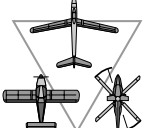
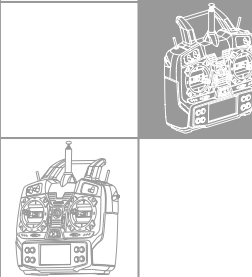




OPTIC 6

6 CH DIGITAL PROPORTIONAL
FM RADIO CONTROL SYSTEM

SYSTEM INSTRUCTION MANUAL



FM/QPCM

- Acro / Glider
- Heli
- Three in One

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Introduction to the Optic System

Congratulations! You now own a Hitec® **Optic**, an extremely versatile radio control system that may be effectively used by both beginning and master pilots. The transmitter may be programmed for aircraft/gliders or helicopters, all with special mixing functions, so it can accommodate many model configurations. You can store programming for **eight** different models in this powerful system! The transmitter will remember all of your settings for each of your different models forever - no backup battery is ever needed. With programmable shift, it can be used with **all** PPM/FM receiver models, even those from other brands! The system pushbuttons allow rapid data input into the easy-to-read LCD display. With its electronic digital trims, you'll never lose your trim positions again, because they stay at the same place you left them for every model stored in memory! You can select the on-off switches for many functions, and you can even assign the throttle to an on-off switch, great for electrics! Standard programming features include servo reversing for all channels, subtrims, end point adjust on all channels, dual rates (with choice of switch), and exponential. Pre-programmed functions and programmable mixers allow you to use the system for any type of model you can imagine. For those learning to fly, the transmitter has "buddy-box" capability, so that you may connect a second Hitec transmitter with an optional trainer cord part #58310 for training by an instructor pilot.

There are two aircraft menu's to choose from:

Aircraft/Glider preprogrammed mixing features include flaperon (dual aileron servos), flap trim, camber control, landing mixing, aileron differential, ailevator (dual elevator servos), V-tail, elevon (for flying-wing models), landing settings, throttle-cut, throttle control select, aileron → rudder mixing, elevator → flap mixing, and crow mixing. Two programmable mixers are also provided for making your own custom functions. The second aileron may be set to plug into channel 5, so you can use the system with ultralight five-channel receivers without any problems!

Helicopter features include five-point pitch and throttle curves, high and low revolution mixing, throttle cut, throttle hold, gyro settings, and rudder → throttle mixing. You may select a conventional swashplate, or if you have a more complex chopper, mixing is provided for the 120° type of three-servo swashplates. Two programmable mixers are also provided for making your own custom functions or for custom compensations. Of course, the Optic helicopter menus have the four helicopter **flight mode** settings found in other radios costing hundreds of dollars more.

About this manual

This manual has been carefully written from scratch to be as helpful to you, the new owner, as possible - it is not just a translation! There are many pages of setup procedures, examples, explanations, and trimming instructions. In order for you to make the best use of your system and to fly safely, please read this manual carefully. If you don't have time to read it thoroughly, at least spend some time browsing through it so that you can see all the features this fine system has to offer and remember them for future use.

Optic System Options:

- 1. Standard Version, Item #158721.** Includes four HS-325HB ball bearing servos, 8 channel Supreme receiver, 600 mAH airborne battery, standard switch harness, and overnight wall charger.
- 2. Airplane Spectra Version, Item # 158722.** Includes Transmitter and Spectra frequency synthesizer module and overnight wall charger.
- 3. QPCM Version, Item # 158724.** Includes four HS-325HB ball-bearing servos, 7-channel QPCM receiver, 600 mAH receiver battery, switch harness, and overnight wall charger.
 - These versions come with the following accessories:
 - 12" (30 cm) servo extension cord
 - Frequency number flag
 - Hardware and mounting package for all the servos
 - Flight preserver" closed-cell foam wrap to protect the receiver from shock and vibration.
 - Warranty card
 - Manual
- 4. Spectra QPCM Transmitter Version, Item # 158725.** Optic transmitter with Spectra Synthesizer Module, 7-channel QPCM receiver and overnight wall charger.

This product is to be used for sport and recreational flying of radio-control models only. Hitec is not responsible for the results of use of this product by the customer or for any alteration of this product, including modification or incorporation into other devices by third parties. Modification will void any warranty and is done at owner's risk. If you have any difficulties, please consult this manual, your hobby dealer, or Hitec (contact information is provided in the rear of this manual). Note the information contained in this manual is subject to change without notice due to possible changes in manufacturing procedures, system software programming, or updates. "Hitec" is a registered trademark of the Hitec RCD, Inc. Disclaimer: This information specific to North American versions of the Optic.

Flying Safety

To ensure your own safety and the safety of others, please observe the following precautions:

Charge the Batteries!

Be sure to recharge the batteries before each flying session. A battery low in charge will soon die, causing loss of control and a crash. Plug in the charger that comes in this system and hook up the transmitter and airborne batteries the day before a planned flying session. Be sure the charger is not turned off by the room's light on-off switch!

When you begin your flying session, reset the transmitter's timer to keep track of how long the system's been used, and monitor the transmitter's voltage display. Quit flying when your transmitter battery level reaches 9.4 volts.

Be careful when you use a field charger on your batteries. A fast-charger may overcharge the batteries, causing overheating and a premature failure. Never charge your transmitter or receiver battery at a rate higher than 2 amps.

Flying field

We recommend that you fly at a recognized model airplane flying field. You can find model clubs and fields by asking the nearest hobby dealer, or contacting the Academy of Model Aeronautics. Always pay particular attention to the flying field's rules, as well as the presence and location of spectators, the wind direction, and any obstacles on the field. Be very careful flying in areas near power lines, tall buildings, or communication facilities as there may be radio interference in their vicinity. If you must fly at a site that is not a club field, be sure there are no other modelers flying within a two-mile range, or you may lose control of your aircraft.

Once you arrive at the flying field...

Before flying, be sure that the frequency you intend to fly with is not in use, and secure any frequency control device (pin, tag, etc.) for that frequency before turning on your transmitter.

Never believe that it's possible to fly two or more models on the same frequency at the same time. Even though there are different types of modulation (AM, PPM or FM, and PCM), only one model may be flown on a single frequency.

When you are ready to fly your model, position the throttle stick or switch to its low speed position, or do whatever is necessary to command your motor NOT to run. Then, you may turn on the transmitter power followed by the receiver power. Use the LOCK function to prevent accidental throttle commands. When you have finished flying, begin by turning off the receiver power, then turn off the transmitter power. If you do not follow these procedures, you may damage your servos or control surfaces, flood your motor, or in the case of electric-powered models, the

motor may unexpectedly turn on and cause a severe injury. Before starting the engine, fully retract the transmitter antenna, power up the transmitter and receiver, and check to be sure that the servos follow the movement of the sticks. If a servo operates abnormally, don't attempt to fly until you determine the cause of the problem. We recommend that you range-check your system before each flying session. Have an observer verify that the system works with the transmitter about 30 paces away with the transmitter antenna collapsed. Finally, before starting the engine, be sure to check that the transmitter model memory is correct for the chosen model.

While you're getting ready to fly, if you place your transmitter on the ground, be sure that the wind won't tip it over. If it is knocked over, the throttle stick may accidentally get moved causing the engine to race unexpectedly, causing damage or injury to anyone nearby.

Before taxiing, be sure to extend the transmitter antenna to its full length. A collapsed antenna will reduce your flying range and may cause a loss of control. It is a good idea to avoid pointing the transmitter antenna directly at the model at all times, since the signal is weakest in that direction.

Finally, don't fly in the rain! Water or moisture may enter the transmitter through the antenna or stick openings and cause erratic operation or loss of control. If you must fly in wet weather during a contest, be sure to protect your transmitter with a plastic bag or waterproof barrier.

Airplane Frequencies

The following frequencies and channel numbers may be used for flying aircraft in the U.S. (this information specific to North American versions of the Optic):

72 MHz band					
Ch.No.	MHz	Ch.No.	MHz	Ch.No.	MHz
11	72.010	24	72.270	37	72.530
12	72.030	25	72.290	38	72.550
13	72.050	26	72.310	39	72.570
14	72.070	27	72.330	40	72.590
15	72.090	28	72.350	41	72.610
16	72.110	29	72.370	42	72.630
17	72.130	30	72.390	43	72.650
18	72.150	31	72.410	44	72.670
19	72.170	32	72.430	45	72.690
20	72.190	33	72.450	46	72.710
21	72.210	34	72.470	47	72.730
22	72.230	35	72.490	48	72.750
23	72.250	36	72.510	49	72.770
				50	72.790
				51	72.810
				52	72.830
				53	72.850
				54	72.870
				55	72.890
				56	72.910
				57	72.930
				58	72.950
				59	72.970
				60	72.990



It is very important to display your transmitters channel number at all times. To install your frequency flag device on your transmitters antenna, slide the appropriate paper numbers into the slots and slip the device onto the transmitters antenna.

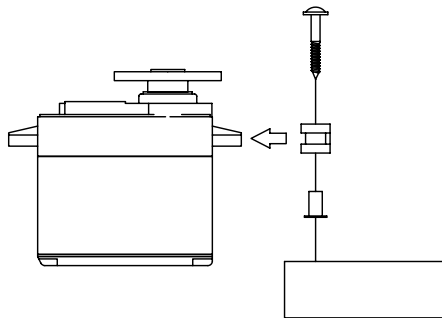
Radio Installation Notes

While you are installing the battery, receiver, and servos into your model's fuselage, please pay attention to the following guidelines:

Notes on Servos

Mounting

When you mount each servo, use the supplied rubber grommets and insert an eyelet up through the bottom. Be sure not to over tighten the screws. If any portion of the servo case directly contacts the fuselage or the servo rails, the rubber grommets will not be able to attenuate vibration, which can lead to mechanical wear and servo failure.



Servo Throw

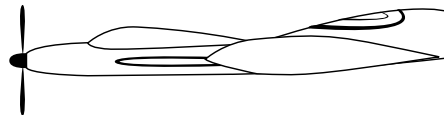
Once you have installed the servos, operate each one over its full travel and check that the pushrod and output arms do not bind or collide with each other, even at extreme trim settings. Check to see that each control linkage does not require undue force to move (if you hear a servo buzzing when there is no transmitter control motion, most likely there is too much friction in the control or pushrod). Even though the servo will tolerate loads like this, they will drain the battery pack much more rapidly.

Switch Harness Installation

When you are ready to install the switch harness, remove the switch cover and use it as a template to cut screw holes and a rectangular hole slightly larger than the full stroke of the switch. Choose a switch location on the opposite side of the fuselage from the engine exhaust, and choose a location where it can't be inadvertently turned on or off during handling or storage. Install the switch so that it moves without restriction and "snaps" from ON to OFF and vice versa.

Receiver Notes

DO NOT cut or coil the receiver antenna wire. It is normal for the receiver antenna to be longer than the fuselage. DO NOT cut it or fold it back on itself - cutting or folding changes the electrical length of the antenna and may reduce range. Secure the antenna to the top of the vertical fin or the tail boom, and let the excess length trail behind the aircraft (be sure it cannot tangle with the tail rotor on a helicopter).



You may run the antenna inside of a non-metallic housing within the fuselage (a plastic outer pushrod housing works well for this), but range may suffer if the antenna is located near metal pushrods or cables. Be sure to perform a range check before flying. With the antenna collapsed, you should be able to walk 20 - 30 paces from the model without losing control or seeing "jitter" in the servos. The range check should be done with the motor running and the model should be securely restrained in case of loss of control.

Radio Installation Notes

Connectors

Be sure the alignment of a servo or battery connector is correct before inserting it into the receiver. To remove a connector from the receiver, try to pull on the connector's plastic housing rather than pulling on the wires. Pulling the wires can ruin the connector pins and break wires.

Using The Aileron Extension

If any of your servos are located too far away to plug directly into the receiver (like the aileron servo), or you need to unplug the servo each time you disassemble the model, use a servo extension cord to extend the length of the servo lead. Additional Hitec extension cords of varying lengths are available from your hobby dealer.

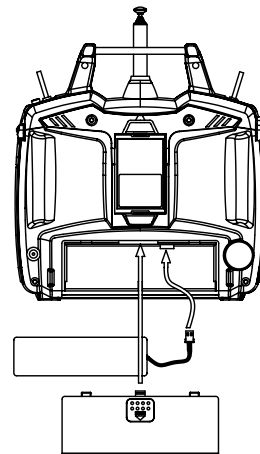
Vibration and Waterproofing

The receiver contains precision electronic parts. Be sure to avoid vibration, shock, and temperature extremes. For protection, wrap the receiver in the provided "Flight Preserver" foam rubber, or use some other vibration-absorbing materials. It's also a good idea to waterproof the receiver by placing it in a plastic bag and securing the open end of the bag with a rubber band before wrapping it with foam. If you accidentally get moisture inside the receiver, you may experience intermittent operation or a crash.

Charging the Optic Ni-Cd Batteries

1. Connect the transmitter charging cord to the transmitter's charging socket (on the rear of the case, left side).
 2. Connect the receiver battery to the receiver connector on the charging cord.
 3. Plug the charger into a wall socket.
 4. The charger's LEDs should light, indicating charging current is flowing. The batteries should be left on charge for about 15 hours. If either light does not turn on, verify that both power switches are OFF. Also be sure the wall switch controlling the room lights does not shut off the charger's electrical outlet when you leave the room.
- Try to charge the batteries with the charger supplied with your system exclusively. The use of a fast-charger may damage the batteries by overheating and dramatically reduce their lifetime.

NOTE: If you need to remove or replace the transmitter battery, do not pull on its wires to remove it. Instead, gently pull on the connector's plastic housing where it plugs in to the transmitter. The battery must be removed to charge it properly with a "peak" charger.



Operating With A Trainer Cord

An optional training cord is available from your dealer. The cord may be used to help a beginning pilot learn to fly easily by allowing a second transmitter, operated by an experienced instructor, to be connected to this system. The instructor may override the beginning pilot at any time to bring the model back under safe control. For training, the transmitter may be connected to another Hitec FM system using the Hitec cord part # 58310.

To use the trainer cord:

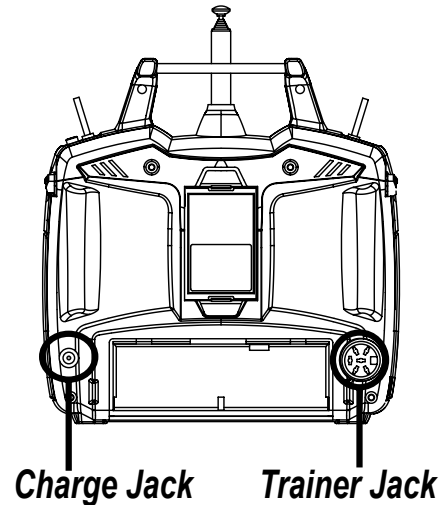
1. Set up both the student's and instructor's transmitters to have identical trim and control motions. If the instructor's

transmitter is on a different frequency than the student's, use the student's as the master transmitter and the other as the student's.

2. Collapse the student's antenna, and fully extend the instructor's antenna. If the student's transmitter has a removable RF module, remove it from the transmitter.
3. The Hitec cord is specifically marked at one end as the "master" the other end as "student". Plug it accordingly into each transmitter, with power switched off. The trainer jack is on the back of the transmitter. Turn the connector until its notches line up and it fits without having to be forced.

Operating With A Trainer Cord

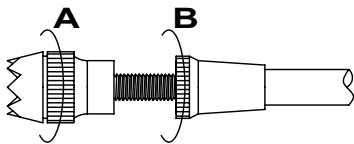
4. Turn on the instructor's transmitter. DO NOT turn on the student transmitter power. Move the controls on the instructor's transmitter, and verify each control moves the proper direction. Now verify that the student's trims and control travels match the instructor's by using the trainer switch (the momentary **Trainer** switch on the top left of the transmitter case) and switching back and forth while leaving the control sticks and trims alone, then moving the control sticks.
5. The instructor's transmitter has normal control over the model unless the trainer switch is pulled, passing control to the student's transmitter. If the student loses control, the instructor can quickly "take over" by releasing the trainer switch and controlling the model.



Other Adjustments

Adjustable length control sticks

You may change the length of the control sticks to make your transmitter more comfortable to hold and operate. To lengthen or shorten your transmitter's sticks, first unlock the stick tip by holding locking piece B and turning stick tip A counterclockwise. Next, move the locking piece B up or down (to lengthen or shorten). When the length feels comfortable, lock the position by turning locking piece B counterclockwise.

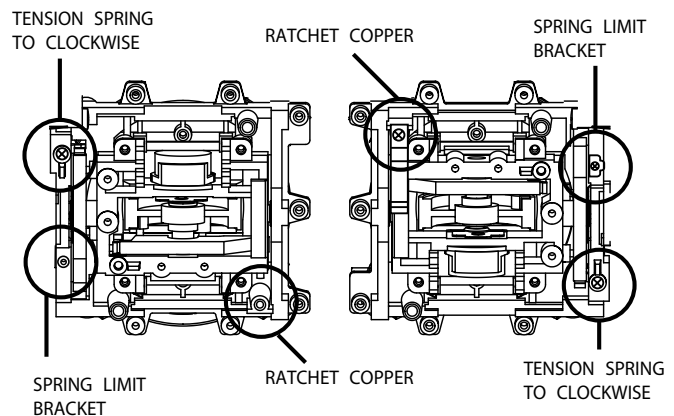


Changing the Optic transmitter's mode

If you wish to change the mode of the transmitter, say from Mode 2 to Mode 1, switch the transmitter on while holding the two EDIT keys down. Then, scroll through the menus using one of the edit keys until you reach the STICK menu. Press one of the cursor keys to switch between Mode 1 and Mode 2.

Stick lever tension adjustment

You may adjust the stick tension of your sticks to provide the "feel" that you like for flying. To adjust your springs, you'll have to remove the rear case of the transmitter. Using a screwdriver, remove the six screws that hold the transmitter's rear cover into position, and put them in a safe place. Unscrew the antenna and set it aside. Now, place some padding under the front of the transmitter and set it face-down on the pad. Gently ease off the transmitter's rear cover. Now you'll see the view shown. Using a small cross-point screwdriver, rotate the adjusting screw for each stick for the desired spring tension. The tension increases when the adjusting screw is turned clockwise, and decreases for counterclockwise motion. When you are satisfied with the spring tensions, you may close the transmitter. Very carefully reinstall the rear cover. When the cover is properly in place, tighten the six screws.



Factory Repair Service Information

Please read the warranty card supplied with your system and return it. Before you decide to have your system repaired, if there is no apparent physical damage, read this instruction manual again and check to be sure that you are operating the system as it was designed to be operated. If you are still having trouble, pack up your system in its original shipping materials and send it to the nearest authorized Hitec R/C Service Center.

