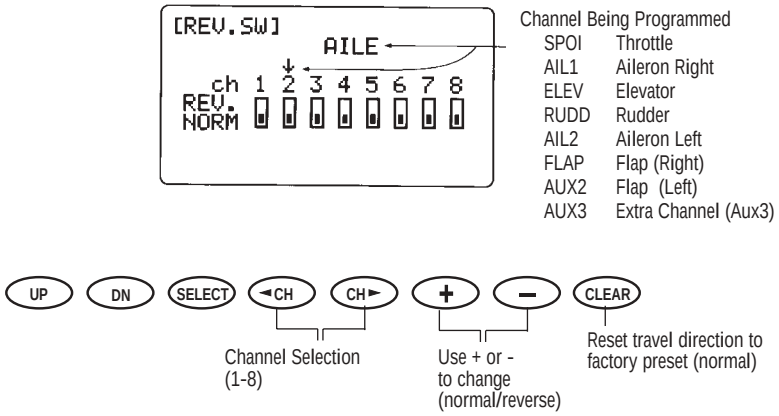
Step 2. Selecting model type (GLID): In System Setup mode, press the *Up* key until the "Type SEL" screen appears. Now press the (+) key until the cursor points to "GLID" on the screen.



Step 3. Activating dual flap: In System Setup mode, press the *Up* key until the "Wing Type" screen is displayed. Press the *CH* key to move the cursor to "DUAL FLAPS." Next press the (+) key to activate (ACT) the dual-flap function.



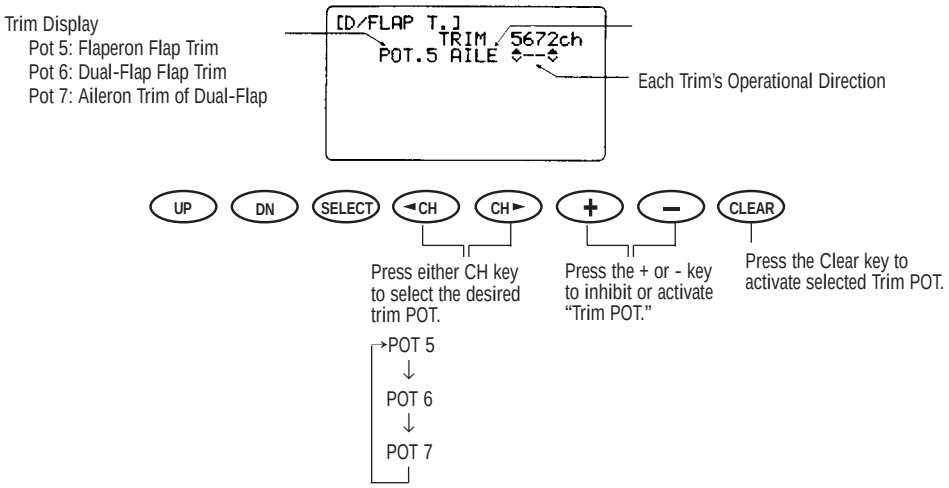
Step 4. Assigning the flaps to the flap switch: In System Setup *Mode* press the *Up* key until "Input Sel." (Flap Input) appears on the screen. Press the (+) key so that "FLP.SW+P6" appears in the lower screen.



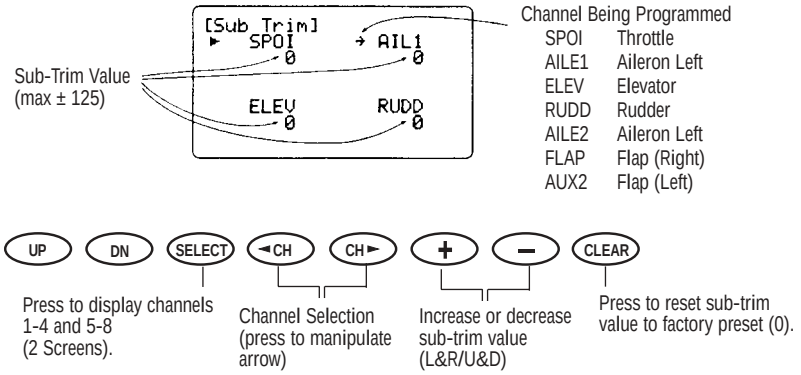
Step 5. Setting servo reversing: Turn the transmitter off and then back on again. Press the *Up* and *Down* keys simultaneously to access the Function mode. Press the *Up* key until the "REV.SW" function appears on the screen. Press the *Channel* key to select each channel and check that the servo direction is operating correctly for each channel. To change the direction of the selected channel, press the (+) or (-) key. Check and adjust all channels as necessary.

Note: When the three-position flap switch is pulled down, the flaps should come down. If they go up, reverse the direction of channel 6 (FLAP) and or 7 (AUX 2).

Note: Because the GLID model programming is being used, the transmitter refers to the throttle function as SPOI or spoilers. Any time "SPO"I is displayed, it functions as throttle.

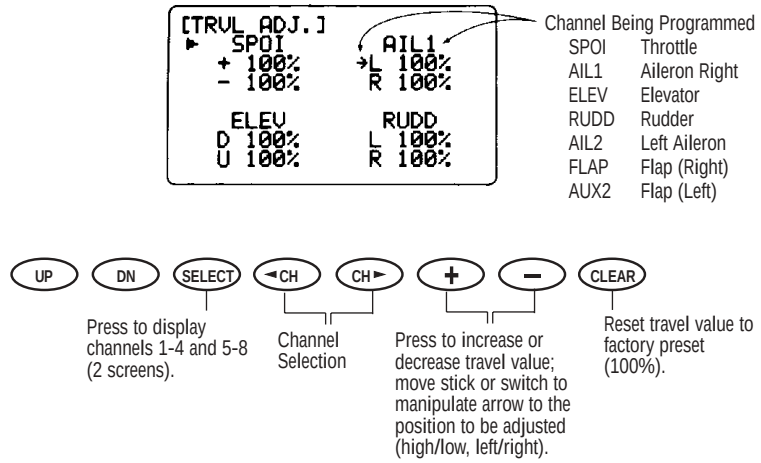


Step 6. Turning off the trim knobs: In Function mode, press the *Up* key until the "D/FLAP T". (dual flap trim) screen appears. Pressing the *CH* key will advance through the three available trim pots: 5, 6 and 7. Inhibit all three by pressing the (+) key when each one is selected. This will prevent any unwanted control movement should the knobs be moved.



Step 7. Adjusting the sub-trims: Turn on the transmitter and receiver and center the trims. Move the flap switch in the upper position. Now reposition all the servo arms so that all the control surfaces are as close as possible to their neutral positions.
In System Setup mode, press the *Up* key until the "Sub-Trim" screen appears. Now press the *Channel* key to access the desired channel and press the (+) or (-) key to perfectly center each control surface. Press the *Select* key to access the other four channels.

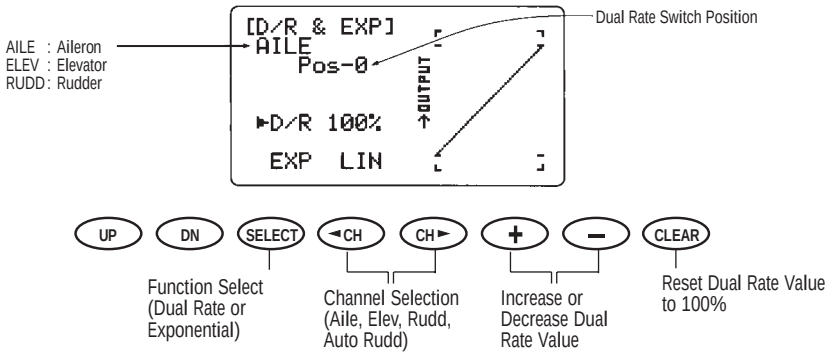
Note: The throttle is referred to as "SPOI" in the glider model.



Step 8. Setting travel adjust: Press the *Up* key until the "TRVL ADJ." screen appears. Pressing the *CH* key will allow access to each channel. Adjust the travel of each channel to the following throws using the (+) or (-) key. Move the corresponding control stick in the desired direction to adjust the travel amount in that direction. Press the *Select* key to access the other four channels.