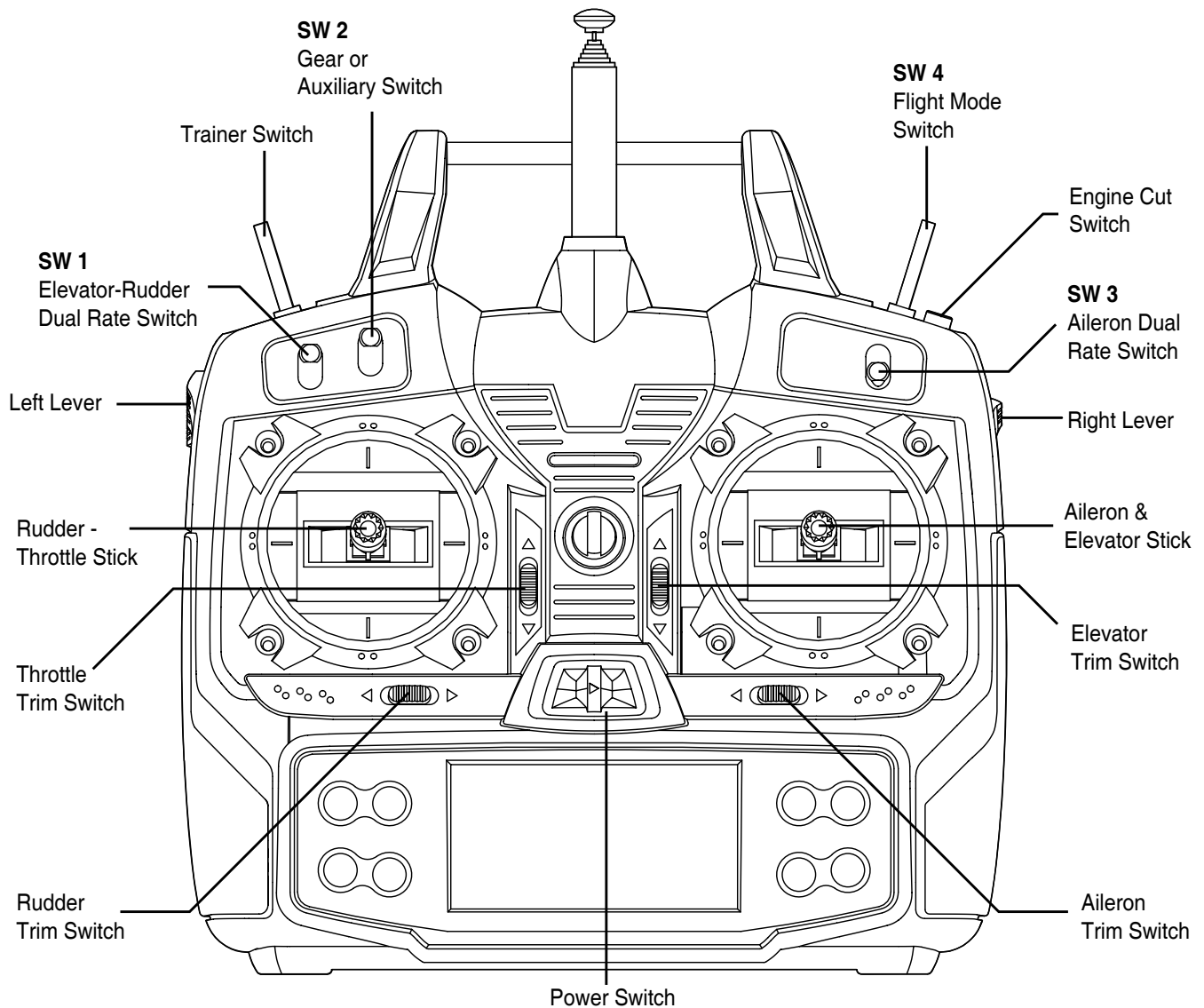
Be sure to include a note in your package that describes the trouble in as much detail as possible, including:

- Symptoms of the problem in as much detail as you can provide, including any unusual mounting conditions or equipment orientation
- A list of items you are sending, and what you want to be repaired.
- Your name, address, and telephone number.

Hitec-RCD, Inc.
12115 Paine St.
Poway, CA 92064
Telephone: 1-858-748-6948
FAX 1-858-748-1767

Web site: <http://www.hitecrd.com>

Optic Controls and Switch Assignments



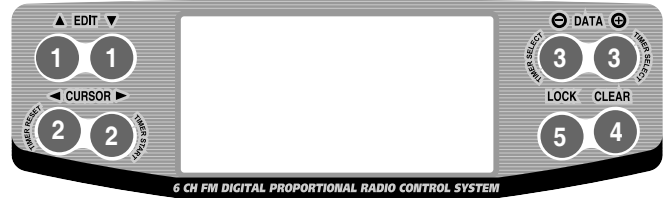
This figure shows the assignments for a **Mode 2** system as supplied by the factory in North America. Note that some of the functions will not operate until activated in the mixing menus.

Transmitter Input Buttons

The buttons are used for different things as follows:

1. The **Edit** buttons allow you to move up and down within the model menus, and move within the regular display.
2. The **Cursor Left/Right** buttons allow you to select options within a particular function, and control the timer function.
3. The **Data +Increase & -Decrease** buttons allow you to increase or decrease the numerical settings for a function
4. The **Clear Active/Inhibit** button resets numbers, and turns functions on and off.
5. The **Lock** button holds the throttle channel fixed while other channels still respond to the transmitter.

You'll learn how to use these buttons in the setup sections that follow.



Receiver - Servo Connection List

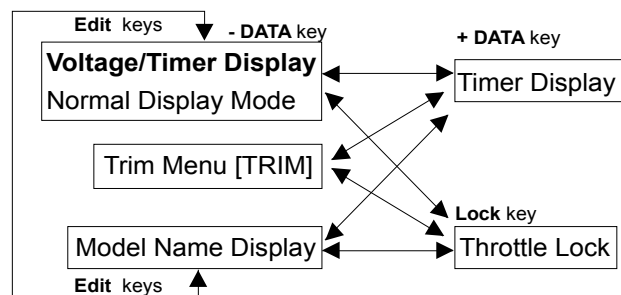
The table below shows the hookups that should be used for each of the model types. Note that some functions shown will not operate until they are activated in the transmitter.

Receiver channel	Aircraft Glider (ACGL)	Helicopter (HELI)
1	Aileron or Right flaperon (FLPN on) or Right elevon (ELVN on) or Right aileron (ADIF on)	Aileron (or Roll Cyclic) or Swash servo 1 (120')
2	Elevator or V-tail right side (VTAL on) or Left Elevon (ELVN on) or Right elevator (AILV on)	Elevator (or Pitch Cyclic) or Swash servo 2 (120')
3	Throttle (controlled by throttle stick or Switch 01)	Throttle
4	Rudder or V-tail left side (VTAL on)	Rudder (Or Yaw control through the gyro)
5	Landing gear (controlled by Gear/Aux switch) or Left aileron (ADIF on) or Left elevator (AILV on)	Gyro sensitivity (values set in GYRO menu)
6	Flap (travel controlled by VR-L and neutral set by VR-R) or Left flaperon (FLPN on)	Pitch (or Collective) or Swash servo 3 (120')

The servo response varies with the selected function. Standard options are shown first.

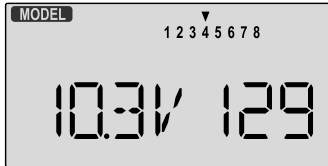
Transmitter Displays and Messages

When you first turn on your transmitter, the first screen shown below appears on the LCD display. Before flying, or even starting the engine, **BE SURE that the model number appearing in the upper right of the display matches the model that you are about to fly!** If you don't, reversed servos and incorrect trims will lead to an immediate crash. You can scroll up and down through the startup screen by pressing one of the two **Edit** keys (the two keys on the far left). If you press timer or engine cut or lock keys, you go directly to those functions regardless of the display.

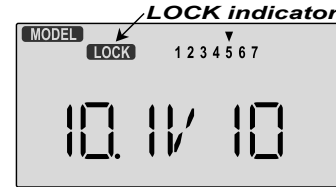


Transmitter Displays and Messages

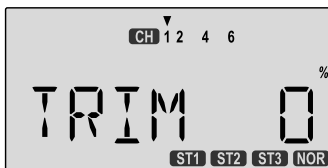
This screen appears at startup. The model memory number is shown by the small down-arrow. Battery voltage is shown in the bottom left, and operating time is on the lower right. You can reset the operating time display by hitting the **Clear** button (the one on the farthest right). Do this after each charge to keep track of your operating time on a single charge.



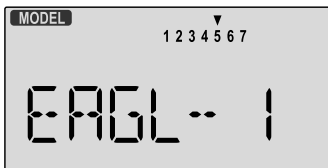
Pressing the **Lock** button locks the throttle servo and holds it where you last commanded it. This is a safety feature to be used when you are carrying the model and transmitter to ensure you don't accidentally give throttle. The **LOCK** indicator shows when the Lock switch has been engaged.



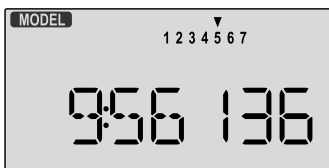
Pressing the **Up** button gives the **Trim** display (different numbers may appear depending on the model type). To see where the trim for a certain channel is, you have to move it! Be sure to move it back to where it was. Note that the CH3 trim only moves downward, so if you need more engine RPM, set up idle with the trim at -25% so you can increase it if needed.



Pressing the **Up** button again gives the **Model Name** display. If you've named your model, it will appear here so you can be sure you have recalled the correct memory. If you do not name the model, you'll have to remember which model memory it's stored within by the memory number.



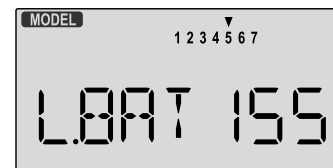
Pressing the **Right** button gives the **Timer** display, with a stopwatch display on the left, and operating time on the right. This also starts the timer, so hit the **Right** key again to stop it. Hitting the **Cursor Left (Off)** button resets the timer.



Warning Displays

The **LOW BATTERY** warning is displayed when the transmitter battery voltage drops below 9.3 volts, and a beeper sounds. The operating time is still shown on the right. If you reset this each time you charge the system, you will have a good idea of how long you can safely operate.

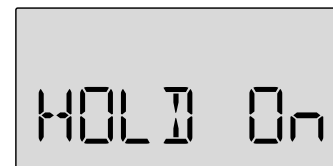
WHEN THE BEEPER SOUNDS, LAND YOUR MODEL AS SOON AS POSSIBLE BEFORE LOSS OF CONTROL DUE TO A DEAD TRANSMITTER BATTERY.



The **IDLE ON** warning is displayed when the transmitter is powered up with the Idle switch on in the helicopter mode only. You can turn this off by moving the **Flt. Mode** (SW-4) switch FORWARD. For your safety, the transmitter will not broadcast until this alarm is ended



The **HOLD ON** warning is displayed when the transmitter is powered up with the Throttle hold switch (SW-1) on in the helicopter mode only. You can turn this off by moving the **SW-1** switch AFT (ELEV RUDD D/R switch). If you then get the **IDLE ON** alarm (see above), you must move the **Flt. Mode** switch fully FORWARD. For your safety, the transmitter will not broadcast until this alarm is ended.



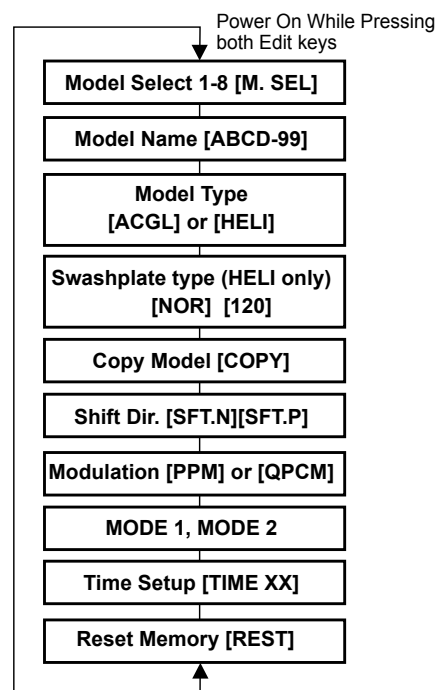
Model Setup Functions

This section describes the **model setup functions** that are used to choose all of the operating features of a particular model memory. These functions are used to select the model memory, the model type (from airplane/glider, and helicopters), set the stopwatch, and other useful functions. These functions are used to set up a new model or a new model memory, to switch between memories, and to change transmit shift..

Map of Basic Menu Functions

(see right)

M.SEL	Model select: choose one of eight model memories	11
****	Model Name (four letters + up to three numbers)	13
ACGL	Acrobatic/Glider model mode	12
HELI	Helicopter model mode	12
NOR	Normal swashplate (HELI only)	12
120°	120° Swashplate (HELI only)	11
COPY	Data Copy	13
SFT.N	Negative Transmit Shift	13
SFT.P	Positive Transmit Shift	13
PPM	PPM or QPCM Modulation	14
QPCM	PCM Modulation	14
STCK1	Transmitter mode 1	7
STCK2	Transmitter mode 2	7
TIME	Timer setup	14
REST	Reset Memory	14



M.SEL - Model Select

Your Optic system can store up to **eight** independent sets of model data in its memory. The Model Select (**MODL**) function allows you to choose from any of the eight sets of model data. You can assign a four-character name and three numerals from 0-199 to each model memory.

The model names are not visible when you wish to switch memories. There are several ways to keep track of which model is in each memory. You may attach a small piece of white tape to the transmitter and write the model's name along with the model setup number (and its channel number), or you may use a notebook, or label the model with its memory number prominently near its on-off switch inside the fuselage.

Choosing a model memory to load

1. Start with the transmitter switched off.
2. Turn on your transmitter while pressing both of the two **Edit** keys (the two keys on the far left). This gets you into the model select (**M.SEL**) menu



3. Select the desired model number by pressing the **Cursor Right** or **Left** button. At this time, the small arrow above the selected model number will blink on and off.
4. Switch power off.
5. Switch power back on. The previously-selected model number is indicated by the arrow above the model numbers in the display.

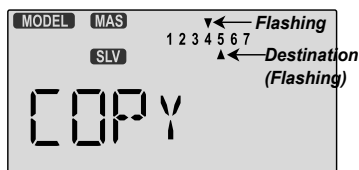
COPY - Copy Model

The **COPY** function is used to copy the model data stored in the current model memory into another model memory. This function is handy to use to start a new model that's similar to one you have already programmed, and is also handy for copying the current model data into another model memory as a backup.

Copying from one model memory to another

1. With the transmitter switched off, turn on your transmitter while pressing both of the two **Edit** keys (the two keys on the far left). The model select (**M.SEL**) menu will be displayed.
2. Press the Up arrow key. This gets you into the model copy (**COPY**) menu. (If you're already in the setup menus, you can just press the **UP** or **Down** arrow key to get here.)

Model Setup Functions



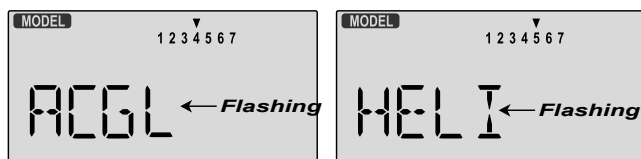
- The source model memory (the memory that will be duplicated) is the current one, indicated by the fixed upper arrow. To select your destination model number, press the **Left** or **Right** Cursor keys. The selected destination memory number is shown by the flashing triangle under it.
- Press the **+Increase** and **-Decrease** Data keys at the same time. The transmitter beeps twice rapidly, indicating the copy has been completed.
- Switch power off.
- Switch power back on. If you wish to go to the newly-saved memory, repeat step 1.

ACGL, HELI - Model Type Select

This function is used to select the **type** of model to be programmed in the current model memory. You may select from aircraft/glider (**ACGL**) and helicopters (**HELI**). If you select a helicopter type, you will need to set the swash type. These settings are covered below.

Selecting the Model Type

- With the transmitter switched off, turn on your transmitter while pressing both of the two **Edit** keys (the two keys on the far left). The model select (**M.SEL**) menu will be displayed.
- Press the **Down** arrow key. This gets you into the type select menu. The current model type will be flashing on and off. (If you're already in the setup menus, you can just press the **Up** or **Down** arrow key to get here.)



- If the model type you want is displayed, you're done. [If you wish to change the swash type in the **HELI** model settings, see the sections below.]
- If you wish to change the model type from that displayed, press on the **Left** or **Right** Cursor buttons until the model type you want, either **ACGL** or **HELI**, appears.
- To select your desired model type, press both the **+Increase** and **-Decrease** Data keys simultaneously. Two beeps tell you that the new model type is now registered. **THIS WILL ERASE ALL THE OLD SETTINGS IN THE MODEL MEMORY, SO BE SURE YOU'RE IN THE CORRECT MODEL MEMORY BEFORE YOU CHANGE MODEL TYPE!**

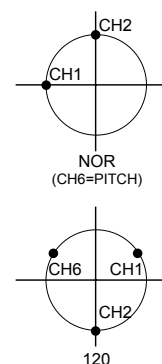
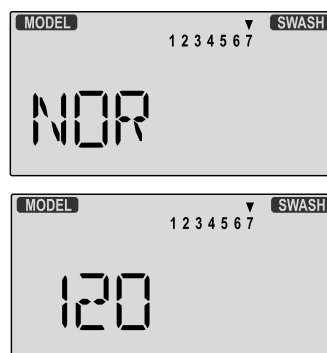
- If you've selected the **HELI** menu, go to the Swash select menu (see below) and choose the swash type for your model.
- Press the **Up** or **Down** arrow keys to get to another setup menu, or switch power off.
- Switch power back on. You may now set up the details of your model in the **Edit** mode.

Swashplate Type Selection

If you are using the helicopter (**HELI**) setting menu, you must tell the Optic system what type of swashplate your model uses. Helicopters may have one servo each for pitch, aileron, and elevator (**NOR**) or they may use three servos in concert on the swash to provide these functions (**120°**). If you are not sure about your swash type, please consult your model's instructions. Note that this menu will not be available unless you have selected the **HELI** model type

Selecting the Swashplate Type

- Select the **HELI** model type in the Model Type Select menus (see above).
- With the transmitter switched off, turn on your transmitter while pressing both of the two **Edit** keys (the two keys on the far left). The model select (**M.SEL**) menu will be displayed.
- Press the **Up** or **Down** arrow keys:
If you're in **HELI** mode, **SWASH** will be highlighted and you can select from two swashplate types: **NOR** and **120°**:



- If the swash type displayed is correct, go on to the next step. If you wish to change the swashplate type from that displayed, press on the **Left** or **Right** Cursor buttons until the swash type you want appears. **CAUTION:** if you change types, you may lose settings in the menus.
- Press the **Up** or **Down** arrow keys to get to another setup menu, or switch power off.
- Switch power back on. You may now set up the details of your model in the **Edit** mode.

Model Setup Functions

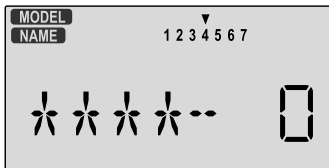
Model Name

The **Model Name** function is used to create an alpha-numeric name which is stored in the model memory along with the rest of the model settings. You will find it useful to help keep track of multiple models that are stored in your Optic system.

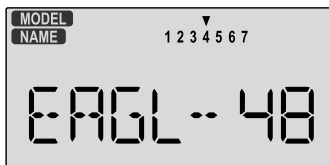
The model name can be four alphabetic characters, along with up to three numbers, 0-199. The letters may be used to abbreviate the model's name, and the numbers may be used for the memory number, or you may wish to store that model's channel number so you can remember it easier.

Inputting a Model Name

1. With the transmitter switched off, turn on your transmitter while pressing both of the two **Edit** keys (the two keys on the far left). The model select (**M.SEL**) menu will be displayed, with "the model type" to represent letters to be chosen.



2. Press the **Up** or **Down** arrow key until you get into the model name menu. You'll see the display as shown to the right, with the MODEL and NAME indicators in the upper left on. The first character of the name will be flashing on and off. (If you're already in the setup menus, you can just press the **Up** or **Down** arrow key to get here.)
3. To change the first character, press the **+Increase** and **-Decrease Data** keys until you see the character you desire. You may select from the upper case letters A - Z, *, +, -, /, and the numbers 0 - 9.
4. Press the **Right Cursor** key to move to the next character.
5. Press the **+Increase** and **-Decrease Data** keys until you see the character you desire.
6. Repeat the previous two steps to input the third and fourth characters of the display.
7. Press the **Right Cursor** key to move to the number displays on the right.
8. Press the **+Increase** and **-Decrease Data** keys until you get to a number that you like. This can be any number from 0 to 199. If you have lots of models with different frequencies, you may wish to input your channel number here.



9. Press the **Up** or **Down** arrow keys to get to another setup menu, or switch power off.

10. Switch power back on. You may now set up the details of your model in the **Edit** mode.

Transmit Shift - SFT.N, SFT.P

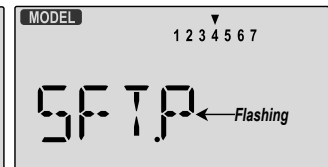
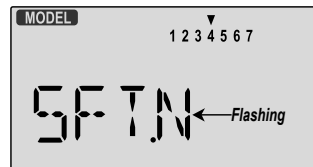
The **Transmit Shift** function is used to change the shift direction of the Optic system. Hitec receivers use a negative shift direction for their transmissions. However, some other brands of RC gear use positive shifting. With this menu, you can change the way your transmitter broadcasts, so that it can address **all types** of PPM receivers. (PPM receivers are also referred to as "FM" receivers.) As shown later, the Optic FM is also compatible with Hitec QPCM receivers. Hitec/RCD™ and Futaba™ receivers use negative shift (**N**), where Multiplex™, JR™ and Airtronics™ use positive shift (**P**)

If you choose the wrong shift direction for your receiver, **the servos may move erratically and will not respond to the transmitter**, even if it is on the correct frequency. Turn off your receiver at once and change the shift direction to preclude damage to your servos.