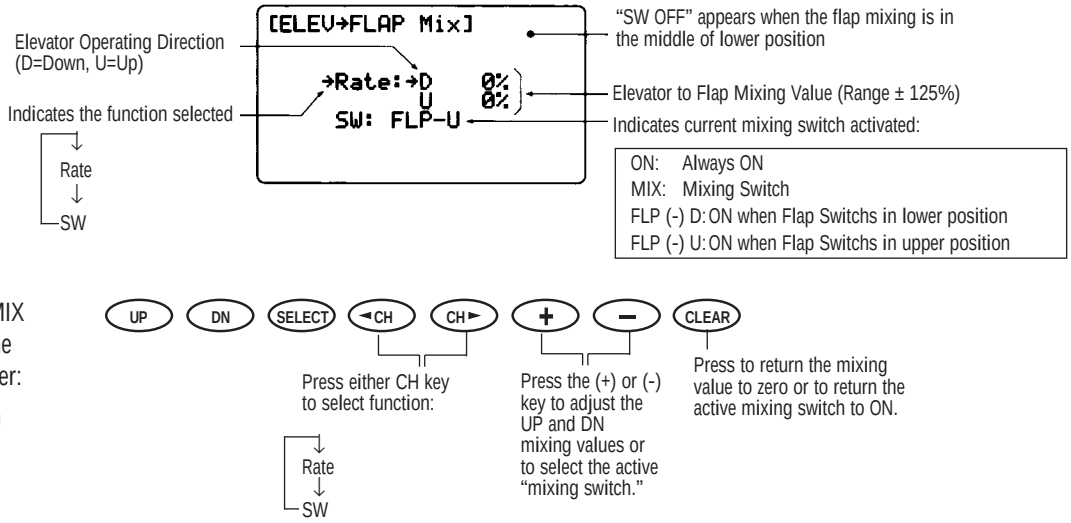
Note: To get the most performance out of your Ultra Stick™, long servo arms (1") are recommended. This provides for large control throws for more aggressive maneuvers. To achieve the control throws listed below, long servo arms may be necessary.

Throttle — Full open to full closed with trim (referred to as SPOI in GLID mode)
Aileron — 1¼" up, 1¼" down
Elevator — 1½" up, 1½" down
Rudder — 4" right, 4" left
Full Flaps — 1½" down



Step 9. Using exponential: Exponential is used to reduce the sensitivity of control around center while still providing full control authority when the control stick is fully deflected. Because the Ultra Stick™ Lite uses large control throws, it's a good idea to give expo a try, even if you've never used it before, to help prevent over-controlling. The exponential rate is adjusted in the same screen as the dual rate from above. In the "D/R & EXP" screen, press the *Select* key to move the cursor to the EXP at the bottom of the screen. Pressing the (+) key will adjust the expo value. Use the *Channel* key to select the aileron, elevator or rudder channel, then use the corresponding dual rate switch to select position 0 or 1. Separate expo values can be programmed for position 0 and 1. We recommend an expo value of 30% on aileron and 25% on elevator and rudder for the first flights then, on subsequent flights, adjust the value until the desired control feel is achieved.

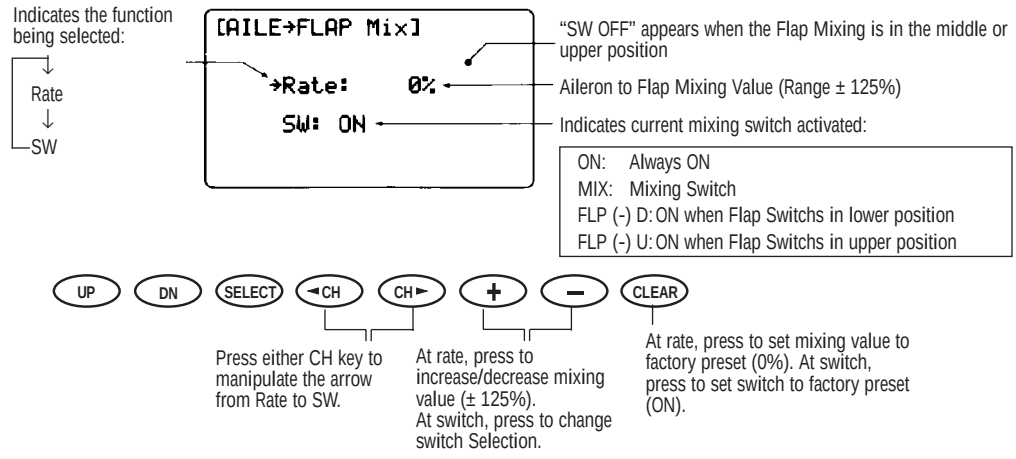
Always use A+ Expo Value! Using the A- expo value will actually make control response more sensitive around center and could cause a crash.



Note:
Switch Assignments for MIX (mix switch) located on the back right of the transmitter:

FLP-D = flap switch down
FLPU = flap switch up
ON = always on

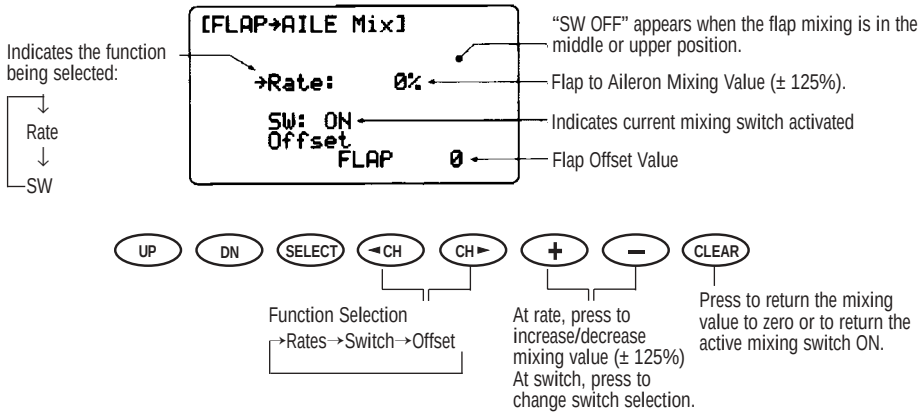
Step 10. Mixing elevator-to-flap: In Function mode, press the *Up* key until "ELEV-FLAP Mix" appears on your screen. This is the elevator-to-flap mix. Press the *CH* key move the cursor to SW:. This allows you to select which switch will be used to turn on/off the elevator-to-flap mixing. Pressing the (+) key will select one of the following switches: MIX = mix switch (located on the back right of the transmitter), FLP-D = flap switch down, FLPU flap switch up, or ON = always on. (See note.) We suggest selecting the mix switch mix so the elevator-to-flap mix can be turned on and off independently of the flaps. After selecting MIX, press the *CH* key to return the cursor to the rate position. With the mix switch in the forward position, hold up elevator and press the (+) key until a 35% value is achieved. Up should result in down flaps. If the flap goes up, reverse the 35% value from a +35 to a -35 using the (-) key. Now hold down elevator with the control stick and press the (+) key until 35% is achieved. The flaps should go up. Reverse the value if necessary until up elevator gives down flaps and down elevator gives up flaps. Later you can experiment with more or less flap throw by changing this value. 35% is a good, safe place to start.



Step 11. Aileron-to-flap mixing: Press the *Up* key until the "AILE-FLAP Mix" screen appears. Press the *CH* key to move the cursor to the "SW:" position. The "SW:" allows you to select which switch is used to turn on/off the aileron-to-flap mix. Pressing the (+) key will select one of the following switches: MIX = mix switch located on the back right of the transmitter, FLP-D = flap switch down, F-U&D = flap switch up and down, and ON = always on. (See note.)

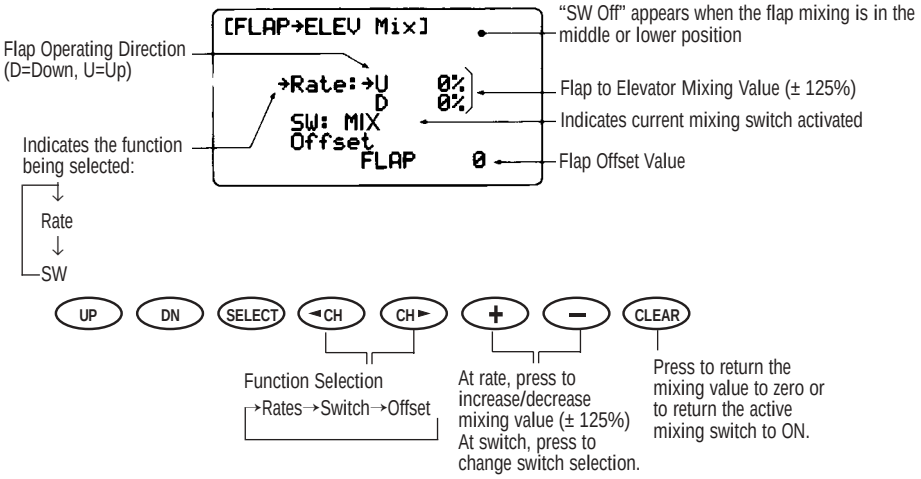
We recommended putting the aileron-to-flap mix on the mix switch so the mix can be turned off independently from the flaps. After selecting "MIX," press the *CH* key to return the cursor to the "Rate" position. Now press the (+) key until +100% value is reached. Now the flaps should move in unison in the same direction with the ailerons. If they move in opposite directions, press the (-) key until a -100% value is reached.

Step 12. Setting up Crow: Crow will be assigned to the flap switch and will be activated when the switch is in the down position. We've already set the flaps to the proper down position in Step 8 travel adjust. Now we need to add the ailerons up 3/4" and the elevator down 1/4".



Step 13. Flap-to-aileron mixing: Press the *Up* key until the mix "FLAP-AILE" screen appears. Now press the *CH* key to move the cursor to the SW: position (flap-to-aileron switch selection). Press the (+) key until "FLP-D" (flap down) appears in the screen. Now press the *CH* key twice to return the cursor to the RATE position. Move the flap switch to the down position. Next press the (+) key until both the ailerons go up 3/4". If the ailerons go down, press the (-) key.

Note: The flap switch must be in the down position to change the rate value.

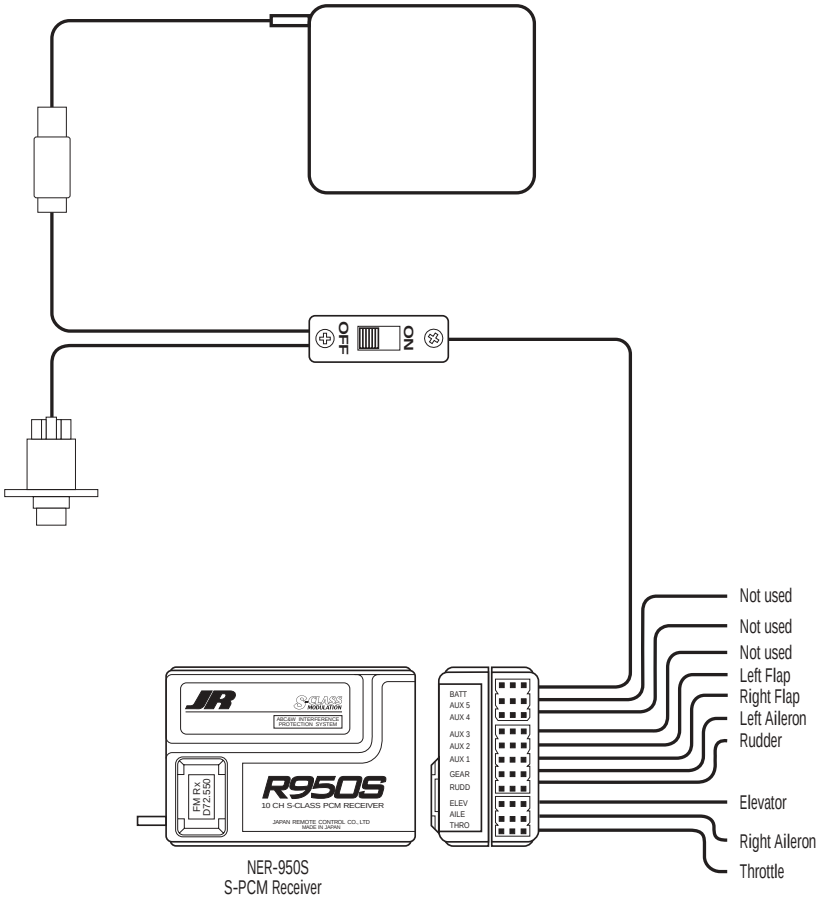


Step 14. Flap-to-elevator mixing: In Function mode, press the *Up* key until the mix "FLAP-ELEV" appears on the screen. Next press the *CH* key to move the cursor to the SW (flap-to-elevator switch selection) position. Press the (+) key until the "FLP-D" (flap down) appears on the screen. Now press the *CH* key to return the cursor to the "Rate" position. With the flap switch in the down position, press the (+) key until the elevator comes down 1/4". If the elevator goes up, use the (-) key to reverse this.

Programming Guide — JR™ XP8103

Programming your JR10X, 10SXII or 10SX in 11 Easy Steps

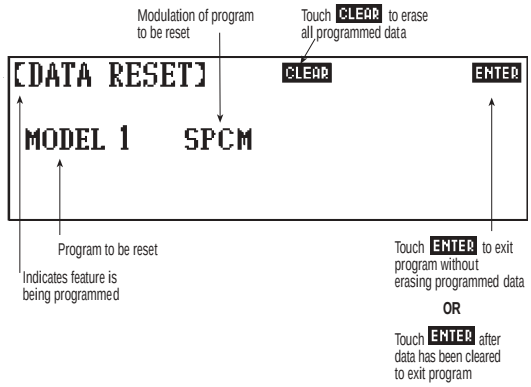
JR's 10X, 10SxII and 10Sx feature many of the same base-level programming features, making programming and setting up the quad-flap function on these radios identical. First, it's important to plug each servo into the correct port in the receiver.

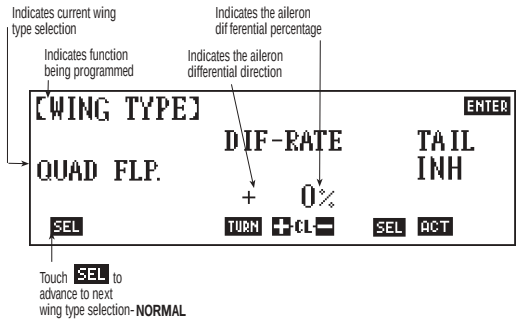


NER-950S
S-PCM Receiver

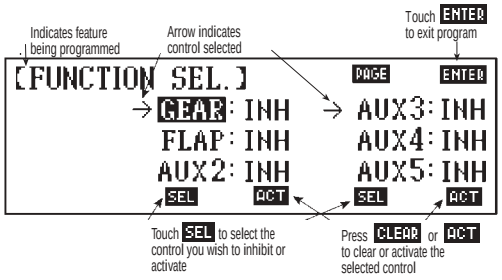
Note: When setting up a new aircraft, it's important to reset the programming to the factory defaults.

Step 1. Data Reset, Code 28: Enter Code 28 and press the *Clear* key to reset the programming to factory default settings. (The 10X will require you to verify that you want to reset with a yes or no — press YES).

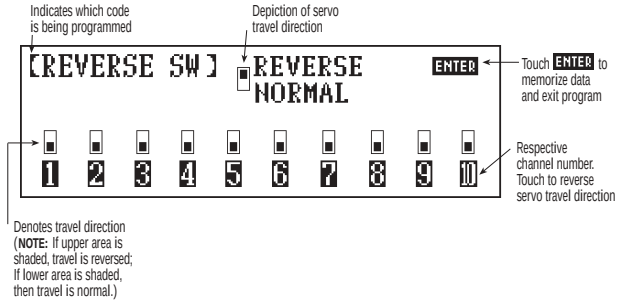




Step 2. Wing Type, Code 22: Enter Code 22 and below normal press the *SEL* key until QUAD.FLP appears. Press *Enter* to return to the Function mode screen.

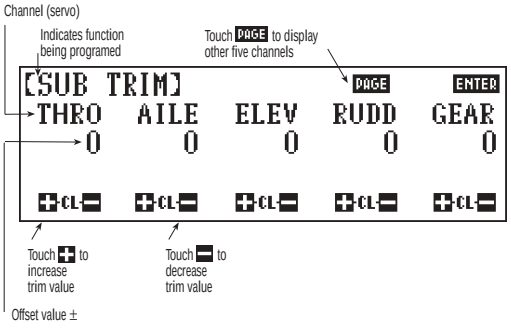


Step 3. Turn off unused channels, Code 17: Enter Code 17 and inhibit channels 5 through 10 by pressing the *SEL* key to select each channel, then press the *Clear* key to inhibit each channel.