If you use a mixture of receiver brands, sure that each model is correctly set for the model of receiver you are using in the corresponding model memory.

Changing the Frequency Shift

1. With the transmitter switched off, turn on your transmitter while pressing both of the two **Edit** keys (the two keys on the far left). The model select (**M.SEL**) menu will be displayed.
2. Press the **Up** or **Down Edit** key until you get into the shift menu. You'll see either the word **SFT.N** or **SFT.P**, with the last character, **N** or **P**, flashing on and off. (If you're already in the setup menus, you can just press the **Up** or **Down** arrow key to get here.)



3. **N** represents negative shift and will work with Hitec™ and Futaba™. **P** represents positive shift and will work with Multiplex™, JR™ and Airtronics™ brands.
4. To change the shift direction from what is shown, press either the **Left** or **Right Cursor** key one time. This will change the display from **P** to **N** or **N** to **P**.
5. Press the **Up** or **Down** arrow keys to get to another setup menu, or switch power off.

Model Setup Functions

Modulation - PPM, QPCM

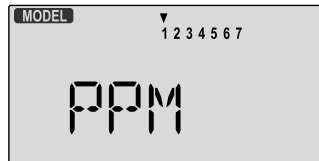
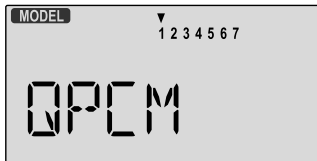
The **Modulation** function is used to choose what type of receiver you will be using with your Optic system. Hitec has two types of receivers, PPM and QPCM. PPM receivers are also referred to as "FM" receivers. QPCM receivers offer you the option of failsafe which will hold the last set of positions received before the interference, or allow you to choose what positions the servos will move to if the signal is lost or interfered.

Failsafe will only work with Hitec QPCM receivers.

You can have a mixture of QPCM and PPM receivers, and the Optic transmitter will remember which type of modulation you are using for each separate model memory.

Changing the Modulation

1. With the transmitter switched off, turn on your transmitter while pressing both of the two **Edit** keys (the two keys on the far left). The model select (**M.SEL**) menu will be displayed.
2. Press the **Up** or **Down Edit** key until you get into the Modulation menu. You'll see either the flashing word **PPM** or **QPCM**. (If you're already in the setup menus, you can just press the **Up** or **Down** arrow key to get here.)



3. **PPM** is also known as "FM" and will work with Hitec and other receivers that are not PCM. **QPCM** represents pulse-code modulation and will only work Hitec QPCM receivers.
4. To input your choice, press either the **Left** or **Right Cursor** key one time. This will change the display from **PPM** to **QPCM** or vice versa.
5. Press the **Up** or **Down** arrow keys to get to another setup menu, or switch power off. This setting will be remembered in the current model memory only.

TIME -Timer Function Setup

Your **Optic** system contains TWO special timer functions, helpful for keeping track of flight duration, engine run time, or other things that need to be monitored during flight. You can set up the timers to count down from anywhere from 0 to 60 minutes. (In addition, the Optic has an "elapsed time" counter that continuously records how long the transmitter has been operating.)

If you select a time from 1 to 60 minutes, the timer will count down the number of minutes selected when you first press the **Right Cursor** button. You may stop it at any time by pressing the **Right Cursor** button a second time. Beginning the last 10 seconds of the selected time, the system will beep every

second to tell you the time has elapsed.

If you wish to reset the timer, just press the **Left Cursor** button. You may then press the **Right Cursor** button to reset it and count down again, whenever you like.

The above instructions apply to both of the Optic's timers.

Setting up the Optic's Two Timers

1. With the transmitter switched off, turn on your transmitter while pressing both of the two **Edit** keys (the two keys on the far left). The model select (**M.SEL**) menu will be displayed.
2. Press the **Up** or **Down EDIT** arrow key until you get into the Timer (**TIME**) menu (if you're already in the setup menus, you can just press the **Up** or **Down** arrow key to get here). You'll see a display with the word "**TIME**." The numbers **1** and **2** are shown; the small triangle indicates whether you are setting Timer 1 or Timer 2.



3. To change the number of minutes shown, press the **+** Increase and **-Decrease Data** keys until you see the amount you desire. You may select from 1 to 60 minutes.
4. Press the **Left** or **Right CURSOR** key to get to the other timer setup menu. Repeat instruction 3 for the second timer if desired.
5. Press the **Up** or **Down** arrow keys to get to another setup menu, or switch power off.
6. Switch power back on. You can view, start, and stop either of the two timers by pressing either **DATA** key. Press the **Right Cursor** button to start the timer, press the **Right Cursor** button a second time to stop it, and press the **Left Cursor** button to reset the timer.

REST - Data Reset

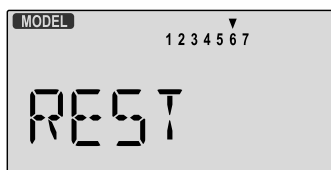
The Reset function is used to clear out an existing set of model data within a single model memory, the one currently selected. This function resets all data to initial values, and may be used to get a "fresh start" so that you may begin with a clear memory before you input new model settings into a memory that had been used for another model. A safety feature allows you to verify "that you wish to reset" before all data is lost.

Resetting the memory

1. With the transmitter switched off, turn on your transmitter while pressing both of the two **Edit** keys (the two keys on the far left). The model select (**M.SEL**) menu will be displayed.
2. Press the **Up** or **Down** arrow key until you get into the Reset (**REST**) menu. This display has the word "**REST**" flashing on

Model Setup Functions

and off. (If you're already in the setup menus, you can just press the **Up** or **Down** arrow key to get here.)



3. IF YOU ARE SURE YOU WANT TO RESET and clear out the current model memory, press both the **+Increase** and **-Decrease** Data keys at the same time. The transmitter will beep twice to indicate a successful reset

4. Press the **Up** or **Down** arrow keys to get to another setup menu, or switch power off.

5. Switch power back on. You may now set up the details of your model in the **Edit** mode.

CAUTION: WHEN YOU COMMAND RESET, YOU'LL ERASE THE MEMORY YOU'RE IN AND LOSE ANY PROGRAMMING YOU HAVE ENTERED. DON'T DO THIS UNLESS YOU ARE POSITIVE YOU WANT TO FLUSH OUT THAT MEMORY AND START FROM SCRATCH WITH THE FACTORY-DEFAULT SETTINGS.

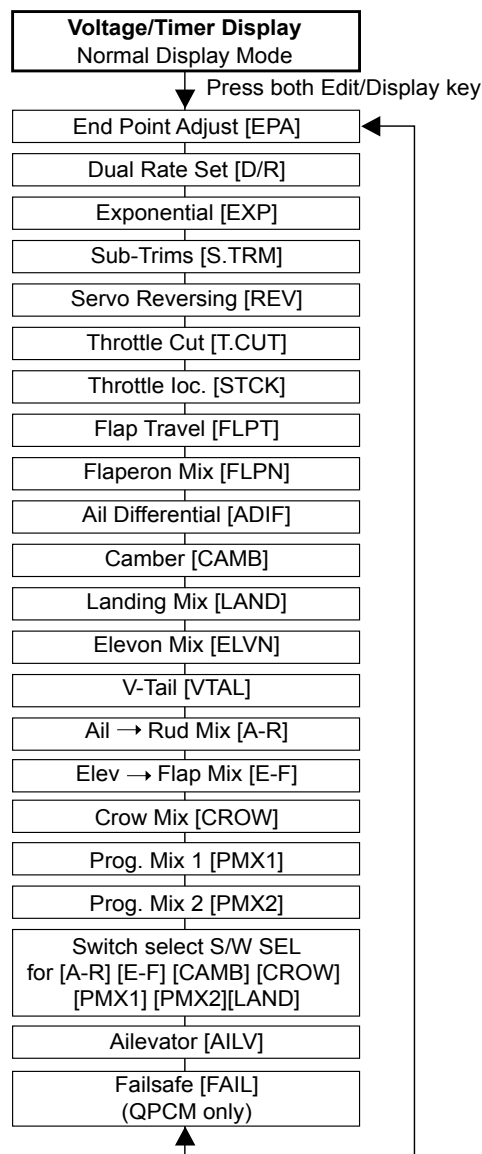
AIRCRAFT & GLIDER (ACGL) MENU FUNCTIONS

This section describes the functions for fixed-wing aircraft, provides a setup example, and then describes the functions individually. Helicopter functions are in the following section

ACGL Functions Map (see right)

Simple Aerobatic Airplane Transmitter Setup	15
EPA End Point Adjust (servo travels)	27
D/R Dual Rates	27
EXP Exponential Settings	28
STRM Subtrim (Neutral settings)	28
REV Servo Reverse	29
T.CUT Throttle Cut (engine shut off)	29
STCK Throttle Control Location	29
FLPT Flap Travel	30
FLPN Flaperon (combined flaps & ailerons)	30
ADIF Aileron Differential	31
CAMB Camber (combined flaps & ailerons)	32
LAND Landing function (select aileron/flap presets)	33
ELVN Elevon mixing (tailless models)	34
VTAL V-tail mixing	35
A->R Rudder Coupling	36
E->F Elevator Flap mixing	36
CROW Crow (Proportional Airbrake Function)	37
PMX1-2 Programmable Mixer #1 - #2	38
S/W SEL Switch select for A-R, E-F, CAMB, CROW, LAND, PMX1, PMX2	39
AILV Ailevator function (Dual elevators)	39
FAIL QPCM Position Input Menu	40
Aircraft Trimming Chart	41-43

Useful Switch & Lever Information
 Gear Switch (SW-2) controls receiver CH5
 Gear Switch Down turns on CROW
 Left Lever controls CROW (airbrake motions)
 Right Lever controls CAMBer motion
 FLT MODE (SW-3) switch Aft = LAND On, Forward CAMB On



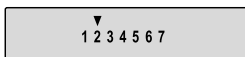
Simple Transmitter Setup - Aerobatic Airplane (ACGL Menu)

The following pages will take you step-by-step through the setup process for a sport or aerobatic airplane in the ACGL menu. Going through this complete section will help you learn how to use your system quickly and easily. If you need to set up a helicopter, please refer to the quick setup instructions in the helicopter section.

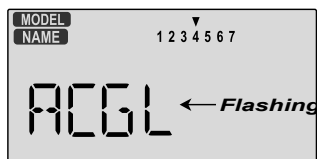
AIRCRAFT SETUP INSTRUCTIONS (AEROBATIC PLANE)

The aircraft setup procedure presented below uses an aerobatic model as an example and assumes that there are two aileron servos, one in each wing. You can use a similar procedure to set up your own model; your setting's numbers and percentages will probably be different. If your model only has one aileron servo, skip the instructions referring to flaperon.

1. Be sure that all of your servos are plugged into the proper receiver channels:
 - CH1** - Right aileron
 - CH2** - Elevator
 - CH3** - Throttle
 - CH4** - Rudder
 - CH5** - Gear
 - CH6** - Left aileron
2. We recommend that you do this programming exercise with the servos installed in the model and connected to the respective control surfaces. This will enable you to immediately see the effect of each programming step.
3. Turn on your transmitter while holding down the two **Edit** keys (the two keys on the far left). This gets you into the model select (**M.SEL**) menu. Press the Cursor **Right** button to move to a new model memory. The selected model memory is indicated by the little flashing arrow pointing down. Memory #2 is shown here.

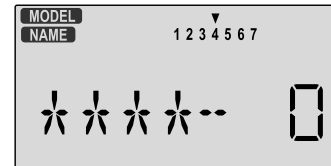


4. Press the **Up** arrow until the word **ACGL** appears, flashing on and off. If it does, you're ready to proceed on to the next step. If not, press the **Left** or **Right Cursor** keys until it appears. You must press both **Data** keys to "Save" the setting, after which the radio will beep twice. This is how you select the type of model you wish to use, either **ACGL** or **HELI**.

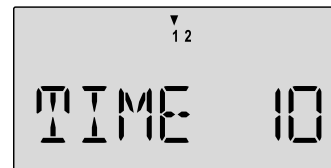


WARNING: selecting a different model type will erase the settings in the model memory. **BE SURE** you're in the correct model memory before selecting a new model type, or you might accidentally erase a model you're using. (The other memories will not be affected.)

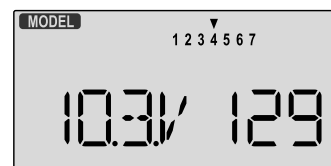
5. Press the **Down** arrow once. This gets you into the model name mode (note the words "MODEL" and "NAME" in the upper left of the display).



6. Now you can select four letters to identify your model. With the first of the four letters flashing, press the **Data +Increase** or **-Decrease** key to change the letter that is displayed. Stop when the first letter is the one you want.
7. Press the **Right Cursor** key once to get to the second letter. Repeat the previous step to choose the second letter.
8. Repeat two more times to fill out the remaining two letters. If you like, you can hit the right cursor button one more time and select a number between **0** and **199** for further identification. It can be handy to use this to store the plane's channel number.
9. Press the **Down** arrow four times. This gets you into the Timer menu (**TIME**). If you want, you can use the **Data +Increase** or **-Decrease** keys to select the amount of time you want the stopwatch to count down. You can set the second timer for something else in the same menu.



10. This completes the initial part of the setup. Now, we'll go ahead and customize the **ACGL** settings for your model. Switch transmitter power **OFF**.
11. Now turn power **ON**. The transmitter should display the model number and battery voltage as shown. The number on the right is the elapsed time, which will vary depending on how long the transmitter has been left on.

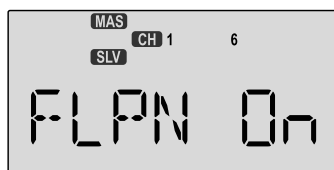


Simple Transmitter Setup - Aerobatic Airplane (ACGL Menu)

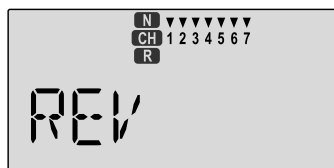
12. Press both **Edit** keys to get to the regular programming menu. The end-point adjust menu (**EPA**) should appear. Press the **Down** arrow to get to the flaperon menu (**FLPN**). The display should show that it is inhibited (**INH**).



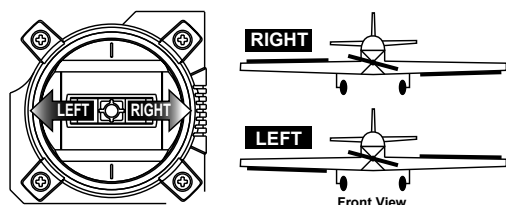
13. Turn on the Flaperon function by pressing the **Active/Inhibit** button (**Clear**) until "On" appears in the display.



14. Be sure that you connect the right aileron servo to receiver **CH1** and the left aileron servo to receiver **CH6**.
 15. Later, you can get differential by adjusting the up and down motion of the two servos in the **FLPN** menu. Now we'll set the servo throw directions. Now check that each servo moves the proper direction. We'll use the Reversing function if they don't. Go to the Reversing menu (**REV**) by hitting the Down arrow.

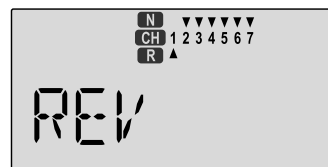


16. We'll start by setting the right aileron servo direction. This is channel 1, and the 1 should be flashing for this command. When you move the right-hand stick to the right, the aileron on the right wing should move upwards, and the aileron on the left should move downward. Check that the right aileron moves the correct way!

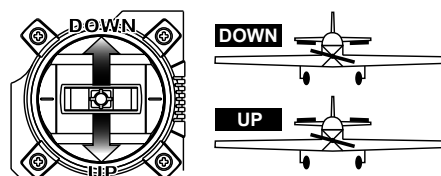


17. If it does not, activate the opposite direction for the CH1 aileron servo by pressing the **Active/Inhibit (Clear)** key. Each press switches from Reversed to Normal and from Normal to Reversed. In the display, **N** for Normal is chosen when the little triangle is above the channel number, and

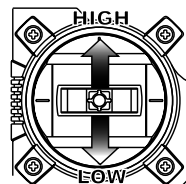
R for Reversed is chosen when the little triangle is below the channel number. Move the right-hand stick again and verify the right aileron moves the right directions. The display shows Channel 1 reversed.



18. Next we'll set the direction of the elevator servo, channel 2. When you move the right-hand stick towards the **BOTTOM** of the transmitter, the elevator should move up. Check to make sure it moves the proper direction! (More planes are crashed due to reversed controls than for any other reason.)



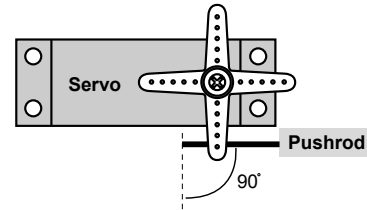
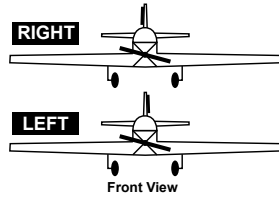
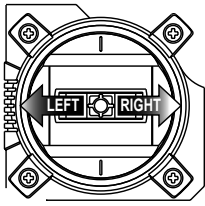
19. If the elevator control moves the wrong direction, move over to Channel 2 by pressing the **Cursor Right** key. Now the '2' should be flashing in the display. Activate the opposite direction for the elevator servo by pressing the **Active/Inhibit (Clear)** key. Move the right-hand stick up-and-down again and verify the elevator moves the right direction.
 20. Now we'll set the direction of the throttle servo. When you move the left-hand stick towards the **BOTTOM** of the transmitter, the throttle should close, meaning that the hole in the carburetor should close. Check to make sure that the throttle lever on the engine moves the proper direction!



HIGH Throttle :
carburetor fully opened
LOW Throttle :
carburetor at idle position
(not fully closed)

21. If the throttle servo moves the wrong direction, move over to Channel 3 by pressing the **Cursor Right** key. Now the 3 should be flashing in the display. Activate the opposite direction for the throttle servo by pressing the **Active/Inhibit (Clear)** key. Verify the throttle stick makes the servo move the carburetor opening in the correct direction.
 22. Now we'll set the direction of the rudder servo. When you move the left-hand stick towards the **CENTER** of the transmitter (to the right), the trailing edge or rear rudder should move to the right. Check to make sure!

Simple Transmitter Setup - Aerobatic Airplane (ACGL Menu)

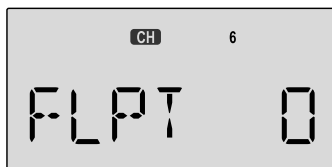


If the rudder moves the wrong direction, move over to Channel 4 by pressing the **Cursor Right** key. Now the '4' should be flashing in the display. Activate the opposite direction for the rudder servo by pressing the **Active/Inhibit (Clear)** key. Move the left-hand stick left-and-right again and verify the rudder moves the right direction.

If your model has retracts, set the correct response direction when commanded by the **Gear (SW-2)** switch, using the same procedure.

If you're using a second aileron servo, you'll now set the left aileron servo direction (otherwise skip this and the next step). This is channel 6, and the '6' should be flashing for this command. When you move the right-hand stick to the right, the aileron on the left wing should move downwards. Check that the left aileron moves the correct way! If it does not, activate the opposite direction for the left aileron servo using the above procedures. Move the right-hand stick again and verify the left aileron moves the proper directions.

Press the **Up** or **Down** arrow keys to the **Flap Travel** function (**FLPT**), and input a percentage of zero (**0**) using the **Data - Decrease** key. This temporarily disables the flap lever (**Right Lever**) so that you can set aileron neutrals without regard to the flap lever position. Later we'll turn it back on.



23. Before we set the servo neutrals, we need to be sure that all the trims are centered. Press both **Edit** keys to get to the main menu, where voltage and time are displayed. Press the **Up** arrow until the word **TRIM** appears. By moving each of the four trim levers around, you can see their positions, and move them back to zero for the next step.

24. Once you have centered all the trims, unscrew the screws holding the servo arms onto the elevator, aileron, and rudder (we'll set the throttle travel later). You will want to place the servo arms on the output shaft so they are near neutral - that is, about 90° to the servo case sides or, if the servo is mounted sideways, 90° to the pushrod (sideways mounting is not recommended). This way you won't run out of subtrim authority. Remove all the arms that are in the way or interfere with your pushrods.