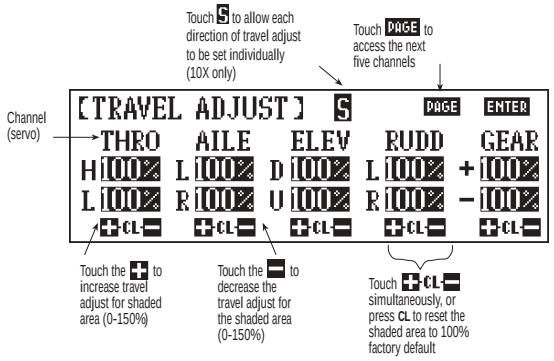


Step 4. Set the servo reversing, Code 11: Enter Code 11 and check that the direction of each servo is moving properly. Reverse any servo as necessary by pressing the numbered key that corresponds with that channel.

1 — Throttle
2 — Right Aileron
3 — Elevator
4 — Rudder
5 — Left Aileron
6 — Right Flap
7 — Left Flap

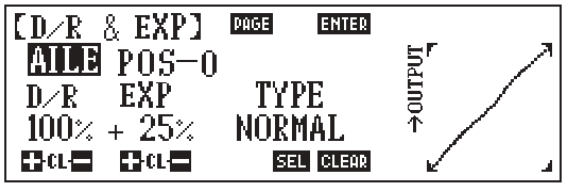


Step 5. Sub-Trims, Code 15: Turn on the transmitter and receiver and center the trims on the transmitter. Reposition any of the control arms as necessary such that the control surfaces are as close to neutral as possible. Now enter "Code 15, Sub-Trim" and fine adjust each control surface until it's perfectly neutral using the (+) or (-) keys below each corresponding channel. The *Page* key allows access to the other five channels. Pressing *Enter* will return to the Function mode.



Step 6. Travel Adjust, Code 12: Enter Code 12 and adjust the control travels of each control surface to the following using the (+) or (-) key below each channel. Pressing the *PAGE* key will access the other five channels.

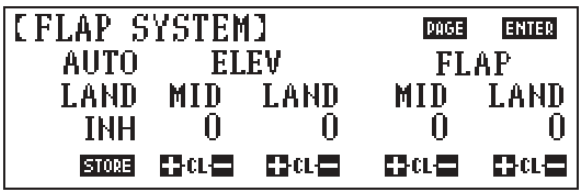
Throttle — Full open to full closed with trim
Aileron — 1 1/4" up, 1 1/4" down
Elevator — 1 1/2" up, 1 1/2" down
Rudder — 4" right, 4" left



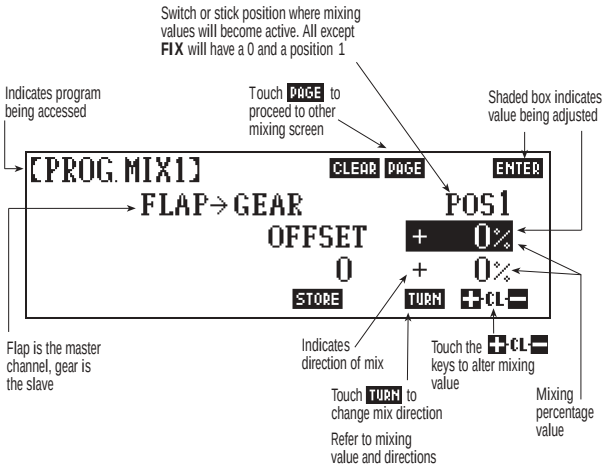
Step 7. Dual Rate and Exponential, Code 13: Enter Code 13. The *Page* key will allow you to select the aileron, elevator and rudder channels while each respective dual rate switch will allow you to select positions 0, 1, or 2 for that channel. Adjust the high rates to 100%, the middle rates to 75% and the low rates to 50% for all three channels. First flights should be made at a low 50% rate.

Exponential is used to reduce the control sensitivity around center while still providing full control authority when the control stick is fully deflected. Because the Ultra Stick™ Lite has large recommended control throws, it's a good idea to give expo a try, even if you've never used it before, to prevent over-controlling. With the PCM-10 channel radios, exponential adjusts exactly like dual rate. Select the desired channel using the *Page* key, then select the switch position using the corresponding dual rate switch, then use the (+) or (-) key to adjust the expo value. We recommend 30% as a good starting point for all channels and positions.

Later you can fine-tune the control feel to your liking after several test flights.

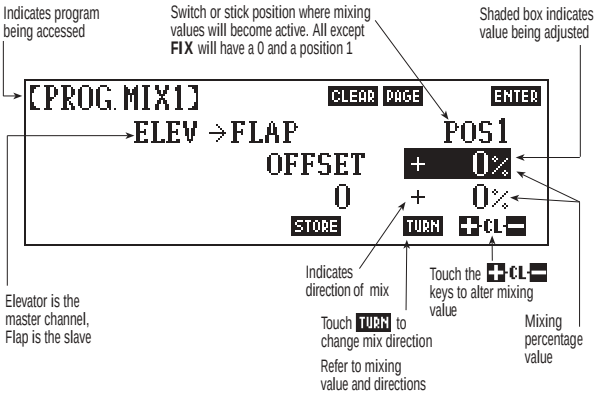


Step 8. Flap System, Code 66: Enter Code 66. Move the flap switch to the mid-position and below the "FLAP MID" on the right side of the screen, press the (-) key until the flap comes down 1 1/2". Next, move the flap switch to the down (land) position and, below the "FLAP LAND" on the right side of the screen, press the (-) key until the flaps come down 1 5/8". With the flap switch still in the down position, press the (+) key below "ELEV LAND" until the elevator comes down 5/8". We have just set up the takeoff flaps (switch in the center position) and the first part of the crow (switch in the lower position).

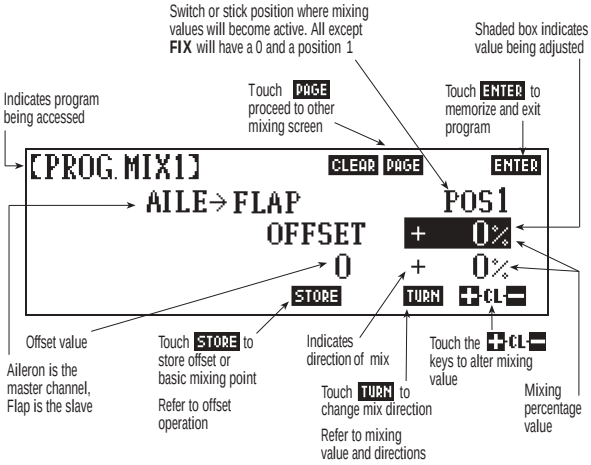


Step 9. Programmable mix for up ailerons in crow, Code 51: We will need to set up a programmable mix to allow the ailerons to move upward when crow is activated. Enter Code 51, Programmable Mix 1. Press the "6" key and then the "5" key at the bottom of the screen to select the FLAP as the master and the GEAR as the slave channels.

Next, press *Enter*. Now press *Page* to access the switch selection screen and press the key below the LD to select the *LAND* switch position to turn on the mix. Press the *Page* key twice to return to the mix screen. Move the flap switch to the lower (LAND) position, then press the (+) key until the ailerons go up 3/4". If the ailerons go down, press the *Turn* key.



Step 10. Programmable mix for elevator-to-flap, Code 52: Enter Code 52, Programmable Mix 2, and press the "3" key and then the "6" key to select the ELEVATOR as master and the FLAPS as slave channels. Press *Enter*, then press the *Page* key to select the switch screen. Below MX press the *SEL* key to select the mix switch to operate the mix. This will allow the elevator-to-flap mix to be turned on/off using the mix switch. Press the *Page* key twice to return to the mix screen. With the mix switch (back right side of transmitter) in the forward position, hold up elevator and press the (+) key until the flaps go down. If the flaps go in the wrong direction, press the *Turn* key. Mixing percentage value of 35% is a good place to start. Now with down elevator, press the (+) key until the flaps go up. Also use 35% as a starting point here. Later you can adjust these values to suit your flying style.



Step 11. Programmable mixing of aileron-to-flaps, Code 53: Enter "Code 53, Programmable Mix 3." Press the "2" key and then the "7" key to mix aileron to AUX 2, then press *Enter.* Press the Page key to access the switch select screen and press the *SEL* key below MX. This will turn on/off the aileron-to-flap mix with the mix switch (located at the back left of the transmitter). Press the *Page* key twice to return to the "Programmable Mix 3" screen. With the mix switch in the forward position, press the (+) key while holding the right aileron control stick until the value reads 100%. If the flap moves opposite the aileron, then press the *Turn* key. Now holding left aileron with the control stick, press the (+) key until 100% is achieved. Press the *Turn* key if necessary.

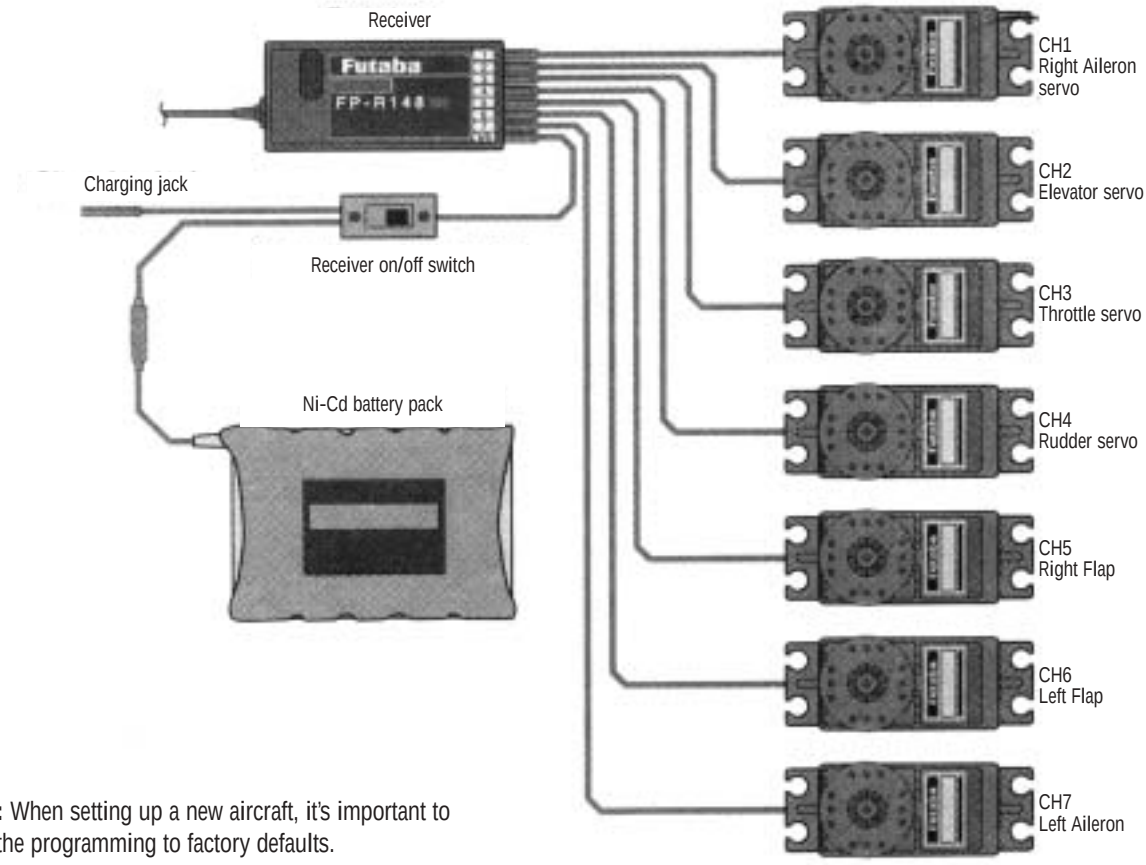
*** Flap Switch**
UP = Normal
MID = Takeoff flaps
DOWN = Crow

*** Mix Switch** = Turns on/off aileron-to-flap and elevator-to-flap mixes

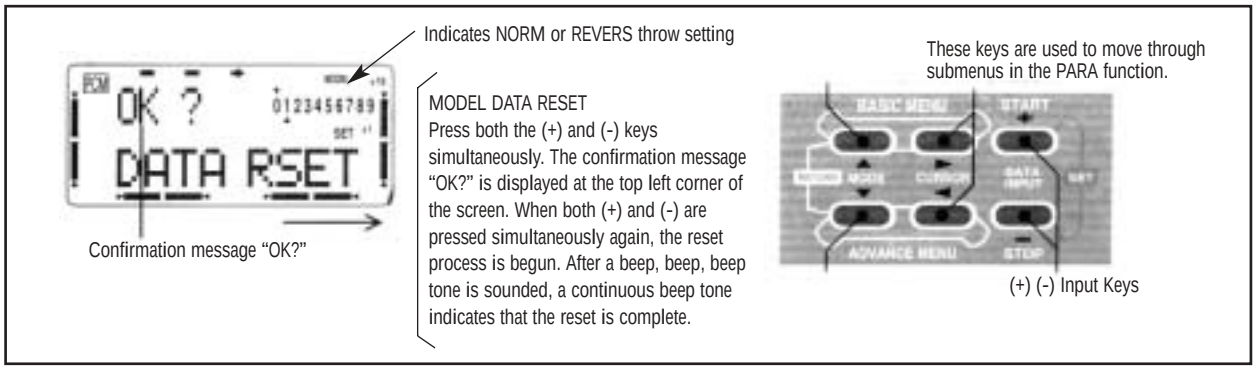
Programming Guide — Futaba 8UA/S

Programming the Futaba 8UA/S in 10 Easy Steps

Before programming your radio, it's important to plug each servo into the correct servo port in the receiver.



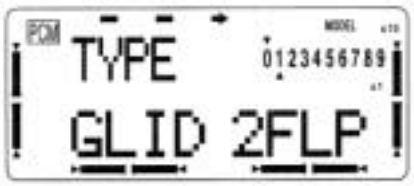
Note: When setting up a new aircraft, it's important to reset the programming to factory defaults.



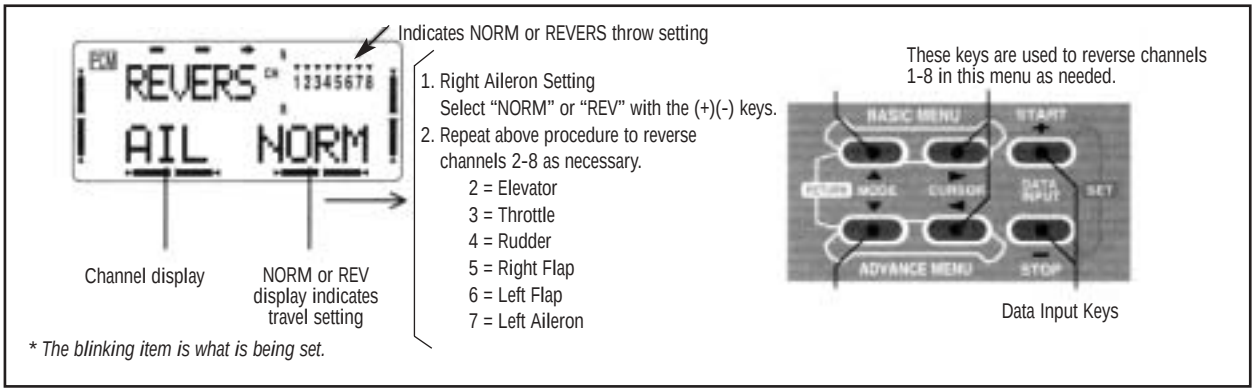
Step 1. Data Reset: Turn on the transmitter and press the two *Basic Menu* keys simultaneously. Now press one of the *Mode* keys to access the "PARA" (parameters) screen. Press the *Cursor* key to select the "DATA RSET" screen. When the "DATA RSET" screen is displayed, pressing the (+) and (-) keys simultaneously will bring up "OK?" on the screen. To reset the memory again, press the (+) and (-) keys simultaneously.

Most of the quad-flap features needed for the Ultra Stick™ Lite are already preprogrammed into the glider software (referred to as GLID 2FLP) included in the Futaba 8UA.

We strongly suggest using the GLID 2FLP model type programming in these radios when setting up quad flaps.