Adjust the clevises on each servo pushrod to get the position of each control to be as close as you can to neutral (lined up with the adjacent portion of wing or tail).

Setting Subtrims. Now we'll adjust all the subtrims to electronically set the desired neutral locations. To do so, go back to the programming menu by pressing both **Edit** keys, then press the **Up** or **Down** arrow key repeatedly until **STRM** appears.

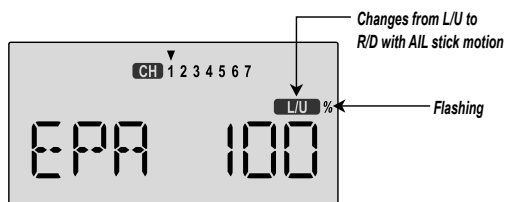


25. Set the right aileron subtrim first. If the little arrow is not pointing at channel 1, press the one of the **Cursor Left** or **Right** buttons until it is (see figure). Then, adjust the subtrim amount by adding or subtracting with the **Data +Increase** or **-Decrease** keys. When you reach a place where the right aileron matches up with the fixed portion of the wing, you are done. If you can't get both to match up, then set the subtrim back to zero and mechanically adjust the clevis to get as close as you can, then readjust the subtrim if necessary.
26. **Note 1:** you should NOT use subtrims instead of mechanically adjusting the pushrods to be close. This is because you can reduce the travel of the radio, especially if you have to set the subtrim at or above 50%. As we stated before, get the pushrods close mechanically first, then use the subtrim adjustment to get it just right.
27. **Note 2:** if you mess up the number you've entered or find the percentage the wrong direction, you can get back to zero quickly by pressing the **Active/Inhibit (Clear)** button.
28. Repeat the subtrim adjustment with the elevator servo (**CH2**). First set the pushrod length mechanically to get as close to neutral as possible, then set the subtrim to get the elevator lined up to be parallel with the stabilizer portion. For full-flying surfaces, use an incidence meter or another method to get the incidence angle recommended by the kit manufacturer or model designer.



Simple Transmitter Setup - Aerobatic Airplane (ACGL Menu)

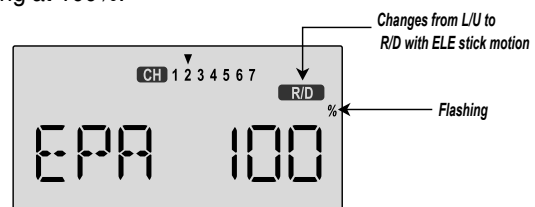
29. For the throttle, we recommend not setting a subtrim at this time. You will use the trim tab on the transmitter for setting your idle RPM. To shut off the motor you will use the Engine Cut function. In this way, you don't lose your carefully-set idle position.
30. Most people set up their engines to idle with the throttle trim near center, so that there is room for changes due to humidity and other factors.
31. The Optic provides a special throttle trim function which allows the throttle trim lever to work at low throttle levels, but disables it at high throttle.
32. Repeat the subtrim adjustment with the rudder (**CH4**), gear (**CH5**), and 2nd aileron channel (**CH6**). As before, first set them mechanically, then adjust the electronic settings. Be sure you have selected the appropriate channel number each time.
33. **Servo EPA (End Point Adjustment)**. Now we'll go through and set the servo travels for each channel. This is both helpful and important, because you can set the throw of each servo, in each direction, so that there is no binding. Eliminating binding is important because it causes very high current drain, and can lead to a battery dying prematurely. Another use for the EPA function is to adjust the model's total throws to match the recommended control motions specified on the plans or instructions by the model's designer.
34. To set travels, get to the **EPA** menu by pressing one of the **Up Down Edit** buttons repeatedly until **EPA** appears. In sequence, we'll set right aileron right travel, right aileron left travel, up and down elevator travels, right and left rudder travels, open and closed throttle positions, and left aileron travels.



35. When you reach the **EPA** menu, you'll see the screen as shown. The channel indicator is above numeral 1 for right aileron, the percent symbol will be flashing, and you'll notice that you can change the **L/U** indicator to **R/D** (or vice versa) by moving the aileron (right) stick. You are about to see that this is how you set the travel directions independently for each stick motion.
36. To set the **RIGHT** aileron motion, move the aileron stick all the way to the right and hold it. The letters "**R/D**" should appear next to the flashing percent sign, meaning you are setting either Right or Down travel (with ailerons it's right or left only, but the display is set up to use the same indicators

for elevator and throttle, thus the dual meanings for the letters). Now if your servo is stalled or binding, you'll hear a buzzing sound. Hit the minus **-Decrease** Data key until the buzzing stops. If the servo is not buzzing, leave the setting at 100%. If you can, choose a location for the pushrod on the servo arm so that the throw is adjusted in the 90-100% range.

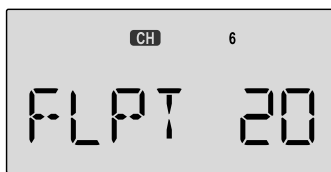
37. To set the right aileron's **LEFT** motion, move the aileron stick all the way to the left and hold it. The letters "**L/U**" should appear next to the flashing percent sign (as shown in the figure above). Again listen and hit the **-Decrease Data** key until the buzzing stops. If the servo is not buzzing, leave the setting at 100%. (Remember, you're only setting the right aileron travel. You set the other aileron's travel in channel 6's EPA.)
38. To set the **UP** elevator motion, press on the **Right Cursor** key until the indicator moves over channel 2. Now move the right stick all the way to the transmitter bottom and hold it. The letters "**L/U**" should appear next to the flashing percent sign. Again listen for a buzzing sound to indicate the servo is stalling, and hit the **-Decrease Data** key until the buzzing stops. If the servo is not buzzing, leave the setting at 100%.



39. Repeat the previous step for **DOWN** elevator by moving the stick all the way to the top of the transmitter, full "down" elevator. Check for binding and adjust the percentage as before.
40. To set the throttle position at **IDLE**, first return to the regular display and set the throttle trim to +25%. Then go back to the **EPA** menu and press the **Right Cursor** key until the arrow moves over channel number 3. Now move the throttle stick all the way to the transmitter bottom and hold it. The letters "**L/U**" should appear next to the flashing percent sign. Listen for a buzzing sound to indicate servo stalling, and hit the **-Decrease Data** key until the buzzing stops. Change the setting to nearly - but not completely - close the throttle (engine idle). Later you may increase or decrease this number so you can't accidentally shut off the engine using the trim tab.

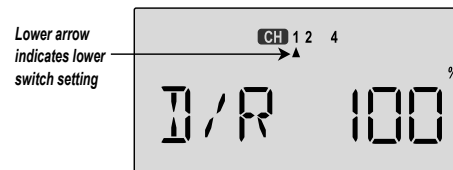
Simple Transmitter Setup - Aerobatic Airplane (ACGL Menu)

41. To set the FULL throttle position, move the throttle stick all the way to the transmitter top and hold it. The letters "R/D" should appear next to the flashing percent sign. [Notice that the Optic transmitter thinks of throttle stick positions to the reverse of the way it seems, in that with the throttle stick fully forwards - "up" towards the transmitter top, is the Down position.] Listen for a buzzing sound to indicate the servo is stalling, and hit the **-Decrease Data** key until the buzzing stops. If the servo is not buzzing, leave the setting at 100% or change your linkage as necessary to fully open the throttle.
42. To set the RIGHT rudder motion, press the **Right Cursor** key until the indicator moves over channel 4. Now move the left stick all the way to the right and hold it. The letters "R/D" should appear next to the flashing percent sign. Listen for a buzzing sound to indicate the rudder servo is stalling, and hit the **Data -Decrease** key until the buzzing stops. If the servo is not buzzing, leave the setting at 100%. You may wish to increase or decrease this number depending on how strongly the model reacts when the rudder is deflected. Now move the stick to the left side, and repeat the setting procedure for left rudder.
43. In the same manner as described above, be sure to set **EPA** values for channels 5 (landing gear) and 6 (second aileron), if you have either.
44. If you wish to have the flaps operate with the **CH6** lever, go back to the **FLPT** menu and input a number greater than zero. Adjust the number to get the desired amount of flap travel as you turn the lever.

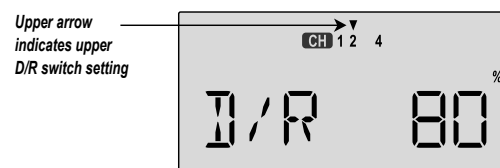


45. If you wish to have differential aileron travel, this can be done in the flaperon menu. First, we'll reduce the down travel on the right aileron. Press the **Right Cursor** key until the little triangles are both above and below the numeral 1. Hold the aileron stick to the left and press the **-Decrease Data** key until the number is smaller. 50-75% is a good starting point. Watch to be sure you're setting the down travel on the right aileron.
46. Next, we'll reduce the down travel on the left aileron. Press the **Right Cursor** key until the little triangle moves below the numeral 6 (the second aileron; the upper triangle should stay over the number 1). This time, hold the aileron stick to the right and press the **-Decrease Data** key until the number is the same as you chose for the other side.

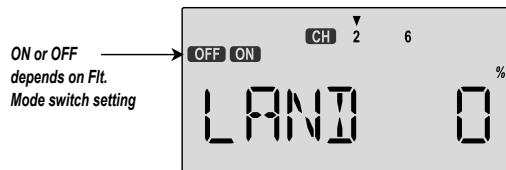
47. You can use the dual rate function or the exponential function to reduce the aileron and elevator travel in flight by flipping switches. Dual rates are typically used to reduce a model's sensitivity and cut down total travel. Exponential functions make the response slower around center and larger away from center. You can use both but they are activated by the same switch. You may wish to use Dual rate on one side of the switch and exponential on the other.
48. **Aileron Dual Rate setting.** Get to the **D/R** menu by pressing one of the **Up Down Edit** buttons repeatedly until **D/R** appears, as shown.



49. The aileron dual rate setting automatically affects both ailerons if the flaperon function is active. To set the aileron dual rate, move the arrow by pressing the **Right Cursor** key until the little arrow is under or over the numeral 1 (the arrow depends on the position of the **Ail D/R** switch above the right stick. Now move the aileron D/R switch up or down, noticing the position of the arrow. You can set two dual rates, one for each switch position. If you set them, be sure to note which switch position turns them on.
50. By pressing the **Data +Increase** or **-Decrease** keys, you can add or subtract from the numerical value displayed. Note that you may pick a value anywhere from 0% to 125% (125% is larger than the normal amount, so if you do this be careful not to exceed servo travel limits and cause stalling or excess current drain). If you quickly want to get back to the default 100%, press the Clear key. We suggest using an initial value of 75%.
51. **NOTE: if you set any of the dual rates to 0%, you will have ZERO CONTROL AUTHORITY and LOSE CONTROL OF YOUR AIRCRAFT when the switch is in that position. DON'T DO IT!**
52. **Elevator dual rate setting: press the Right Cursor** key one time to get the little arrows above or below the numeral 2. Now set the elevator dual rates in the same way you set the ailerons in the previous step.

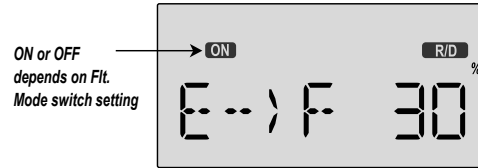


53. **Rudder dual rate setting:** press the **Right Cursor** key one time to get the little arrows above or below the numeral 4. Now set the rudder dual rates in the same way you set the ailerons and elevator in the previous steps.
54. **Landing setup.** You can get an airbrake effect by flipping a switch to raise or lower both flaperons and add elevator to keep it trimmed. This high-drag configuration makes the landing approach steeper to help make safe landings in small fields. This is an on-off function, not proportional.
55. With landing mode on, it is possible to lose some aileron effectiveness. Be sure to test the landing settings at altitude before trying it on a landing approach. You should spend some time fine-adjusting the elevator travel so that there is minimal trim change when the landing (**Fit. Mode (SW-4)**) switch is operated.
56. Press one of the **Up Down Edit** buttons until the **LAND** window appears, as shown. The landing mode is **OFF** unless the **Fit. Mode (SW-4)** switch (upper left of transmitter) is fully aft (away from you).



57. The arrow should be over the numeral 2. Now press the **Data +Increase** key to change the percentage shown. You may input the amount of offset for the elevator at this time. This should be set from -7% to -10%. Don't use too much or it could crash your model.
58. Press the **Cursor Right** key one more time, and you may now input the CH6 setting. The rates may vary considerably for different models, but for initial settings you might try the flap rate around 50-55%. You may want flaps to droop or rise, depending on the model type.
59. **E->F Mixing:** you may couple or mix elevator to flaps for tighter corners in the elevator-to-flap mixer. Get to the **E->F** menu, then activate it by pressing the **Clear** key. Press the **Right Cursor** key to get the percent symbol to flash. Now you may input the percentage of mixing with the **Data +Increase** key. Start out with 10-20% and increase it until the corners in your loops are square enough. If the flaps don't drop when you pull up elevator, reverse the sign in front of the mix percentage (change the + to a - or vice versa).

60. Be sure to input a mixing percentage for each side of the elevator stick motion.



61. **Throttle Cut.** The **TCUT** function allows you to kill the engine by pressing on the **ENG CUT** pushbutton on the top right of the transmitter, commanding the throttle servo to move to a preset position. If you use the TCUT function, you'll never need to adjust the trim on your engine after you've got a good idle position! For safety, the TCUT feature only operates if the throttle stick is below its 50% position. After about 3-5 seconds, the throttle servo responds to throttle stick.

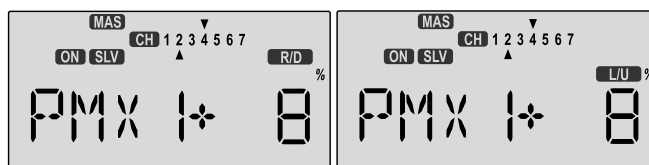
To set up TCUT, get to the **TCUT** menu. Now you may input the amount of throttle servo motion using the **Data +Increase** key. Choose a small negative number, which will command the throttle servo to close the carburetor below its idle position. If the engine doesn't quit when you press the cut button, increase the negative percentage. Be careful not to choose a position which stalls the servo.

62. **CAMBER.** You can use the **CAMB** function to configure your model to droop its ailerons and flaps to get higher lift for takeoff and landing. The camber function may be turned on and off with a switch, and you may also add elevator offset to keep the model trimmed. Camber is an on-off function, not proportional. To set up camber, please read the setup instructions on page 33.
63. **Ailevator.** You may use the **AILV** for models that have two elevator servos to automatically gang them together for elevator function without using a programmable mixer. In addition, you may program in a response to aileron Commands, which allows you to use them for 3-D maneuvers such as torque rolls. The AILV function cannot be switched on and off during flight. For more information on AILV, please read the setup instructions on page 39.
64. **Aileron differential (ADIF)** is a function that allows you to individually set the up and down motion of ailerons controlled by two separate aileron servos. The two servos must be plugged into channels 1 and 5, so this function is the best way to control a two-servo model using a five-channel receiver.

You cannot activate both ADIF and FLPN functions, you must choose one or the other. We recommend using FLPN for receivers with six channels and ADIF for receivers with five channels. For instructions on how to use ADIF, please refer to the setup instructions on page 31.

Simple Transmitter Setup - Aerobatic Airplane (ACGL Menu)

65. **Programmable mixers:** now take advantage of your system's advanced custom programming capabilities. You may use one or both of the two programmable mixers (**PMX1**, **PMX2**) to get rid of unwanted tendencies (for example, rolling or tucking during knife-edge flight).
66. For tucking during knife-edge, you want to apply a little up elevator when you are using full rudder to sustain knife-edge. Thus, we want the **master** channel to be rudder, and the **slave** to be elevator.
67. To program this mixing, first get to the **PMX1** window. Press one of the **Edit Up/Down** keys until you see **PMX1** displayed. Then press the **Active/Inhibit (Clear)** key to activate it (a flashing **ON** or **OFF** will appear, depending on the position of the selected **ON-OFF** switch, which turns mixer #1 on and off).
68. Next, press the **Cursor Right** key once to select the master channel (**MAS** flashes on and off), then press the **Data +Increase** key until the little arrow moves over the numeral **4**, indicating CH4 (rudder) is the master channel. Press the **Cursor Right** key once (**SLV** flashes on and off), then press the **Data +Increase** key until the little arrow is under the numeral **2**, indicating **CH2** (elevator) is the slave channel.
69. Now, you'll define the mixing percentage. Notice that the mixer starts with 100% on both sides, which is WAY too much. Move the rudder stick to one side and press the **Clear** button, zeroing the percentage. Move it to the other side and repeat. Now both sides are set to zero percent.
70. If your model tucks during knife-edge, you'll want to input up elevator for rudder going both directions. Move the rudder stick to the right and press the **Data +Increase** until you can see which way the elevator moves; if incorrect, press the **Data -Decrease** key until the plus sign changes to a minus sign. Repeat this by moving the rudder stick to the other side. You'll end up with a plus sign for one rudder direction, and minus for the other direction. Start with only **5-10%** mixing on both sides until you know how much you need from actual test flying.
71. Be sure you understand how to set the switch to turn **PMX1** on and off, since you won't want this mixing on during normal flight, only during knife-edge. Later, after you fly the model you may fine-tune the amount of elevator travel so that the pitching tendency is eliminated.



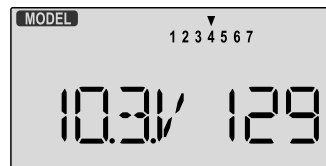
You can use the other mixer to handle adding aileron corrections during knife-edge. In this case, you'll have the same percentage sign on both sides of the rudder. This introduction just scratches the surface of the capabilities of your Optic system. Please read the manual so you'll know what other features you can take advantage of. The sky's the limit - we know you'll enjoy using your **Optic** system!

Simple Transmitter Setup - Electric Airplane, 5-Channel Receiver (ACGL Menu)

The aircraft setup procedure presented below uses an electric model as an example and assumes that there are two aileron servos, one in each wing. It also assumes that you are using a micro five-channel receiver. It will take you step-by-step through the setup process for an electric airplane in the **ACGL** menu, including the setup for airbrakes.

FIVE-CHANNEL ELECTRIC AIRCRAFT SETUP INSTRUCTIONS

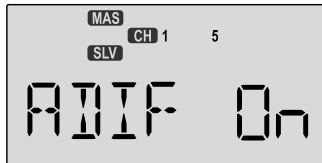
- Be sure that all of your servos are plugged into the proper receiver channels:
 - CH1** - Right aileron
 - CH2** - Elevator
 - CH3** - Electronic speed control
 - CH4** - Rudder (if used)
 - CH5** - Left aileron
- We recommend that you do this programming exercise with the servos installed in the model and connected to the respective control surfaces. This will enable you to immediately see the effect of each programming step. You should remove the propeller for safety.
- Follow steps 3-10 in the *Aerobatic Airplane setup instructions* to do the initial setup for your electric model.
- Now, you will customize the **ACGL** settings for your model. Switch transmitter power **OFF**, then turn power **ON**. the transmitter should display the model number and battery voltage as shown. The number on the right is the elapsed time, which will vary depending on how long the transmitter has been left on.



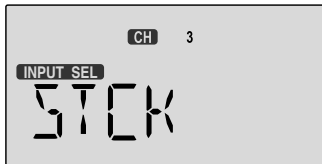
5. Press both **Edit** keys to get to the regular programming menu. The end-point adjust menu (**EPA**) should appear. Press the **Down** arrow to get to the aileron differential menu (**ADIF**). The display should show that it is inhibited (**INH**).



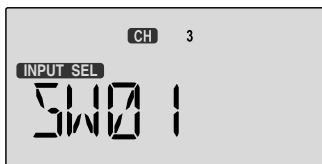
6. Turn on the **ADIF** function by pressing the **Clear** button until "On" appears in the display.



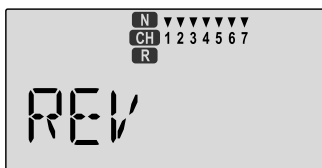
7. Be sure that you connect the right aileron servo to receiver **CH1** and the left aileron servo to receiver **CH5**.
8. You may wish to have the electric motor controlled by an **ON-OFF** switch instead of the throttle stick (good for racers and aircraft that only use full throttle). In this case, go to the **STCK INPUT SELECT** menu by pressing the **UP** or **DOWN** arrow key.



9. You can select Switch SW-01 ("ELEV RUDD D/R" to operate the electronic speed control by pressing the **CLEAR** button.