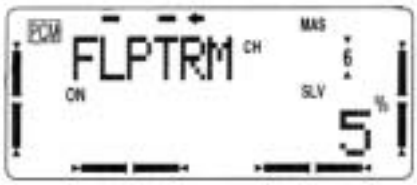


Step 2. Selecting model type (GLID): Press the two *Basic Menu* keys simultaneously to enter the basic programming mode. Now press *Mode* key until "PARA" (parameters) appears on the screen. Press a *Cursor* key until "TYPE" appears on the top of the screen. Next press the (+) button until "GLID 2FLP" is displayed. With "GLID 2FLP" displayed on the screen press the (+) and (-) key simultaneously twice to access the Glider 2 flaps program.

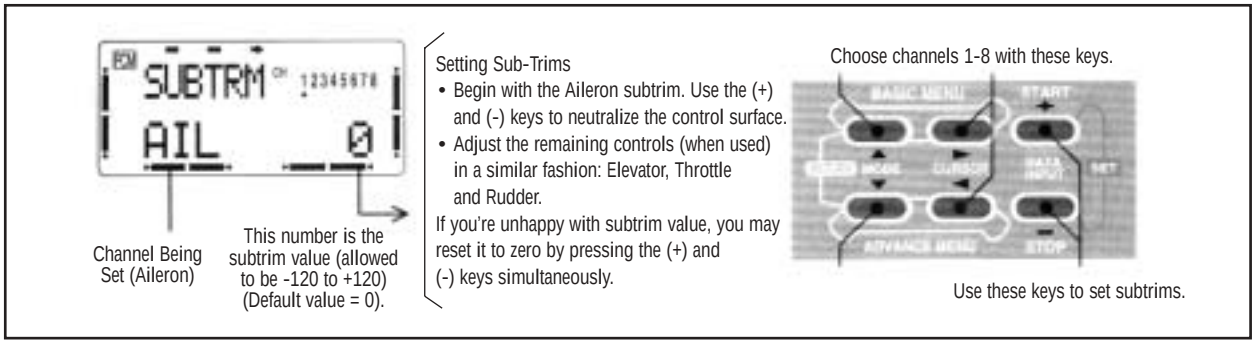


Step 3. Setting the servo reversing: In the BASIC MENU mode, press the *Mode* key until the "REVERS" screen appears. The *Cursor* key allows you to access the different channels, while pressing the (-) key reverses the selected channel (the (+) key changes that channel back to normal). Check that channels are moving in the proper direction and reverse as necessary. Don't worry about the flap direction at this time.

Note: The throttle is referred to as ABK (air brake) in the glider mode and functions normally with the throttle stick and trimmer.



Step 4. Turning off the flap trim knob (Ch. 6): Press the *Advance Menu* keys simultaneously to enter the Advanced Menu mode. Now press the *Mode* key until "FLPTRM" appears on the screen. Press the (+) button to turn on the flap trim function. Now press the *Cursor* so that the +30 value is blinking. Press the (-) key until a "0" appears in the screen.

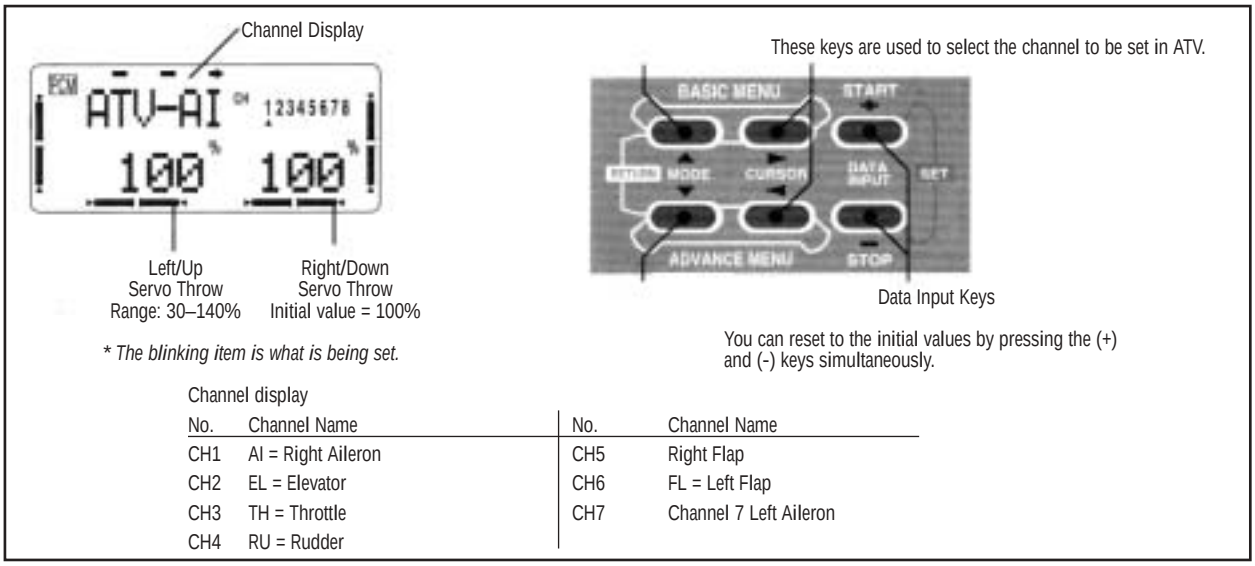


Step 4. Adjusting sub-trims: With the transmitter and receiver turned on and the trims centered on the transmitter, reposition the servo arms as necessary so that all control surfaces are as close to neutral as possible. Now press the two *Basic Menu* keys to enter Basic mode. Press the *Mode* key to access the "SUBTRM" screen. While in the "SUBTRM" screen, pressing the *Cursor* key will scroll through channels and then pressing the (+) or (-) key will adjust the sub-trim values. Adjust the sub-trims for each channel until each control surface is perfectly neutralized.

Note: The throttle channel is referred to as ABK (air brake) in the glider mode and functions normally with the throttle stick and trim.

Step 5. Setting up Crow (also referred to as butterfly): Press the *Advance Menu* keys simultaneously to enter the Advanced Menu mode. Now press the *Mode* key until "BFLY" appears on the screen. Press the (+) key to activate butterfly programming. Next press the *Cursor* to access the AIL function and, with the A switch (top left corner) in the down position, adjust the value using the (+) or (-) key until the ailerons are up 3/4".

Now press the *Cursor* key until the "FLP" appears on the screen and adjust the value using the (+) or (-) key until the left aileron is up 3/4". Now press the *Cursor* key until the "ELE" appears on the screen and adjust the value until the elevator goes down 1/4". Next press the *Cursor* until "FLP" appears on the screen and adjust the value until the flaps go down 1$^{1}/_{2}$". This presets the ailerons, flaps and elevator for Crow and it is activated on switch A.

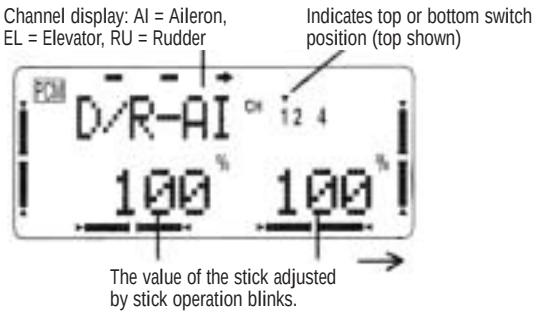


Channel display

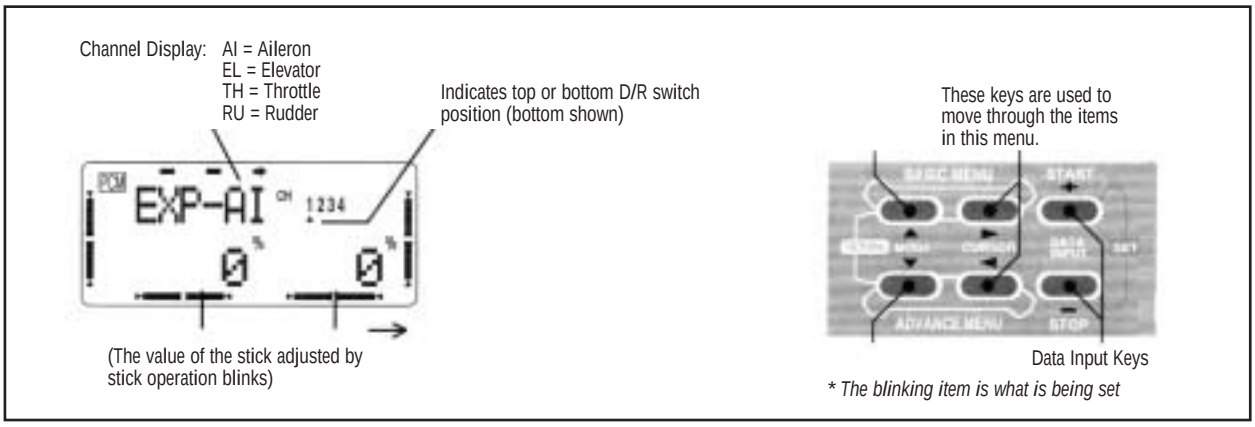
No.	Channel Name	No.	Channel Name
CH1	AI = Right Aileron	CH5	Right Flap
CH2	EL = Elevator	CH6	FL = Left Flap
CH3	TH = Throttle	CH7	Channel 7 Left Aileron
CH4	RU = Rudder		

Step 6. Adjusting the travel volume: Press the two *Basic Menu* keys simultaneously to enter the Basic mode. Now press the *Mode* key until the "ATV" (adjustable travel volume) screen appears. Pressing the *Cursor* key will advance through the channels, while pressing the (+) or (-) key will increase or decrease the travel of that channel. It's necessary to adjust each direction of each channel by moving that selected channels stick in the desired direction. Adjust each channel to the following.

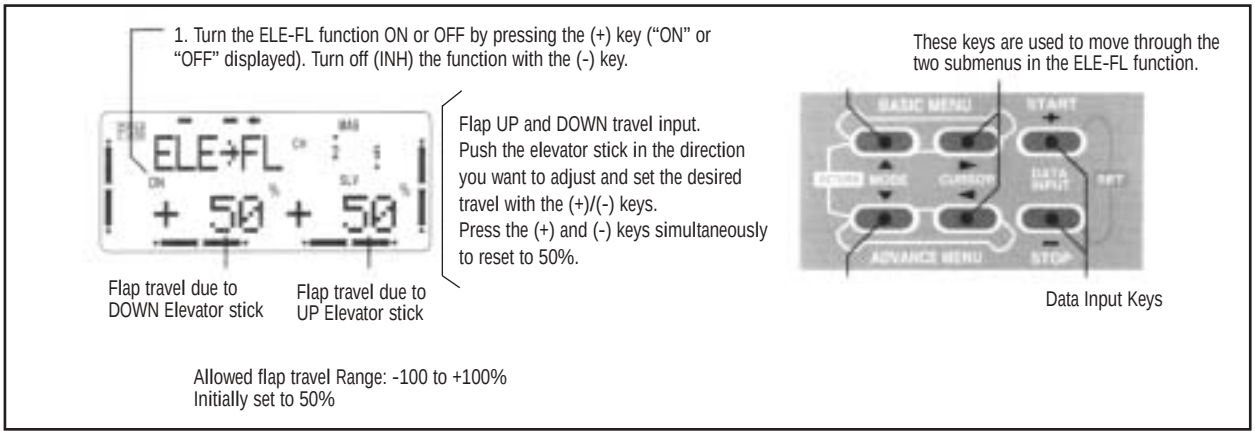
Throttle — Full open to full closes with trim
Aileron — 1¼" up, 1¼" down
Elevator — 1½" up, 1½" down
Rudder — 4" right, 4" left



Step 7. Setting dual rates: In Basic mode press the *Mode* key until the "D/RE" screen appears. This is the dual rate program. Press the *Cursor* to access the aileron, elevator or rudder channels, then press the (+) or (-) key to change the values. Note that two dual values are available by toggling that channel's dual rate switch. On all three channels, high rate should be adjusted to 100%, while low rate should be set at 50%.

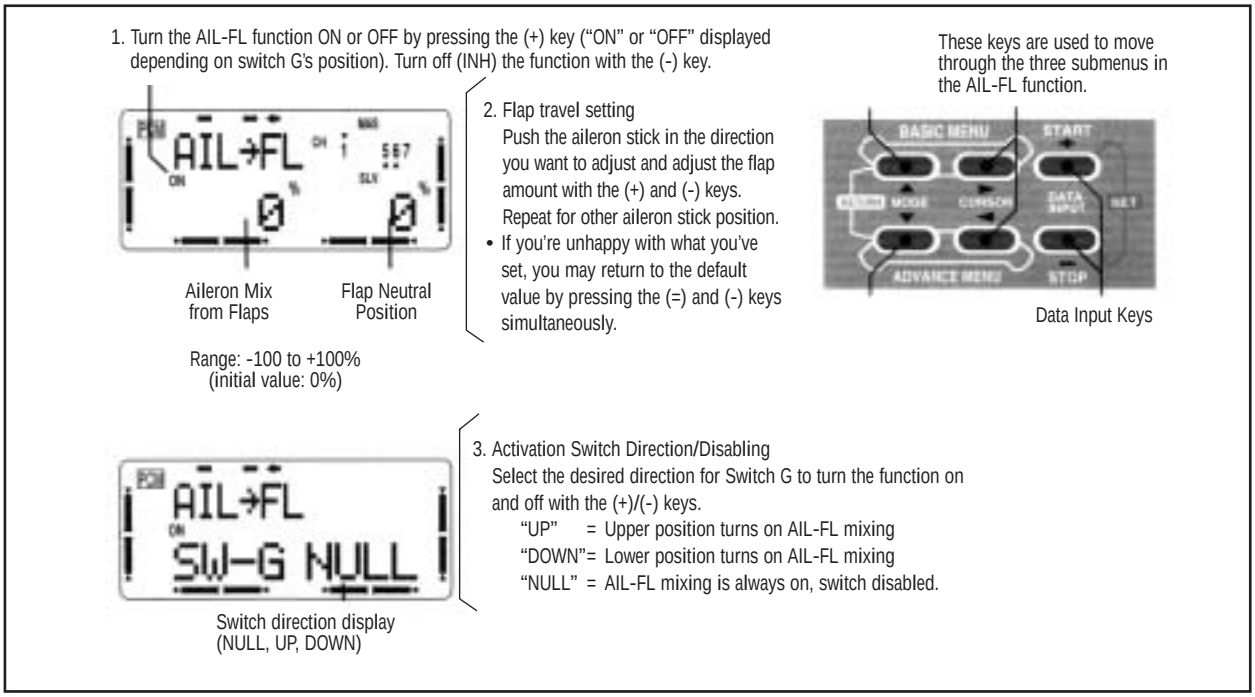


Step 8. Setting the exponential adjustments: Exponential is used to reduce the control sensitivity around center while still providing full control authority when the control stick is full deflected. Because the Ultra Stick™ has large recommended control throws, it's a good idea to give expo a try, even if you've never used it before, to prevent over-controlling. In Basic mode, press the *Mode* key until the "EXP" function appears on the screen. Pressing the *Cursor* key will allow access of the aileron, elevator, rudder and AB (throttle) channels. Toggling the respective dual rate switch will allow one of two expo values to be stored. It's recommended that a -30% expo be programmed for aileron, elevator and rudder as a good starting point. Later after several test flights you can fine-tune the control feel to your liking.



Step 9. Elevator-to-flap mixing: Press the Advance Menu keys simultaneously to access the Advanced Menu mode. Next press the *Mode* key until "ELE-FL" (elevator-to-flaps) appears on the screen. Press the (+) key to activate elevator-to-flaps. With flap switch C in the up position (ELE-FLP), press the *Cursor* key until the value is blinking. Then use the (+) or (-) key while holding the elevator stick in the desired up or down position to change the values so that up elevator gives down flaps and down flaps gives up elevator. A value of 35% in both directions is a good place to start.

Note: If flaps travel in the wrong direction when elevator is applied, reverse the value using the (+) or (-) key.
E.G., +35% to -35%. The ELE-FLP switch is used to turn on/off this function.



Step 10. Aileron-to-flap mixing: In Advanced Menu Mode, press the *Mode* key until the "AIL-FL" screen appears. Next press the + button to activate the aileron-to-flap mixing. Press the *Cursor* so that the 0 value is blinking. Now press the (+) or (-) keys while holding right then left aileron until the flap moves in unison with the ailerons. A starting value of 50% is a good place to start. Now press the *Cursor* key until "SW-E" appears and press the (+) key until "Down" appears on the screen. This assigns the aileron-to-flap mix to the E switch, and it's on when the switch is pulled forward.