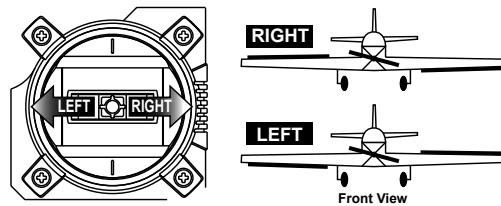


10. Now we will check that each servo moves the proper direction. If not, we'll use the Reversing function. Go to the Reversing menu (**REV**) by hitting the **Down** arrow.

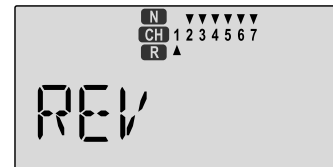


11. We'll start by setting the right aileron servo direction. This is channel 1, and the 1 should be flashing for this command. When you move the right-hand stick to the right, the aileron on the right wing should move upwards, and the aileron on

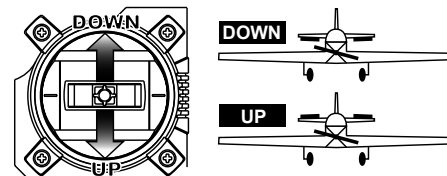
the left should move downward. Check that the right aileron moves the correct way! (More planes are crashed due to reversed controls than for any other reason.)



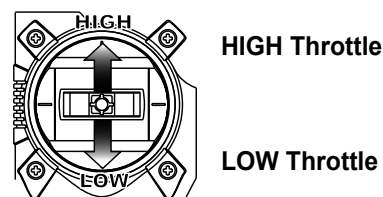
12. If it does not, activate the opposite direction for the CH1 aileron servo by pressing the **Active/Inhibit (Clear)** key. Each press switches from Reversed to Normal and from Normal to Reversed. In the display, **N** for Normal is chosen when the little triangle is above the channel number, and **R** for Reversed is chosen when the little triangle is below the channel number. Move the right-hand stick again and verify the right aileron moves the right directions. The display shows Channel 1 reversed.



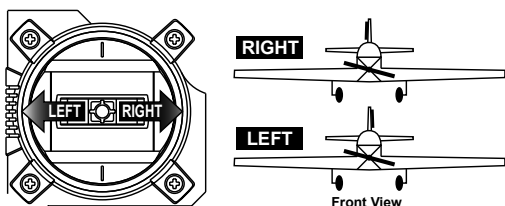
13. Next we'll set the direction of the elevator servo, channel 2. When you move the right-hand stick towards the **BOTTOM** of the transmitter, the elevator should move **up**. Check to make sure it moves the proper direction!



14. If the elevator control moves the wrong direction, move over to Channel 2 by pressing the **Cursor Right** key. Now the '2' should be flashing in the display. Activate the opposite direction for the elevator servo by pressing the **Active/Inhibit (Clear)** key. Move the right-hand stick up-and-down again and verify the elevator moves the right direction.
15. Now we'll set the direction of the electronic speed control. If you're using the left-hand stick for throttle control, when you move the stick towards the **TOP** of the transmitter, the motor should spin. It should stop at low throttle stick.



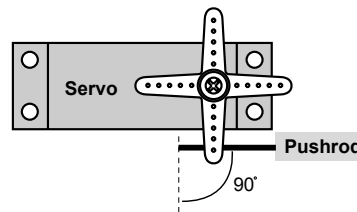
16. If the throttle stick operates the speed control the wrong direction, move over to Channel 3 by pressing the **Cursor Right** key. Now the 3 should be flashing in the display. Activate the opposite direction for the throttle servo by pressing the **Active/Inhibit (Clear)** key. Verify the throttle stick makes the motor turn on and off in the correct direction.
17. If you are using Switch SW-1 for throttle on-off, check that the switch operates the motor in the direction you would like. The UP position should be used for motor ON, and DOWN for motor OFF. If it does not, reverse CH3 using the REV menu as described above.
18. Now we'll set the direction of the rudder servo, if used. When you move the left-hand stick towards the CENTER of the transmitter (to the right), the trailing edge, or rear of the rudder should move to the right. Check to make sure!



If the rudder moves the wrong direction, move over to Channel 4 by pressing the **Cursor Right** key. Now the '4' should be flashing in the display. Activate the opposite direction for the rudder servo by pressing the **Active/Inhibit (Clear)** key. Move the left-hand stick left-and-right again and verify the rudder moves the correct direction.

19. Now set the **CH5** aileron servo direction (otherwise skip this and the next step). This is channel 5, and the '5' should be flashing for this command. When you move the right-hand stick to the right, the aileron on the left wing should move downwards. Check that the **CH5** aileron moves the correct way! If it does not, activate the opposite direction using the above procedures. Move the right-hand stick again and verify the **CH5** aileron moves the proper directions.
20. Before we set the servo neutrals, we need to be sure that all the trims are centered. Press both **Edit** keys to get to the main menu, where voltage and time are displayed. Press the Up arrow until the word TRIM appears. By moving each of the four trim levers around, you can see their positions, and move them back to zero for the next step.
21. Once you have centered all the trims, unscrew the screws holding the servo arms onto the elevator, ailerons, and rudder (we'll set the throttle travel later). You will want to place the servo arms on the output shaft so they are near neutral - that is, about 90° to the servo case sides or, if the servo is mounted sideways, 90° to the pushrod (sideways mounting is not recommended). This way you

won't run out of subtrim authority. Remove all the arms that are in the way or interfere with your pushrods.

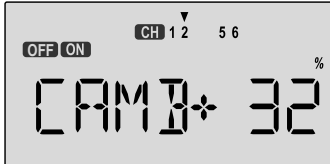


Adjust the clevises on each servo pushrod to get the position of each control to be as close as you can to neutral (lined up with the adjacent portion of wing or tail).

Setting Subtrims. Now we'll adjust all the subtrims to electronically set the desired neutral locations. To do so, go back to the programming menu by pressing both **Edit** keys, then press the **Up** or **Down** arrow key repeatedly until **STRM** appears.

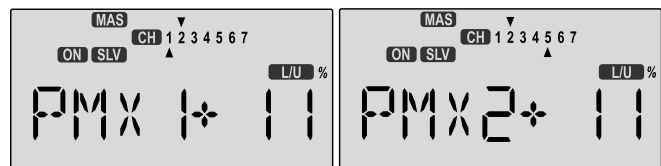
22. Set the subtrims for CH1 and CH5 ailerons, elevator, and rudder following the instructions given in steps 25 - 32 in the aerobatic setup instructions. Remember your second aileron servo is plugged into CH5.
23. **Servo EPA (End Point Adjustment).** Set up the servo travels for each channel following the instructions given in steps 33 - 43 in the aerobatic setup instructions.
24. **Dual Rates and Exponential Functions.** You can use the exponential function to make the aileron and elevator responses less sensitive around neutral, so that your racer reacts smoothly for mild control inputs, but reacts strongly when you command a lot of stick. You can adjust the amount in flight by flipping switches. Exponential functions make the response slower around center and larger away from center. You may also use dual rate to adjust the total travels, but keep them linear.
Set up dual rates following the procedures given in steps 48 - 53 of the aerobatic aircraft setup instructions.
NOTE: if you set any of the dual rates to 0%, you will have ZERO CONTROL and LOSE CONTROL OF YOUR AIRCRAFT when the switch is in that position. DON'T DO IT!
25. **Airbrake setup using CAMB.** You can get airbrakes by flipping a switch to raise both flaperons and add elevator to maintain trim. This configuration increases the drag, making the landing approach steeper to help make safe landings in small fields.
With **CAMB** on, it is possible to lose some aileron effectiveness. Be sure to test the landing settings at altitude before trying it on a landing approach. You should spend some time fine-adjusting the elevator travel so that there is no trim change when CAMB is on.

26. Press one of the **Up Down Edit** buttons until the **CAMB** window appears, as shown. Activate it using the **CLEAR** button. The CAMB mode is OFF unless the **FLT MODE** switch SW-4 is forward. (You can change this switch in the SWITCH SELECT menu.)
27. Hit the **Cursor Right** key one time to get to the **Ch1 preset** menu. Press the **Data +Increase** key to input a preset value for the CH1 aileron. Start out with a moderate value and increase it after you've seen how the model behaves.



28. Press the **Cursor Right** key to move the arrow over the numeral **2**. Now press the **Data +Increase** key to change the percentage the elevator moves to. This should be set a very small number, as it will affect the trim considerably. Don't use too much or it could crash your model.
29. Press the **Cursor Right** key one more time, and you may now input the second aileron's CH5 setting. Set it to match the CH1 servo's travel.
30. If you want this airbrake function to be a proportional control using the left slide lever, use the CROW menu instead of the CAMB menu. See the setup instruction for more information on the CROW menu.
31. **Elevator->Flaperon Mixing:** you may want to set up your model so that when you pull elevator, the two ailerons droop for tighter corners. This may be done with **Programmable mixers**. You will use both of the programmable mixers (**PMX1**, **PMX2**) for this feature. For a little down flap when you pull elevator, set the **master** channel to be elevator, and the **slave** to be aileron 1 (CH1).
32. To program this mixing, first get to the **PMX1** window. Press one of the **Edit Up/Down** keys until you see **PMX1** displayed. Then press the **Active/Inhibit (Clear)** key to activate it (a flashing **ON** or **OFF** will appear, depending on the position of the selected **ON-OFF** switch, which turns mixer #1 on and off).
33. Next, press the **Cursor Right** key once to select the master channel (**MAS** flashes on and off), then press the **Data +Increase** key until the little arrow moves over the numeral **2**, indicating CH2 (elevator) is the master channel. Press the **Cursor Right** key once (**SLV** flashes on and off), then press the **Data +Increase** key until the little arrow is under the numeral **1**, indicating **CH1** (aileron 1) is the slave channel.

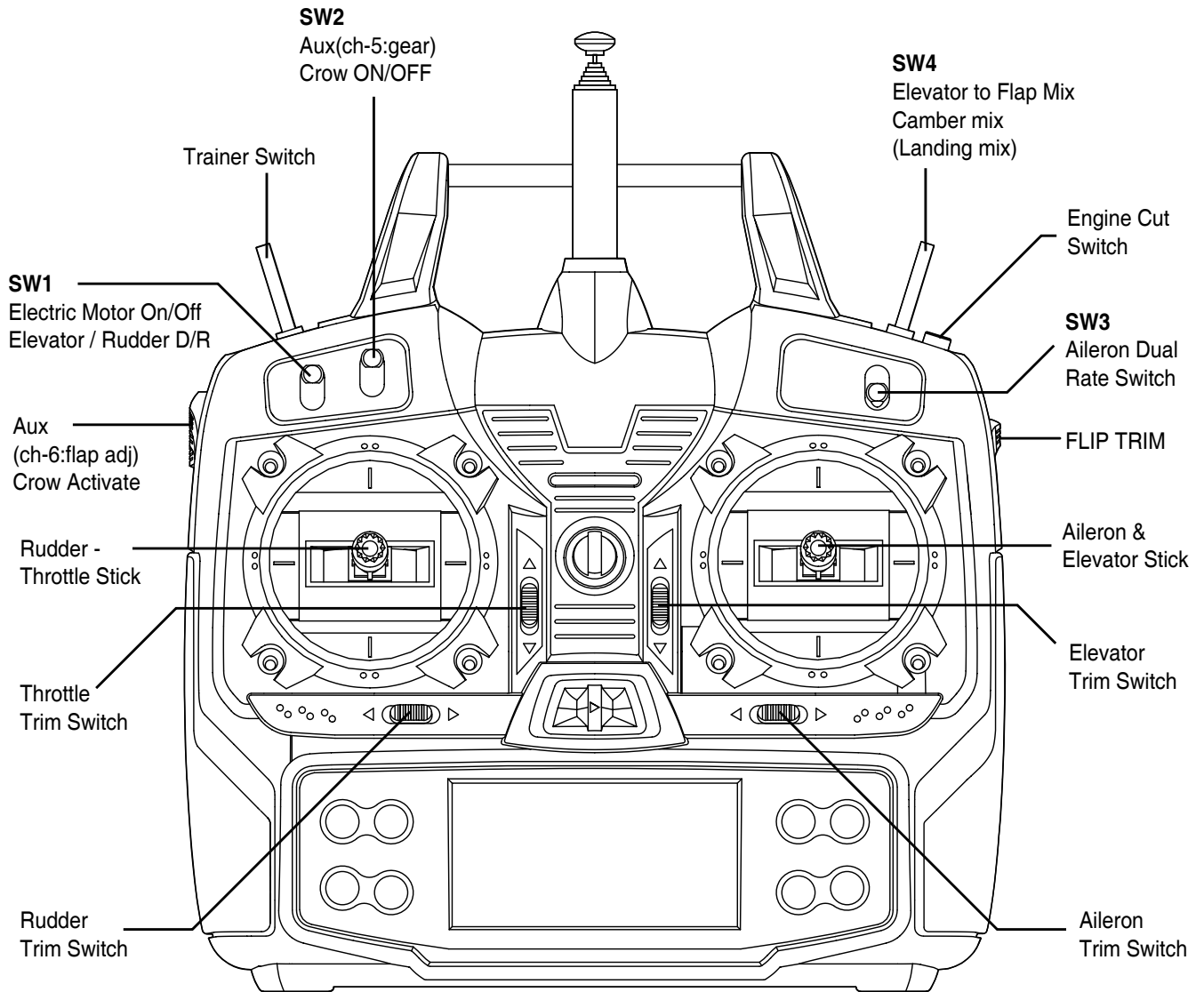
34. Now, you'll define the mixing percentage. Notice that the mixer starts with 100% on both sides, which is WAY too much. Move the elevator stick down and press the **Clear** button, zeroing the percentage. Move it up and repeat. Now both sides are set to zero percent.
35. You'll probably want to input down flap for up elevator only. Move the elevator stick up and press the **Data +Increase** until you can see which way the elevator moves; if incorrect, press the **Data -Decrease** key until the plus sign changes to minus sign. You'll end up with a number for up elevator direction, and zero for the down direction. Start with only **5-10%** mixing on the UP side until you know how much you need from actual test flying. Too much droop increases drag and slows the model down.
36. Be sure you understand how to set the switch to turn **PMX1** on and off, since you only want this on during racing. Later, after you fly the model you may fine-tune the amount of aileron travel for tighter turns.



Use the other mixer to set up the droop of the second aileron, **CH5**, in the same way. In this mixer, master = CH2, slave = CH5. Set the mixing percentages so that both ailerons droop the same amount, or else your model will roll when you pull elevator!

This introduction just scratches the surface of the capabilities of your **Optic** system for a five-channel electric model. Please read the manual so you'll know what other features you can take advantage of. We hope you enjoy using your **Optic** system!

Optic Aircraft Controls and Switch Assignments

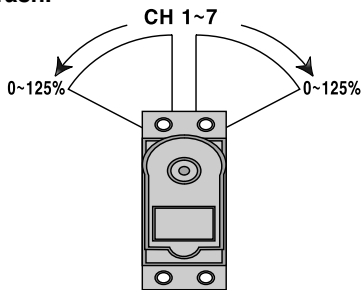


This figure shows the assignments for a Mode 2 system as supplied by the factory.
Note that some of the functions will not operate until activated in the mixing menus.

Airplane Model Function Descriptions

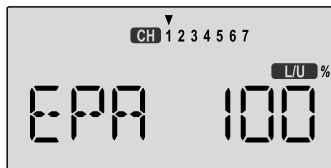
EPA - End Point Adjust

The **EPA** function is used to set (or limit) the travel of each servo, and may be set anywhere from 0% and 125% for each travel direction. Reducing the percentage settings reduces the total servo throw in that direction. The **EPA** function is normally used to prevent any servos from binding at the ends of their travel. **If you change the EPA setting to 0%, you will not have any servo response in that direction, and will probably crash.**



Setting EPA values on your system:

1. Enter the programming mode by pressing the two **Edit Up Down** keys (the two keys on the far left) at the same time. You should pop right into the **EPA** screen, but if you do not, press either **Edit Up Down** key until you see **EPA** displayed. The channel indicator is above numeral **1** for ailerons, the percent symbol will be flashing, and you'll notice that you can change the **L/U** indicator to **R/D** (or vice versa) by moving the aileron (right) stick. In the next steps you will see how you set the travel directions independently for each stick (or lever or gear switch) motion.



2. To set the **RIGHT** aileron servo travel, move the aileron stick all the way to the right and hold it. The letters **"R/D"** should appear next to the flashing percent sign, meaning you are setting either Right or Up travel (with ailerons it's right or left only, but the display is set up to use the same indicators for elevator and throttle, thus the dual meanings for the letters). Now if your servo is stalled or binding, you'll hear a buzzing sound. Hit the **Data -Decrease** key until the buzzing stops. If the servo is not buzzing, leave the setting at 100%. Later, depending on how rapidly the model rolls, you can use aileron dual rates to reduce the sensitivity.
3. To set the **LEFT** aileron motion, move the aileron stick all the way to the left and hold it. The letters **"L/U"** should appear next to the flashing percent sign. Again listen and hit the **Data -Decrease** key until the buzzing stops. If the servo is not buzzing, leave the setting at 100%.

4. To set EPA travel for other channels, press the **Cursor Right** key to select the channel you wish to change. The little triangle moves and indicates the active channel. Repeat these steps with each channel in sequence, taking care to set the travel for both directions. You may set each channel separately, anywhere in between 0% and 125%, and if you wish to rapidly return to the default 100% setting, press the **Active/Inhibit (Clear)** key.
5. Return to the regular operating mode by pressing the two **Edit Up Down** keys simultaneously.

D/R - Dual Rates

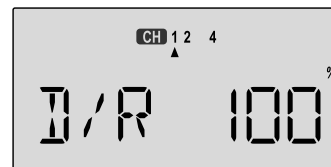
If this is your first computer radio, you may have never been introduced to dual rates before. Dual rates are used because most models respond more rapidly to control inputs while they're flying at higher speeds, and it is possible to be really gentle with the controls and yet still over-control. Dual rates are used to adjust the transmitter so that a control actuated at high speed will not cause a radical response, so they are very useful for beginning pilots as well as experts.

Dual rates are selected by flipping the dual rate switches on the transmitter. The **Optic** has two dual rate switches, one for ailerons and one for elevator, and rudder. The aileron dual rate switch is located over the right-hand stick; the elevator and rudder dual rate switch is located over the left-hand stick. The amount of travel reduction or increase may be set anywhere between 0 and 125%.

Note: if you set the dual rate amount to zero, you will get no response from that channel, which may cause a crash.

Inputting Dual Rate Values

1. Get to the **D/R** screen with the **Edit Up Down** keys.
2. The active channel number is indicated by the arrow above or below the channel numbers. The arrow's position depends on the position of that channel's dual rate switch. In the figure, the aileron (CH1) dual rate setting at the D/R switch's lower position is being programmed.

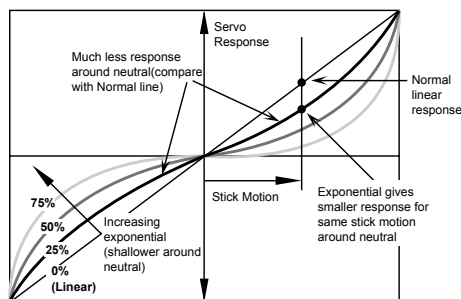


Airplane Model Function Descriptions

3. Use the **Data +Increase** or **-Decrease** key to choose the amount of dual rate for that switch position. You may set the travel for both sides of the switch simply by flipping the switch to the other position (the arrow will also switch sides). If you wish to return to the original 100% value, press the **Active/Inhibit (Clear)** key.
4. Press the **Cursor Right** key to move to another channel you wish to input dual rate settings.
5. Repeat the first three steps for the dual rate settings on the remaining channels. Note that you can leave one side of the dual rate switches alone. This can be used for exponential settings (see next function).
6. Return to the regular operating mode by pressing the two **Edit Up Down** keys simultaneously.

EXP - Exponential

You may be new to exponential settings. "Exponential" refers to a mathematical function where the curve grows steeper the further away from center it gets. Expo is a way to get the effect of dual rates without having to flip a switch. The figure below will help explain this concept.



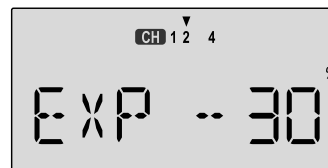
You will notice that exponential has a smooth curve. For this reason it is possible to have low sensitivity at low stick angles (like dual rates), and yet have full motion at full stick deflection. The Optic allows you to have two different values of exponential, chosen by the same dual rate toggle switches on the transmitter, described earlier. You might want to set a dual rate at one switch position with zero exponential, and an exponential value with 100% dual rate at the other. Then you can switch between them in flight and decide which you like better. Later, you can combine both dual rate settings and exponential on a single switch setting.

There are really two kinds of exponential, "positive" and "negative." Negative exponential is the one shown above, and the type of expo most commonly used, where servo movement is softer around neutral. Positive exponential is where the servos are very sensitive around neutral and soft at extremes. It is sometimes used for helicopter tail rotors.

The Optic allows you to set exponential for ailerons, elevator, and rudder.

Setting Exponentials

1. Enter the programming mode by pressing the two **Edit Up Down** keys (the two keys on the far left) at the same time. Press either **Edit Up Down** key until the **EXP** menu appears, as shown.



2. To set exponential for channel 1, move the arrow by pressing the **Cursor Right** or **Left** keys repeatedly until the arrow is under or over the channel number you want. Now switch the appropriate switch up or down, noticing the position of the arrow. You can set two values of exponential, one for each switch position. By pressing the **Data +Increase** or **-Decrease** keys, you can add or subtract from the numerical value displayed. Note that you may pick a value anywhere from -100% to +100%. If you quickly want to get back to the default 0%, press the Active/Inhibit (Clear) key. You should understand that you won't see changes in your model's servo response unless you move the sticks. To get a feel for how exponential works, just hold partial stick and switch the Expo on and off (one side of the switch should be set to zero expo). You'll see how it affects the servo travel.
3. The values you set for exponential are highly dependent on both the model and pilot's preference. I normally recommend a start value of about -10% to -20%, and many test flights, slowly increasing the number until things are "right". Obviously this depends on the pilot and model so go ahead and fly it with Expo only on one side of the switch, turn it on and off during flight, and change things to suit yourself. Or don't use it at all if you don't like it - it's not for everyone.
4. Repeat this procedure for the expo settings on the other remaining channels.
5. Return to the regular operating mode by pressing the two **Edit Up Down** keys simultaneously.

S.TRM - Subtrim Settings

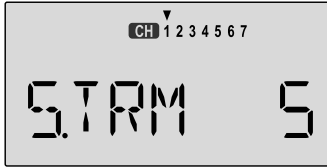
The Subtrim window is used to make small adjustments or corrections in the neutral position of each servo, independent of the digital trim buttons. The recommended procedure is to zero out both the trims (see settings menu) and the subtrims (this menu). Then, one mounts the servo arms and sets up linkages so that the neutral position of each control surface is as close to where it should be as possible, with the arm 90° to the pushrod. Finally, small amounts of subtrim are used to make fine corrections. We recommend that you try to keep all of the subtrim values of as small as possible. Otherwise, when the

Airplane Model Function Descriptions

subtrims are large values, the servo's full range of travel may be restricted.

Setting Subtrims

1. Use the **Edit Up Down** keys to call up the **STRM** window.



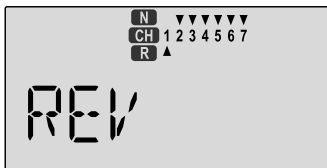
2. Press the **Cursor Right** or **Left** key until the small arrow is above the channel you wish to adjust (the figure shows subtrim adjustment for **CH1**).
3. Adjust the neutral position using the **Data +Increase** or **-Decrease** keys. You may adjust between -100% and +100%. If you want to reset the value back to zero, press the **Active/Inhibit (Clear)** key.
4. Repeat steps 2 and 3 for each channel to be adjusted in turn.
5. Return to the regular operating mode by pressing the two **Edit Up Down** keys simultaneously.

REV - Servo Reversing

The servo reverse function may be used when you need to change the direction that a servo responds to a control stick motion. When you use this function, **BE SURE THAT YOUR CONTROL IS MOVING THE CORRECT DIRECTION**. If you are using any preprogrammed mixers such as flaperon, be sure to set correct travels in the REV menu setting up the preprogrammed function.

Reversing Servos

1. Get to the **REV** screen with the **Edit Up Down** keys.
2. Use the **Data +Increase** or **-Decrease** key to select the channel you wish to reverse. The active channel number will flash.



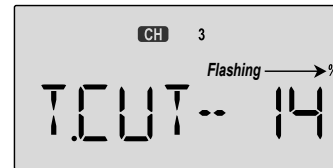
3. Toggle between normal (**N**) and reverse (**R**) with the **Active/Inhibit (Clear)** key. The arrow above the number indicates normal travel, while the arrow below indicates reversed travel (the figure shows all channels normal, none reversed).
4. Repeat this procedure for each channel needing to be reversed.
5. Return to the regular operating mode by pressing the two **Edit Up Down** keys simultaneously.

T.CUT - Throttle Cut (Engine Kill) Function

The **Throttle Cut** function provides you an easy way to stop the engine by simply pressing a button with the throttle stick at idle, which commands the throttle servo to move a prescribed amount. The throttle servo moves to the selected cut position when the Cut button is pressed and the throttle stick is below 50%. Above 50% throttle, the cut button has no effect. The activation direction may be chosen by the owner.

Setting up the Throttle Cut function

1. Get to the **T.CUT** screen with the **Edit Up Down** keys.
2. Place the throttle stick at its idle position (towards bottom of transmitter). Use the **Data -Decrease** key to select the amount of motion of the throttle servo you wish - normally you want to completely close the carburetor, but be careful not to choose too much travel that might stall the servo. You may see the servo move when you press the **Active/Inhibit (Clear)** button. A maximum of 50% may be chosen, but only use the amount you need to fully close the carburetor without stalling the servo.



3. Return to the regular operating mode by pressing the two **Edit Up Down** keys simultaneously.

Note: the throttle servo will be disabled for a 2-3 second period after the throttle cut button is pressed.

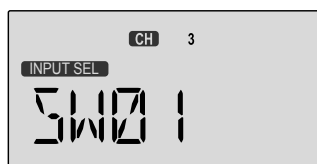
Note: The throttle cut function does not operate if Switch 01 controls the throttle (see below).

STCK - Throttle Location

Your **Optic** system has a unique feature that allows you to choose whether the throttle control plugged into channel 3 is activated by the throttle stick or by Switch SW01 (the switch labeled "Elev Rudd D/R" on the top left of the front of the transmitter). If you are flying an electric-powered model or some other model that only needs the throttle to be on or off, you can use this function.

Setting the Throttle Location

1. Use the **Edit Up Down** arrow keys to select the **STCK** window. The window will either display the **STCK** display, indicating the throttle stick controls channel 3, or the **SW01** display, indicating the switch controls it.



Airplane Model Function Descriptions

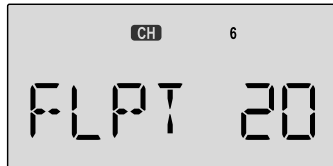
2. Press the **CLEAR** key to switch between the two possible settings.
3. If you choose the Switch SW-01 control setting, be sure the switch is in the OFF position before you switch on the airborne system. This is to ensure you do not accidentally turn on full throttle.

FLPT - Flap Travel Function

The Flap Travel function is used to specify the amount of flap travel produced by motion of the flap control (the **Left lever**). If flaperon is inactive, the Right lever may be used to trim the flap position. With flaperons active, the Right lever controls the motion of both flaperons.

Setting Flap Travel function

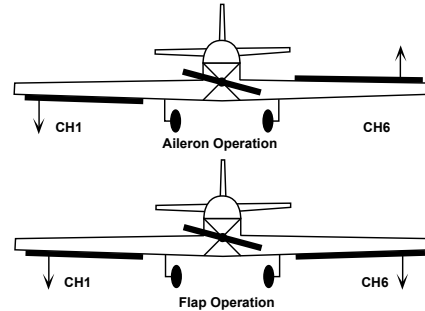
1. Use the **Edit Up Down** arrow keys to select the **FLPT** window. The number in the display may be different.



2. Press the **Data +Increase** or **-Decrease** key to input your desired flap motion setting. The 30% default value produces "reasonable" travel for many models, but you must try it out on your own model to be sure. A 100% setting causes extreme travel and is not recommended as it can cause the servos to bind or excessive trim changes. You may want to set it to a smaller number, say 10% for starters. If you wish to return to the default 30% setting, press the **Active/Inhibit (Clear)** key. You can toggle through the settings 0%, 30%, and 100% by continuing to press this key. Setting it to 0% disables the Right lever control, but the flaps will still respond to mixing functions such as **E->F** and to the **Landing** function.

FLPN - Flaperon Mixing

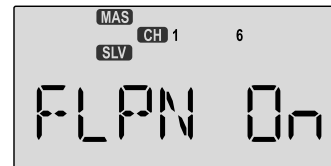
The Flaperon mixing function uses two servos to individually control two ailerons, combining the aileron function with the flap function. Both ailerons can be raised and lowered simultaneously for a flap effect. Of course, aileron function, where the two controls move in different directions, is also performed. The down travel of the left and right ailerons can be adjusted, so you can also get a differential effect. (Left and right flap travel are adjusted individually in the EPA menu.) To take advantage of the flaperon mixing function, you'll need to connect the right aileron servo to CH1 (AIL) and the left aileron servo to CH6 (FLP).



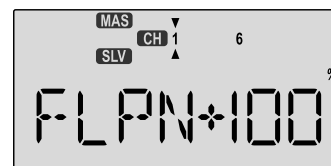
You can combine the flaperon function with the landing function (**LAND**), to get steeper descents without building up airspeed. This is very convenient for making short approaches on small fields. Note that you cannot have both flaperon and elevon mixing active at the same time.

Setting up the Flaperon function

1. The right flaperon servo should be plugged into **CH1**, and the left flaperon servo should be plugged into **CH6**.
2. Press one of the **Up Down Edit** buttons repeatedly to select the **FLPN** window. The **INH** indicator will show.
3. Press the **Active/Inhibit (Clear)** key to activate the flaperon function. This will show the **On** indicator.

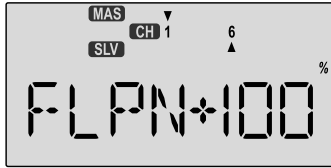


4. Press the **Cursor Right** key once. A small arrow is displayed over the numeral **1**, representing aileron master channel, and the percent indicator will blink on and off. A small arrow is displayed under the numeral **1**, which tells us we're setting the right (**CH1**) flaperon servo. Move the aileron stick all the way to the right, and check that both flaperons move the right direction. If the right (**CH1**) flaperon moves the wrong way, change the its travel direction by holding the stick to the right, pressing the **Active/Inhibit (Clear)** key, then pressing the **Data -Decrease** key until you reach -100%. This will also change the travel for the left stick motion.

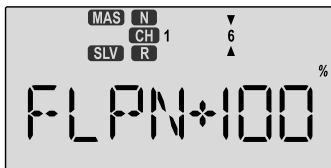


Airplane Model Function Descriptions

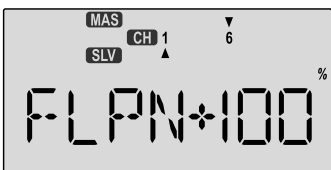
5. If the left (**CH6**) flaperon moves correctly with aileron stick, go to the next step. Otherwise, change the its travel direction by pressing the **Cursor Right** key (the little arrow moves under the **6**), press the **Active/Inhibit (Clear)** key (sets 0%), then press the **Data -Decrease** key until you reach -100%.



6. Now you'll input the amount of flap response on the flaperons. The flap motion is commanded by the **Right Lever** on the right side of the case (near your right-hand index finger), and both flaperons should move the same direction when you move the lever. Press the **Cursor Right** key one time, so the little arrow moves over the **6** indicating flaps are now the master channel. Note the arrow under the **6** as well, indicating left (**CH6**) flaperon. Now you may adjust the amount of left flaperon travel with the **Data +Increase** and **-Decrease** keys. Press **Active/Inhibit (Clear)** key if you wish to reset to 0%). You may need to choose negative values to get the control to travel the correct direction.



7. Now you'll input the amount of flap lever response on the right (**CH1**) flaperon by pressing the **Cursor Right** key once. Now the little arrow moves under the 1, and you may adjust the amount of right flaperon travel with the **Data +Increase** and **-Decrease** keys.



8. You may wish to set aileron differential. Aileron differential means that each aileron has more travel in the 'up' direction than the 'down' direction. Normally the down travel is reduced to about half of the up travel, especially on slower-flying models. Press the **Cursor Right** key two times, so the little arrows move over and under the **1** indicating aileron stick is again the master channel. The arrow under the **1** indicates the right (**CH1**) flaperon. Move the stick to the LEFT and press the **Data -Decrease** key until you get to 50-75%. If you need even more differential, you can choose as low

as 0% down, and the ailerons will move up only.

This is preferred over reducing the up travel, which reduces the roll rate.

9. You must repeat this procedure for the left flaperon also.

Press the **Cursor Right** key one time, so the little arrow moves under the 6 indicating the left (**CH6**) flaperon. Move the stick to the Right and as before, press the **Data -Decrease** key until you get to 50-75%.

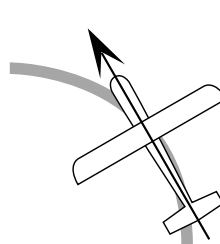
ADIF - Aileron Differential

Before we explain why we use differential, please note that this function drives two aileron servos out of channels 1 and 5. So **if you have a five-channel receiver, use the ADIF function to set up your model.**

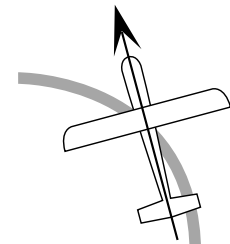
Ailerons are used to roll or bank the aircraft's wing, but making a roll or turn has a price. A wing that generates lift also generates a drag component called induced drag, meaning that drag is induced as a byproduct of the lifting wing. This means that the wing that is lifting more is also dragging more, and the resulting drag difference causes the fuselage of the model to yaw away from the desired turn direction, exactly the wrong thing to have happen. This causes even more drag, which can really hurt an aircraft's performance. There are two ways to reduce the yaw of the fuselage, differential (**ADIF**) and rudder coupling (**A->R**). Both should be used together.

Aileron differential causes the ailerons to automatically move with more UP than DOWN motion, which helps to reduce induced drag. It helps, along with rudder-coupling, to make the fuselage point straight into the oncoming air stream (this is also called "coordinating the turn").

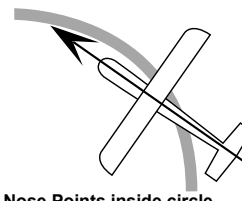
The amount of differential is highly dependent on the model configuration. A good starting point is for the down aileron to move 50% to 75% as much as the up-moving aileron.



Coordinated turn
fuseline up with turn direction
(don't change anything!)



Nose Points outside Circle
increase coupling and/or differential

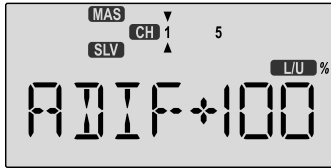


Nose Points inside circle
Too much coupling or differential.
Reduce one or both.

Airplane Model Function Descriptions

Setting Up Differential

1. Press one of the **Up Down Edit** buttons repeatedly to select the **ADIF** window. To begin with, the function is already activated, but it's set to 100% on both sides so there is no differential.



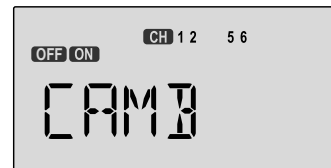
2. A small arrow is displayed under the numeral **1**, showing that CH1 is the affected channel. To set the differential for the right aileron (**CH1**) down travel, hold the aileron stick to the left side (display shows **L/U**), and press the **Data Decrease** key (the right aileron moves down when left aileron stick is commanded). Continue reducing the percentage until you reach about **60%** to **70%**.
3. Make sure that the up travel for the first aileron (CH1) stays at 100% by holding the aileron stick to the right side (display shows **R/D**) and verifying that the display shows **100%**.
4. Press the **Cursor Right** key once, to get to the left aileron (**CH5**) setting menu. A small arrow is displayed under the numeral **5**, showing that CH5 is the affected channel.
5. Move the aileron stick to the right (display shows **R/D**), and press the **Data Decrease** key reducing the percentage until you reach about **60%** to **70%**.
6. Make sure that the up travel for the second aileron (CH5) stays at 100% by holding the aileron stick to the left side (display shows **L/U**) and verifying that the display shows **100%**.
7. If for some reason you want a 0% setting, press the **Active /Inhibit (Clear)** key. This is the maximum amount of differential you can get, but will reduce the roll rate if selected.

CAMB - Camber Control

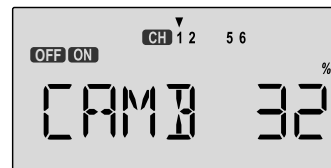
Your **Optic** system contains a special mixing function called "Camber." You may use the **Camber** function to select a group of preset positions for channels 1, 2, and 6 (1, 2, 5, and 6 if **ADIF** is activated). This is used for models requiring these presets for certain flying conditions. For example, many sailplanes use drooped ailerons and flaps to maximize their climb during launch. Scale models might drop ailerons and flaps for slower, more realistic flight.

Setting up Camber function

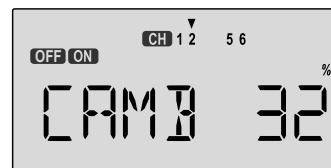
1. Use the **Edit Up Down** arrow keys to select the **CAMB** window. Depending on the position of the **FLT MODE** (SW-3) switch, the display will show a flashing **OFF** or **ON**. The **FLT MODE** (SW-4) switch turns **CAMB on** when all the way forward.



2. First the amount of Right or first aileron offset is programmed. Press the **Cursor Right** key to get a small arrow displayed over the numeral **1** (representing first aileron). You may adjust the amount of travel with the **Data +Increase** and **-Decrease** keys. You may use anywhere between -100% and +100%, but a small value of $\pm 10\%$ or less is the recommended starting value. Be careful as this may have a significant effect on the model's trim. Press the **Active/Inhibit (Clear)** key if you wish to reset to 0%.

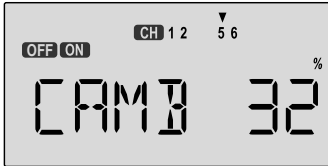


3. Next, the amount of elevator offset is programmed. A small arrow is displayed over the numeral **2** (representing elevator). You may adjust the amount of travel with the **Data +Increase** and **-Decrease** keys. You may use anywhere between -100% and +100%, but a small value of $\pm 10\%$ or less is the recommended starting value. Be careful as this has a very powerful effect on the model's trim. Press the **Active/Inhibit (Clear)** key if you wish to reset to 0%.

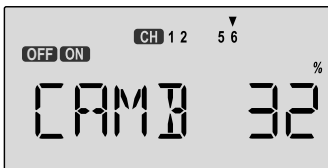


Airplane Model Function Descriptions

4. To get to the second aileron travel setting, press the **Cursor Right** key. The small triangle is now displayed above the numeral **5**, indicating the flap channel. You may input any desired flap travel with the **Data +Increase** and **-Decrease** keys. The default is 0%, and you may set this anywhere from -100 to +100% (check that there is no binding with large flap deflections and aileron commands). With flaperons, large motions should also be avoided because of reduced aileron effectiveness. You may return to the 0% settings by hitting the **Active/Inhibit (Clear)** key.



5. To get to the flap travel setting, press the **Cursor Right** key. The small triangle is now displayed above the numeral **6**, indicating the flap channel. You may input any desired flap travel with the **Data +Increase** and **-Decrease** keys. The default is 0%, and you may set this anywhere from -100 to +100% (check that there is no binding with large flap deflections and aileron commands). You may return to the 0% settings by hitting the **Active/Inhibit (Clear)** key.



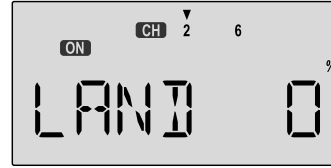
Note: At first, be very cautious using the CAMB function when you are flying slowly, as there could be a loss of roll authority. Check out how it works at high altitude first.