Preflight at the Field

Charge both the transmitter and receiver pack for your airplane. Use the recommended charger supplied with your particular radio system, following the instructions provided with the radio. In most cases the radio should be charged the night before going out flying.

Check the radio installation and make sure all the control surfaces are moving correctly (i.e. the correct direction and with the recommended throws). Test run the engine and make sure it transitions smoothly from idle to full throttle and back. Also ensure the engine is tuned according to the manufacturers instructions, and it will run consistently and constantly at full throttle when adjusted.

Check all the control horns, servo horns and clevises to make sure they are secure and in good condition. Replace any items that would be considered questionable. Failure of any of these components in flight would mean the loss of your aircraft.

Adjusting the Engine

☐ **Step 1**

Completely read the instructions included with your engine and follow the recommended break-in procedure.

☐ **Step 2**

At the field, adjust the engine to a slightly rich setting at full throttle and adjust the idle and low-speed needle so that a consistent idle is achieved.

☐ **Step 3**

Before you fly, be sure that your engine idles reliably, transitions and runs at all throttle settings. Only when this is achieved should any plane be considered ready for flight.

Range Testing the Radio

Before each flying session, range-check your radio. This is accomplished by turning on your transmitter with the antenna collapsed. Turn on the radio in your airplane. With your airplane on the ground, you should be able to walk 30 paces away from your airplane and still have complete control of all functions. If not, don't attempt to fly! Have your radio equipment checked out by the manufacturer.

2003 Official AMA National Model Aircraft Safety Code

Effective January 1, 2003
Model Flying MUST be in accordance with this Code in order for AMA Liability Protection to apply.

GENERAL

1) I will not fly my model aircraft in sanctioned events, air shows or model flying demonstrations until it has been proven to be airworthy by having been previously, successfully flight tested.

2) I will not fly my model higher than approximately 400 feet within 3 miles of an airport without notifying the airport operator. I will give right-of-way and avoid flying in the proximity of full-scale aircraft. Where necessary, an observer shall be utilized to supervise flying to avoid having models fly in the proximity of full-scale aircraft.

3) Where established, I will abide by the safety rules for the flying site I use, and I will not willfully and deliberately fly my models in a careless, reckless and/or dangerous manner.

4) The maximum takeoff weight of a model is 55 pounds, except models flown under Experimental Aircraft rules.

5) I will not fly my model unless it is identified with my name and address or AMA number, on or in the model. (This does not apply to models while being flown indoors.)

6) I will not operate models with metal-bladed propellers or with gaseous boosts, in which gases other than air enter their internal combustion engine(s); nor will I operate models with extremely hazardous fuels such as those containing tetranitromethane or hydrazine.

7) I will not operate models with pyrotechnics (any device that explodes, burns, or propels a projectile of any kind) including, but not limited to, rockets, explosive bombs dropped from models, smoke bombs, all explosive gases (such as hydrogen filled balloons), ground mounted devices launching a projectile. The only exceptions permitted are rockets flown in accordance with the National Model Rocketry Safety Code or those permanently attached (as per JATO use); also those items authorized for Air Show Team use as defined by AST Advisory Committee (document available from AMA HQ). In any case, models using rocket motors as a primary means of propulsion are limited to a maximum weight of 3.3 pounds and a G series motor. (A model aircraft is defined as an aircraft with or without engine, not able to carry a human being.)

8) I will not consume alcoholic beverages prior to, nor during, participation in any model operations.

9) Children under 6 years old are only allowed on the flight line as a pilot or while under flight instruction.

RADIO CONTROL

1) I will have completed a successful radio equipment ground range check before the first flight of a new or repaired model.

2) I will not fly my model aircraft in the presence of spectators until I become a qualified flier, unless assisted by an experienced helper.

3) At all flying sites a straight or curved line(s) must be established in front of which all flying takes place with the other side for spectators. Only personnel involved with flying the aircraft are allowed at or in the front of the flight line. Intentional flying behind the flight line is prohibited.

2003 Official AMA National Model Aircraft Safety Code

Continued

4) I will operate my model using only radio control frequencies currently allowed by the Federal Communications Commission. (Only properly licensed Amateurs are authorized to operate equipment on Amateur Band frequencies.)

5) Flying sites separated by three miles or more are considered safe from site-to site interference, even when both sites use the same frequencies. Any circumstances under three miles separation require a frequency management arrangement which may be either an allocation of specific frequencies for each site or testing to determine that freedom from interference exists. Allocation plans or interference test reports shall be signed by the parties involved and provided to AMA Headquarters. Documents of agreement and reports may exist between (1) two or more AMA Chartered Clubs, (2) AMA clubs and individual AMA members not associated with AMA Clubs, or (3) two or more individual AMA members.

6) For Combat, distance between combat engagement line and spectator line will be 500 feet per cubic inch of engine displacement. (Example: .40 engine = 200 feet.); electric motors will be based on equivalent combustion engine size. Additional safety requirements will be per the RC Combat section of the current Competition Regulations.

7) At air shows or model flying demonstrations a single straight line must be established, one side of which is for flying, with the other side for spectators.

8) With the exception of events flown under AMA Competition rules, after launch, except for pilots or helpers being used, no powered model may be flown closer than 25 feet to any person.

9) Under no circumstances may a pilot or other person touch a powered model in flight.

Organized RC Racing Event

10) An RC racing event, whether or not an AMA Rule Book event, is one in which model aircraft compete in flight over a prescribed course with the objective of finishing the course faster to determine the winner.

A. In every organized racing event in which contestants, callers and officials are on the course:

1. All officials, callers and contestants must properly wear helmets, which are OSHA, DOT, ANSI, SNELL or NOCSAE approved or comparable standard while on the racecourse.

2. All officials will be off the course except for the starter and their assistant.

3."On the course" is defined to mean any area beyond the pilot/staging area where actual flying takes place.

B. I will not fly my model aircraft in any organized racing event which does not comply with paragraph A above or which allows models over 20 pounds unless that competition event is AMA sanctioned.

C. Distance from the pylon to the nearest spectator (line) will be in accordance with the current Competition Regulations under the RC Pylon Racing section for the specific event pending two or three pylon course layout.

11) RC Night flying is limited to low performance models (less than 100 mph). The models must be equipped with a lighting system that clearly defines the aircraft's attitude at all times.

MDS' 1.48 Pro is designed to give outrageous performance for 1.20-size airplanes. With an APC of 16x8, the Stick will hover at half throttle. Punching full will cause the Stick to leap vertical like it was shot out of a sling shot!

Other features of the MDS 1.48 include ringed construction for easy start ups and long life, dual ball bearings, and a machined dual needle carburetor. Turning an APC of 16x8 at 9,200 rpm's, our testing proved the 1.48 to be not only powerful, but also easy to start and tune with a great transition and idle.

The quality and performance of the Moki 1.35 is unmatched by any other engine of similar displacement. The smoothness at all speeds is quite remarkable. Idle and throttle transition characteristics are without equal in any other model engine due to the unique fuel metering system in the Moki carburetor.

The Moki 1.35 will handle a wide range of props, and is ideal for high performance aerobatic aircraft. A variety of accessories are available including: remote needle valves, spinner adapter nuts, radial back plate mounts and much more.

Saito's FA-180 engine is fast becoming the pilots choice for powering 1.20 size airplanes. The FA-180 offers a 20% displacement increase over the popular Saito FA-150. What does this mean? How about a 8% power increase over the FA-150 and an awesome 14% power increase over the FA-120. And what's more the FA-180 fits in the 1.20 size mount. So if your old 1.20 just doesn't have what it takes, replacing it with the Saito FA-180 is no problem. Simply put the FA-180 is the most powerful in its class.

Saito's new FA-100 will turn an APC 14 x 8 prop 300 to 700 rpm more than either the Saito .91 or O.S. .91. At only 19.2 ounces (less muffler), it weighs nearly 2 ounces less than the O.S as well! The Saito FA-100 is not just a punched out .91. It features a newly tooled case that shares the mounting dimensions of the O.S. 91. This allows it to be used with the many after-market engine mounts already available to fit this engine.

HANGAR 9®

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