LAND - Landing Function

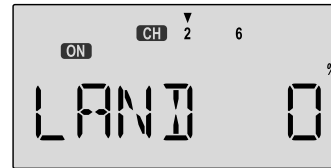
The **LAND** function simultaneously moves the flap and elevator servos to defined positions to help make steep descents or limit airspeed in dives. The controls move to the defined positions by flipping the **FLT MODE SW-4** switch fully **AFT**. If your model has a single flap servo on CH6, the flap is dropped. If flaperons are active, you'll want to raise both to prevent tip-stalling with some up-elevator to compensate, but you may want to experiment with small values of down flaperons to slow the model down. Use the elevator offset to maintain pitch trim when the landing function is turned on.

Setting up Landing function

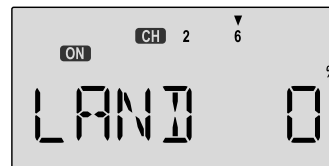
1. Use the **Edit Up Down** arrow keys to select the **LAND** window. Depending on the position of the landing switch, the display will show a flashing **OFF** or **ON**. The **Fit. Mode (SW-4)** switch turns **on LAND** when all the way **AFT**.



2. First the amount of elevator offset is programmed. A small arrow is displayed over the numeral **2** (representing elevator). You may adjust the amount of travel with the **Data +Increase** and **-Decrease** keys. You may use anywhere between -100% and +100%, but a small value of $\pm 10\%$ or less is the recommended starting value. Be careful as this has a very powerful effect on the model's trim. Press the **Active/Inhibit (Clear)** key if you wish to reset to 0%.



3. To get to the flap travel setting, press the **Cursor Right** key. The small triangle is now displayed above the numeral **6**, indicating the flap channel. You may input any desired flap travel with the **Data +Increase** and **-Decrease** keys. The default is 0%, and you may set this anywhere from -100 to +100% (check that there is no binding with large flap deflections and aileron commands). With flaperons, large motions should also be avoided because of reduced aileron effectiveness. You may return to the 0% settings by hitting the **Active/Inhibit (Clear)** key.

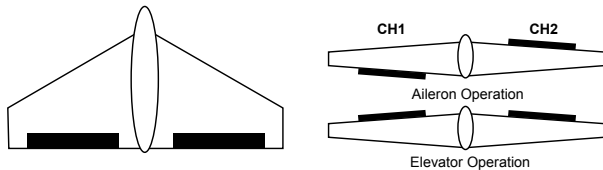


Note: At first, be very cautious using the LAND function when you are flying slowly, as there could be a loss of roll authority. Check out how it works at high altitude first.

Airplane Model Function Descriptions

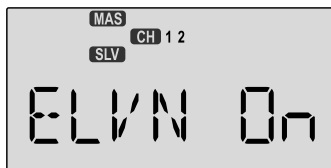
ELVN - Elevon Mixing

The **Elevon** function should be used with delta wings, flying wings, and other tailless aircraft whose layouts combine the aileron and elevator functions, and requires one servo for each elevon. Connect the right elevon to receiver **CH1** and the left elevon to **CH2**. The amount of aileron and elevator response can be adjusted independently. However, if you program in too much elevator or aileron travel, the servos may reach their travel limits before full stick motion has occurred. The default values for this mixer are 100%, but **you may want to keep the travel settings at 50% or below** because most elevon planes are very sensitive, and adjust the control linkages to get the travel you desire. Note that you cannot use either flaperon or V-tail mixing when elevon mixing is active.

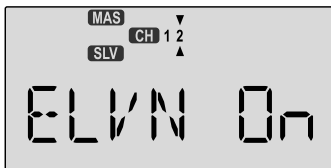


Setting up elevon mixing

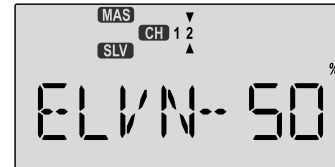
1. The right elevon should be plugged into **CH1**, and the left elevon should be plugged into **CH2**.
2. Press one of the **Up Down Edit** buttons repeatedly to select the **ELVN** window.
3. To activate, press the **Active/Inhibit (Clear)** key. The letters "INH" will turn to "On."



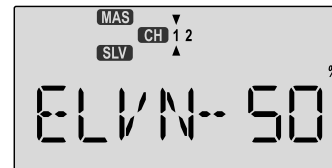
4. Press the **Cursor Right** key once, to get to the elevator travel setting menu. A small arrow is displayed over the numeral **2** represents elevator master channel, and the percent indicator will blink on and off. The little arrow below the **2** indicates left elevon is being set.



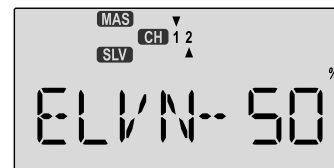
5. Move the elevator stick all the way to the back (full up position): both elevons should move upwards like elevators. If the left (**CH2**) elevon moves down, change the its travel direction by pressing the **Active/Inhibit (Clear)** key to get 0% quickly, then pressing the **Data -Decrease** key until you reach -50%.



6. If the right (CH1) elevon moves down with up elevator stick, change the its travel direction by pressing the **Cursor Right** key (the little arrow moves under the 1), then press the **Data -Decrease** key until you reach -50%. Otherwise, continue.
7. Now you'll input the amount of aileron stick response on the right (CH1) elevon by pressing the **Cursor Right** key once. Now the little arrows move both over and under the 1, and you may adjust the amount of right elevon travel with the **Data +Increase** and **-Decrease** keys. 50% is a good starting point. As before, change the sign and use -50% if it travels the wrong way with aileron stick.



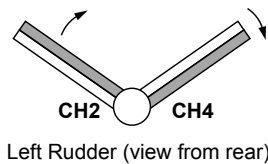
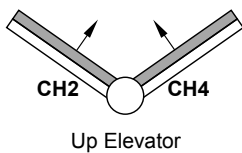
8. Now you'll input the amount of aileron stick response on the left (**CH2**) elevon by pressing the **Cursor Right** key once. Now the little arrow moves under the **2**, and you may adjust the amount of left elevon travel with the **Data +Increase** and **-Decrease** keys. 50% is a good starting point. Change the sign if travel needs to be reversed.



Airplane Model Function Descriptions

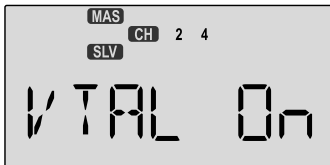
VTAL - V-Tail Mixing

V-tail mixing is used with V-tail aircraft so that both elevator and rudder functions are combined for the two tail surfaces, called "ruddervators." The response to both elevator and rudder inputs can be adjusted independently. However, if you program in too much elevator or rudder travel, when both rudder and elevator are commanded the servos may reach their travel limits before full stick motion has occurred. Therefore, you should keep the travel settings at 50% or below and adjust the control linkages to get the travel you desire. Note that you cannot have both V-tail and elevon mixing active at the same time.

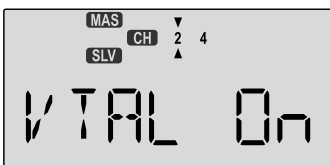


Setting up V-Tail mixing

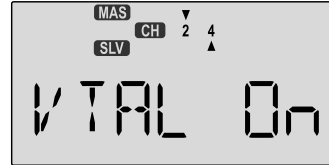
1. The right ruddervator should be plugged into **CH2**, and the left ruddervator should be plugged into **CH4**.
2. Press one of the **Up Down Edit** buttons repeatedly to select the **VTAL** window. The **INH** indicator will show.
3. Press the **Active/Inhibit (Clear)** key to activate the V-tail function. The display will show **On**.



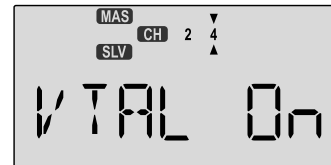
4. Press the **Cursor Right** key once, to get to the elevator setting menu. A small arrow is displayed over the numeral **2**, representing elevator master channel, and under the numeral **2**, indicating the right (**CH2**) ruddervator, and the percent indicator will blink on and off. Move the elevator stick all the way to the back (full up position): both ruddervators should move upwards. If the right (**CH2**) ruddervator moves down, change the its travel direction by pressing the **Active/Inhibit (Clear)** key, then pressing the **Data -Decrease** key until you reach -50%.



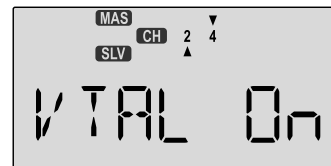
5. If the left (**CH4**) ruddervator moves down with up elevator stick, change the its travel direction by pressing the **Cursor Right** key (the bottom arrow moves under the **4**), the **Active/Inhibit (Clear)** key (sets 0%), then press the **Data -Decrease** key until you reach -50%. Otherwise, continue.



6. Now you'll input the amount of rudder stick response on the left (**CH4**) ruddervator by pressing the **Cursor Right** key once. Now the little arrows move both over and under the **4**, and you may adjust the amount of left ruddervator travel with the **Data +Increase** and **-Decrease** keys. 50% is a good starting point. Press **Active/Inhibit (Clear)** key if you wish to reset to 0%.



7. Now you'll input the amount of rudder stick response on the right (**CH2**) ruddervator by pressing the **Cursor Right** key once. Now the little arrow moves under the **2**, and you may adjust the amount of right ruddervator travel with the **Data +Increase** and **-Decrease** keys. 50% is a good starting point. Press **Active/Inhibit (Clear)** key if you wish to reset to 0%.

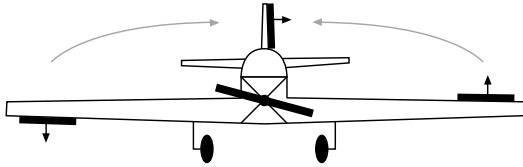


8. Remember to be sure not to have so much travel as to cause binding when both elevator and rudder are commanded simultaneously.

Airplane Model Function Descriptions

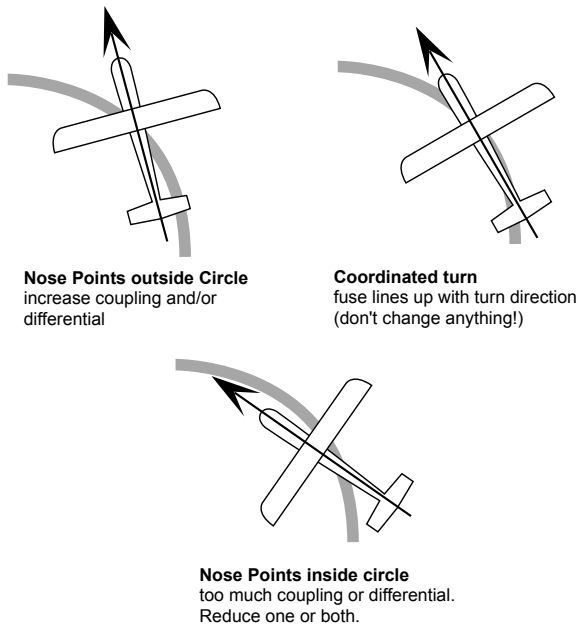
A->R - Aileron Rudder Mixing

Aileron-to-rudder mixing is a function that causes the rudder to move automatically with the motion of the aileron stick. This is done because when ailerons are used to command a turn, the down-moving aileron has more drag than the up-moving one, so the plane's fuselage tries to yaw against the turn. Adding rudder mixing cures this problem by making the fuselage point straight into the oncoming air stream (this is also called "coordinating the turn").



The slower the model flies, the more mixing is needed, and the faster it moves, the less is needed. It is ideal to make slow-flying scale models fly realistically. The amount of coupling is highly dependent on the model configuration. Usually only a small amount of rudder is needed. It will also help to set up some aileron differential using the **EPA** menus. A good starting point is to limit the ailerons' down motion to 50% to 75% of the up-moving aileron's motion.

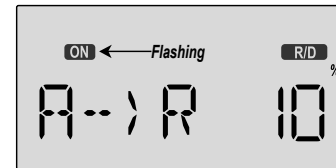
The aileron-to-rudder mixing function may be on always, or may be turned on and off using **Switches 1, 2, 3, or 4**. You may choose how in the **S/W SEL** menu.



Setting Up A->R Mixing (Rudder Coupling)

1. Press one of the **Up Down Edit** buttons until the **A->R** window appears, as shown. The default is for the function to be inhibited, as shown. To activate, press the **Active/Inhibit (Clear)** key. The letters "INH" will turn to "0," and

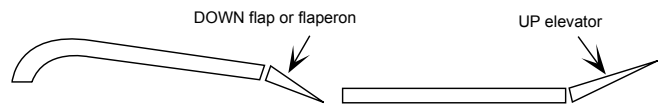
either the **ON** indicator or the **OFF** indicator will be flashing, depending on the position of the ON-OFF switch that is selected. See the Switch Select instructions on P. 39 for information on how to select the ON-OFF switch.



2. Press the **Cursor Right** key once, and the **Percent** sign will be flashing. Move the aileron stick all the way to the right, and adjust the **R/D** mixing amount by pressing the **Data +Increase** or **-Decrease** key. You may set any amount between -100 and 100% (an initial value of 10-20% is suggested). To return to the initial 0% value, press the **Active/Inhibit (Clear)** key.
3. Move the aileron stick all the way to the left, and adjust the **L/U** mixing amount in the same way. To return to the initial 0% value, press the **Active/Inhibit (Clear)** key.

E->F - Elevator Flap Mixing

Elevator-to-flap mixing makes the flaps drop or rise whenever you pull on the elevator stick. It is used to make tighter "pylon" turns or squarer corners in maneuvers. Elevator-to-flap mixing is set up so that the flaps droop (are lowered) when up elevator is commanded.

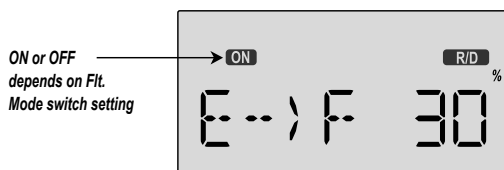


Notice that this mixing function works with the flaperon setting. If flaperon mixing (**FLPN**) AND **E->F** mixing are activated, when you pull up elevator, BOTH ailerons will droop. This function is turned on with the **Fit. Mode** (SW-4) switch fully **forward**.

Setting Up E->F Mixing

1. Press one of the **Up Down Edit** buttons until the **E->F** window appears. The default is for the function to be inhibited. To activate, press the **Active/Inhibit (Clear)** key. This will cause the **INH** display to change to a number display, and either **ON** or **OFF** will be flashing either the ON indicator or the OFF indicator will be flashing, depending on the position of the ON-OFF switch that is selected. See the **Switch Select** instructions on P. 39 for information on how to select the ON-OFF switch.

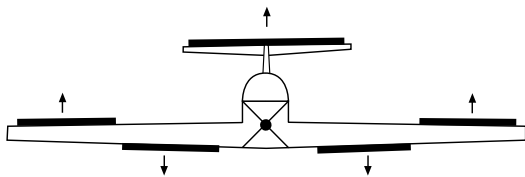
Airplane Model Function Descriptions



2. Press the **Cursor Right** key to get the percent sign flashing, then press the **Data +Increase** and **-Decrease** keys to increase or decrease the amount of mixing. Check the direction the flaps move with elevator stick: with up elevator, the flaps should droop downwards, and for down elevator they should come up. In other words, they should move opposite the elevator motion. If they don't, use the **Data +Increase** and **-Decrease** keys to change the sign in front of the percentage number. You should probably start with a smaller number (say 20% or so) and slowly increase it to learn how the model reacts. Remember the position of the **Flt. Mode (SW-4)** switch turns this function on and off (fully aft turns it **ON**).

CROW - Crow Mixing (Airbrakes)

The **Crow** mixing function is useful for increasing the drag of a model during landing approaches, which makes the approach steeper and slower, making landings shorter and easier. This is especially useful for stunt planes and sailplanes to help make precision landings. **You may select the switch that turns on the Crow function, and the function is commanded proportionally by the Left Lever position.** You can move the lever a small or large amount and get a small or large travel (unlike **Camber** which provides a fixed amount of motion). Ailerons, elevator, and flaps are the three controls that are commanded by **Crow** function, which is also called "butterfly" in the sailplane world.



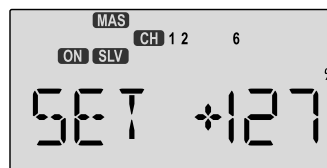
The idea of the **crow** function is to simultaneously **raise** the ailerons (which reduces the wing's lift), and **drop** the flaps (to regain the lift lost by the up aileron movement). Elevator motion may also be also commanded if needed to prevent a trim change induced by the flap and aileron motion. Normally, crow is set up so that the maximum control movements (maximum

drag) occur at "low" **slider** position (towards the bottom of the transmitter). The **selected ON-OFF** switch must be **ON** for Crow to operate.

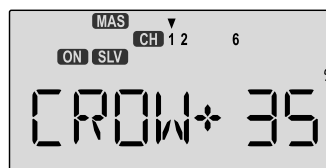
Note: activating CROW automatically turns CH5 into a second aileron servo, and CH6 becomes a flap servo commanded by the Right slider if FLPT is not set to zero.

Setting Up Crow Mixing

1. Start by locating the **CROW** menu with the **Up Down Edit** keys. Either the **ON** or **OFF** display will be flashing, depending on the position of the Gear switch SW-2 (forward is on).
2. First set the **CROW** function activation point. Hit the **Cursor Left** key one time to get to the **SET** menu. Now move the left lever all the way up. Enter that position by pressing the **Clear Active/Inhibit** key. The display should read a number around **+125%**.

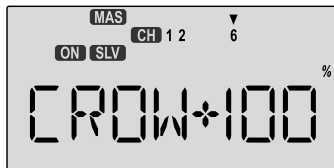


3. Make sure **CROW** is **ON** by moving the Crow on-off switch to its **ON position**. Verify by looking at the flashing ON/OFF indicator. Either the **ON** indicator or the **OFF** indicator will be flashing, depending on the position of the ON-OFF switch that is selected. See the **Switch Select** instructions on P. 39 for information on how to select the ON-OFF switch.
4. Next, set up the throws for the first aileron. Press the **Cursor right** key two times to get to the aileron setting menu (a small arrow will appear over the number **1** in the display). Press the **Data +Increase** or **-Decrease** keys to adjust the amount of aileron motion. Move the Left lever all the way down and be sure the ailerons go **UP**. If they don't, press the **Clear Active/Inhibit** key and then press the **Data** keys change the sign. You'll probably want a fair amount, but not all, of aileron travel. Be sure not to use full travel, so you'll have roll authority while on approach in full crow command. Notice that you set the throw for both ailerons at the same time: this is the reason to have identical control arm lengths and identical neutral positions.



Airplane Model Function Descriptions

- Now press the **Cursor right** key one time to get to the elevator setting menu (a small arrow will appear over the number 2 in the display). Press the **Data +Increase or -Decrease** keys to set up the throws for the elevator as desired. Move the left lever and be sure the elevator goes **down** with crow. If it doesn't, change the sign (this may depend on servo orientation). You probably should not use much elevator motion until you determine if Crow changes the trim.
- Now press the **Cursor right** key one time to get to the second aileron setting menu (a small arrow will appear over the number 5 in the display). Press the **Data +Increase or -Decrease** keys to set up the throws for the second aileron as desired. Move the left lever and be sure the second aileron goes **UP** with crow. If it doesn't, change the sign (this may depend on servo orientation). Be sure to set both aileron offsets to be the same.
- Now press the **Cursor right** key one time to get to the flap menu (a small arrow will appear over the number 6 in the display). Press the **Data +Increase or -Decrease** keys to set up the throws for the flaps as desired. Move the Left lever and be sure the flaps go **down** with crow. If they don't, change the sign (this may depend on servo orientation). You'll probably want as much flap motion as possible - 90 is great if you can get it. Like the ailerons, you set both flap offsets at the same time.



- If you can't get enough travel, go to the **EPA** menu and be sure channel 6 is set as high as possible to get 90° flap travel. Of course, you can reduce them to get the amount of travel that you'd like at full crow in the EPA menu, but this is better done in the Crow menu as given in the previous step. It may be helpful to use long servo arms on the flap servos to increase their effective throw. For starters, use zero or very little elevator compensation until you fly and determine what is needed: if the model pitches up with crow, add down elevator compensation and if it pitches downwards, add some up compensation. Make only small changes in compensation because it has a big effect on trim. Remember to try your crow setup out at higher altitudes to verify that the trim doesn't change rapidly. If you want to steepen the descent, increase the flap downward deflection while increasing the up aileron movement.

Caution: when setting up crow, do not call for too much aileron "up" travel, or you'll lose roll authority, and this occurs at a crucial time, when your model is flying relatively slowly on a landing approach. Always make changes in small increments, don't try to do it "all at once."

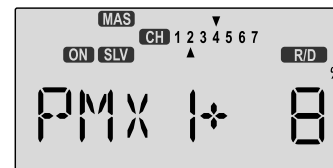
PMX1, PMX2 - Programmable Mixes 1 and 2

Your **Optic** system contains TWO independent programmable mixers (**PMX1** and **PMX2**) with unique capabilities. You may use mixing to correct unwanted tendencies of the aircraft during aerobatics, takeoff, or landing, or some special maneuver of your own choosing. Each mixer may be programmed to do things that are not built-in programs. This makes them useful for all sorts of different things. Note that the mixers may be programmed to be turned on by flipping a selected switch, or to be on all the time.

You may also use the mixers for correcting unwanted flying tendencies, like automatically applying a bit of rudder with throttle to account for torque/P-factor effects, to a corrective elevator motion during knife-edge flight to correct for an undesired tucking tendency (the latter is described in the **ACGL** model setup section and below).

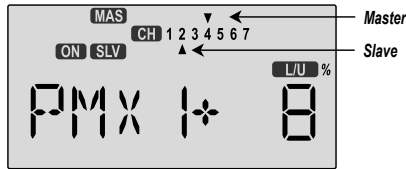
Using the Programmable mixers

- Call up the mixer screen by repeatedly pressing one of the **Edit Up Down** keys until a **PMX** window appears. The default is for the function to be inhibited. To activate, press the **Active/Inhibit (Clear)** key. This will cause the **INH** display to change to a display showing 100%, Master and Slave indicators, and a flashing **ON** or **OFF** depending on the position of the ON-OFF switch that is selected. See the Switch Select instructions on P. 39 for information on how to select the ON-OFF switch. Be sure the **PMIX** is **ON** so you can see the results of your programming. The default switch for **PMIX 1** is SW-3 and default for **PMIX 2** is SW-1.



- Now you'll select the **Master** channel for the mixing, the channel that causes the mixing to occur. Press the **Cursor Right** key to get the master channel indicator **MAS** flashing on and off, then press the **Data +Increase or -Decrease** keys to move the top arrow over the number of the desired master channel, 1 - 6.

Airplane Model Function Descriptions



- Next you'll put in the **Slave** channel, the one that is affected by motion of the master channel. Press the **Cursor Right** key to get slave channel indicator **SLV** flashing on and off, then press the **Data +Increase** or **-Decrease** keys to move the bottom arrow underneath the number of the desired slave channel.
- Now you'll input the mixing percentage, which tells how much the slave channel responds to the master channel. Press the **Cursor Right** key to cause the percent (%) sign to the right of the large number to flash on and off. Note that you can set the percentage for the mixer on each side of the master channel's control's motion by moving the master channel's control back and forth. The motion of the master channel's control is also indicated by the R/D (= Right/Down) or L/U (= Left/Up) indicator in the window.
- Hold the master channel's control to one side, and then use the **Data +Increase** or **-Decrease** key to change the percentage for the mixer. Verify that you get the proper motion of the slave channel when you move the master. If you don't get a response to the master movement, check that the mixer is turned **on** with its on-off switch. Change the percentage if the amount of travel is incorrect. If you want to set the percentage to ZERO, press the **Active/Inhibit (Clear)** key.
- Move the master control to the other side of its travel and then repeat the actions in the previous step to set the amount of mixing on the other side. Use the **Data +Increase** or **-Decrease** key to change the percentage for the mixer until you get the response you want for the second side.

[Knife-Edge Example: for a model that tucks during knife-edge flight, set up a mixer with **Master = 4** (Rudder), and **Slave = 2** (elevator). You want to get up elevator mixed in for either direction of full rudder. Therefore, you'll set **plus** mixing on one side of the rudder stick, and **minus** mixing on the other side. Normally only 5% to 10% mixing is needed to solve this problem.

S/W SEL - Switch Selection For Auxiliary Functions

Your Optic system allows you to customize your radio and choose what switches are used to turn on the following functions: **A->R**, **E->F**, **CAMB**, **CROW**, **LAND**, **PMX1**, and **PMX2**. Note that each of these functions may be chosen to be turned on by flipping a switch, or to be on all the time.

Choosing The On-Off Switch For Certain Radio Functions

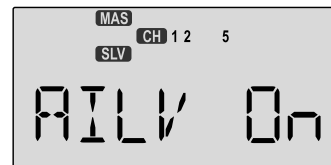
- Call up the **Switch Select** screen by repeatedly pressing one of the Edit Up Down keys until the highlighted words **S/W SEL** appear. The window may appear with any of the following displayed: **A->R**, **E->F**, **CAMB**, **CROW**, **LAND**, **PMX1**, and **PMX2**.
- Use the **Data +Increase** or **-Decrease** keys to select the desired function.
- Use the Left Right Cursor keys to select from the following on-off possibilities for the selected function
 - On** indicates the function is ALWAYS on.
 - 1** represents Switch SW-1, the "ELEV RUDD D/R" switch. On is **down**.
 - 2** represents Switch SW-2, the "GEAR AUX" switch. On is **down**.
 - 3** represents Switch SW-3, the "AIL D/R" switch. On is **down**.
 - 4** represents Switch SW-4, the "FLT MODE" switch. The FLT MODE switch has three positions to select from:
 - NOR** = on at **forward** position
 - ST1** = on at **middle** position
 - ST2** = on at **aft** position
- Repeat Steps 2-3 for any additional functions you wish to set.

AILV - Ailevator Function

Your **Optic** system contains special programming to allow you to fly a model with two independent elevator servos which respond together to the elevator stick, and in opposite directions to the aileron stick. This combination of aileron and elevator results in the name "ailevator" and allows you to do torque rolls with 3-D aircraft! Note that the **AILV** function is on all the time once it is activated.

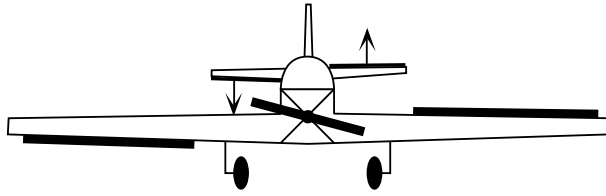
Setting Up the Ailevator Function

- This function requires two elevator servos, one for each side. Plug the right elevator servo into channel 2, and the second elevator servo into channel 5. If you need retracts, you will have to use the output from channel 6.
- Call up the mixer screen by repeatedly pressing the **Edit Up** or **Down** key until the **AILV** window appears. The default is for the function to be inhibited. To activate, press the **CLEAR** key. This will cause the **AILV INH** display to change to **AILV ON**. **AILV** is not a switch able function, it is either **ON** or **OFF**.

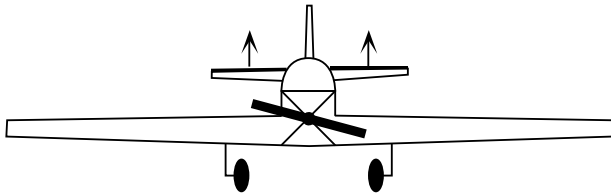


Airplane Model Function Descriptions

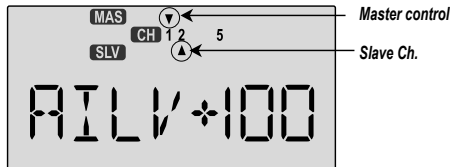
3. Move the stick to command aileron. In addition to the aileron servo(s), both elevator servos should move. They may move in opposite directions (as they should) or the same direction (instructions for correcting this are below).



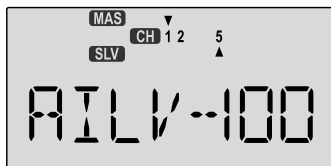
4. Move the stick to command elevator. Both elevator servos should move. They may move in the same direction (as they should) or opposite directions (to be corrected below).



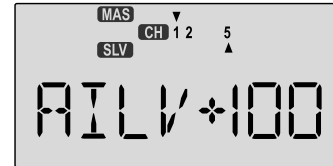
5. Press the **Cursor Right** key to get to the travel setting menus. The display shows a triangle over the number 1 and under the number 2, indicating you are in the **AIL->CH2** setting menu, programming the response of the CH2 elevator servo due to aileron (CH1) commands.



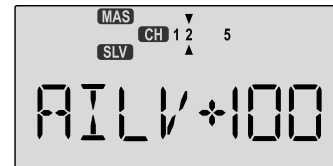
6. If the elevator servo plugged into **CH2** goes the correct direction with aileron stick, go to the next step. Otherwise, press the **Data +Increase** or **-Decrease** keys to change the sign of the percentage displayed. If it is (+), change it to (-), or vice versa. Only change the sign of the number, you can decrease its value later if you need to.



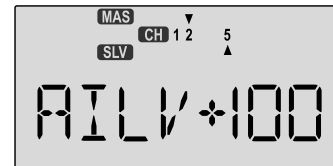
7. If the elevator servo plugged into **CH5** goes the correct direction with **aileron** stick, go to the next step. Otherwise, press the **Cursor Right** key to get to the **AIL->CH5** setting menu, then press the **Data +Increase** or **-Decrease** keys to change the sign of the percentage displayed. If it is (+), change it to (-), or vice versa. Only change the sign of the number, you can decrease its value later if you need to.



8. If the elevator servo plugged into **CH2** goes the correct direction with **elevator** stick, go to the next step. Otherwise, press the **Cursor Right** key to get to the **AIL->CH2** setting menu, then press the **Data +Increase** or **-Decrease** keys to change the sign of the percentage displayed. If it is (+), change it to (-), or vice versa. Only change the sign of the number, you can decrease its value later if you need to.



9. If the elevator servo plugged into **CH5** goes the correct direction with **elevator** stick, go to the next step. Otherwise, press the **Cursor Right** key to get to the **ELEV->CH5** setting menu, then press the **Data +Increase** or **-Decrease** keys to change the sign of the percentage displayed. If it is (+), change it to (-), or vice versa.



10. Once you have all the servos moving the correct directions, you can go back and adjust each of the travels independently, so that both elevator servos move up the **SAME** amount when elevator control is given, and move opposite the same amount for aileron command. You will need to decrease the percentage shown for the one moving further, or increase the percentage for the one moving less.

Airplane Model Function Descriptions

FAIL - Failsafe Function

Your Optic system contains special programming to allow you to fly a model using Hitec's special QPCM software. In this menu, which only appears when QPCM is selected in the power-on menus, you can choose where your servos are commanded to move if the receiver loses the signal from the transmitter due to interference.

Setting Up the FAILSAFE Function

QPCM Operation

Note: The OPTIC 6 QPCM is NOT compatible with Hitec's older HPD-07RB PCM receivers and must be used with Hitec's HPD-07RH QPCM receiver.

Activating the Hitec QPCM Failsafe

The failsafe feature of Hitec's QPCM receiver, model number HPD-07RH is a safety feature designed to allow the user to program a "set" position for a flight control surface to be at, in the event of a loss of signal from the transmitter.

Note: Failsafe does not have to be activated to use the QPCM signal. You do have the choice of using or not using the failsafe function.

1. To access this screen, turn on the transmitter.
2. Turn on the receiver power.
3. Press both Edit keys at the same time enter the menu loop.
4. Use the Edit keys to scroll down or up through the menu until you come to the Failsafe screen.



5. The default position has the failsafe feature inhibited.
6. Arm the failsafe feature by pressing the "Clear" key, the screen should now read, FAIL On.
7. To set the desired servo position when failsafe lockout occurs, move the control sticks to the position you want the control surfaces to be in if a failsafe condition should occur, hold the sticks in this position and press both Data keys at the same time. You should hear a double "beep"
8. Cycle the transmitter on, then off, then back on.
9. Test the effect by turning off your transmitter and watching the servo failsafe position activate.
10. To change the failsafe hold positions, repeat step 7, 8 and 9

Aircraft Flight Trimming Chart

The following chart may be used to systematically set up and trim a model for straight flight and aerobatic maneuvers. Please note that for best results, trimming should be done in near-calm conditions. Before you decide to make a change, be sure to try the test several times before making adjustments. If any changes are made, go back through the previous steps and verify that they are not also affected. If they are, make further adjustments as necessary.

To test for...	Test Procedure	Observations	Adjustments
1. Control neutrals	Fly the model straight and level	Use the transmitter trims for hands-off straight & level flight.	Change electronic subtrims or adjust clevises to center transmitter trims.

Aircraft Flight Trimming Chart

To test for...	Test Procedure	Observations	Adjustments
2. Control throws	Fly the model and apply full deflection of each control in turn	Check the response of each control - Aileron high-rate: 3 rolls in 4 seconds; low-rate: 3 rolls/6 sec - Elevator high-rate: to give a smooth square corner; low-rate gives approx. 130 ft diameter loop - Rudder: high-rate 30-35° for stall turns; low rate maintains knife-edge	Change EPA (for high rates), and Dual Rate settings (for low rates) to achieve desired responses.
3. Decalage	Power off vertical dive (crosswind if any). Release controls when model vertical (elevator trim must be neutral)	A. Model continues straight down B. Model starts to pull out (nose up)? C. Model starts to tuck in (nose down)?	A. No adjustment B. Reduce incidence C. Increase incidence
4. Center of Gravity	Method 1: Roll into near vertically-banked turn. Method 2: Roll model inverted	A1. Nose drops B1. Tail drops A2. Lots of forward stick (down elevator) required to maintain level flight B2. No forward stick (down elevator) required to maintain level flight, or model climbs	A. Add weight to tail B. Add weight to nose
5. Tip weight (coarse adjustment)	Fly model straight & level upright. Check aileron trim maintains level wings. Roll model inverted, wings level. Release aileron stick.	A. Model does not drop a wing. B. Left wing drops. C. Right wing drops	A. No adjustment B. Add weight to right tip. C. Add weight to left tip.
6. Side Thrust & Warped Wing	Fly model away from you into any wind. Pull it into a vertical climb, watch for deviations as it slows down.	A. Model continues straight up. B. Model veers left C. Model veers right D. Model rolls right	A. No adjustment B. Add right thrust C. Reduce right thrust D. Put trim tab under left wing tip *
7. Up/Down Thrust	Fly the model on normal path into any wind, parallel to strip, at a distance of around 100 meters from you (elevator trim should be neutral as per Test 3). Pull it into a vertical climb & neutralize elevator	A. Model continues straight up B. Model pitches up (goes toward top of model) C. Model pitches down (goes toward bottom of model)	A. No adjustment B. Add down thrust C. Reduce down thrust
8. Tip weight (fine adjustment)	Method 1: fly the model as per Test 6 and pull into a reasonably small diameter loop (one loop only) Method 2: fly the model as per Test 6 and then push into an outside loop (one only, fairly tight)	A. Model comes out with wings level B. Model comes out right wing low C. Model comes out left wing low	A. No adjustment necessary B. Add weight to left tip C. Add weight to right tip

Aircraft Flight Trimming Chart

To test for...	Test Procedure	Observations	Adjustments
9. Aileron differential	<p>Method 1: fly model toward you & pull into a vertical climb before it reaches you. Neutralize controls, then half-roll the model.</p> <p>Method 2: fly model on normal pass and do three or more rolls</p> <p>Method 3: fly the model straight and level and gently rock the aileron stick back and forth</p>	<p>A. No heading changes</p> <p>B. Heading change opposite to roll command (i.e. heading veers left after right roll)</p> <p>C. Heading change in direction of roll command</p> <p>A. Roll axis on model centerline</p> <p>B. Roll axis off to same side of model as roll command (i.e. right roll, roll axis off right wing tip)</p> <p>C. Roll axis off to opposite side of model as roll command</p> <p>A. Model flies straight ahead without yawing</p> <p>B. Model yaws away from roll command (i.e. right roll, yaw left)</p> <p>C. Model yaws towards roll command (i.e. right roll, yaw right)</p>	<p>A. Differential settings OK</p> <p>B. Increase differential</p> <p>C. Decrease differential</p> <p>A. Differential settings OK</p> <p>B. Increase differential</p> <p>C. Decrease differential</p> <p>A. Differential settings OK</p> <p>B. Increase differential</p> <p>C. Decrease differential</p>
10. Dihedral	<p>Method 1: Fly the model on normal pass and roll into knife-edge flight; maintain flight with top rudder (do this test in both left & right knife-edge flight)</p> <p>Method 2: Apply rudder in level flight</p>	<p>A. Model has no tendency to roll</p> <p>B. Model rolls in direction of applied rudder</p> <p>C. Model rolls in opposite direction in both tests</p>	<p>A. Dihedral OK</p> <p>B1. Reduce dihedral</p> <p>B2. Use mixer to produce aileron opposing rudder travel (start with 10%)</p> <p>C1. Increase dihedral</p> <p>C2. Mix ailerons with rudder direction 10%</p>
11. Elevator alignment (for models with independent elevator halves)	<p>Fly the model as in Test 6 and pull up into an inside loop. Roll it inverted and repeat the above by pushing it up into an outside loop.</p>	<p>A. No rolling tendency when elevator applied</p> <p>B. Model rolls in same direction in both tests - halves misaligned.</p> <p>C. Model rolls opposite directions in both tests. One elevator half has more throw than the other (model rolls to side with most throw).</p>	<p>A. Elevators in correct alignment</p> <p>B. Either raise one half, or lower the other</p> <p>C. Reduce throw on one side, or increase throw on the other.</p>
12. Pitching in knife-edge flight	<p>Fly the model as in Test 10</p>	<p>A. There is no pitch up or down</p> <p>B. The nose pitches up (the model climbs laterally)</p> <p>C. Nose pitches down (model dives laterally)</p>	<p>A. No adjustment needed</p> <p>B. Alternate cures:</p> <ol style="list-style-type: none"> 1) move CG aft; 2) increase incidence; 3) droop ailerons; 4) mix down elevator with rudder <p>C. Reverse 'B' above</p>

*Trim tab is 3/16" x 3/4" x 4" trailing edge stock, placed just in front of aileron on bottom, pointed end forward.

Optic Helicopter (HELI) Programming

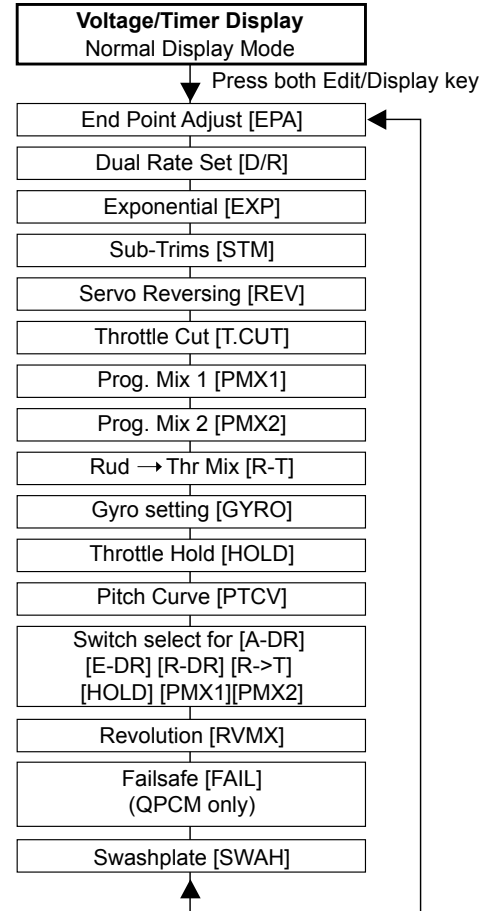
This section describes how to use the **Optic** helicopter functions (model type **HELI**).

Descriptions of the other functions, such as endpoints, dual rates, expo, etc., are contained in the aircraft (**ACGL**) section.

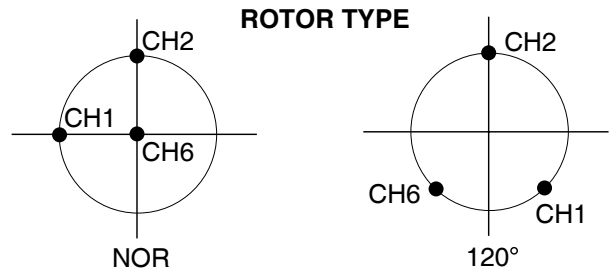
The **HELI** menu provides three flight conditions in addition to the normal one (**NOR**).

ST1 may be used for forward flight and mild aerobatics, **ST2** may be used for inverted, and **ST3** is used for autorotations.

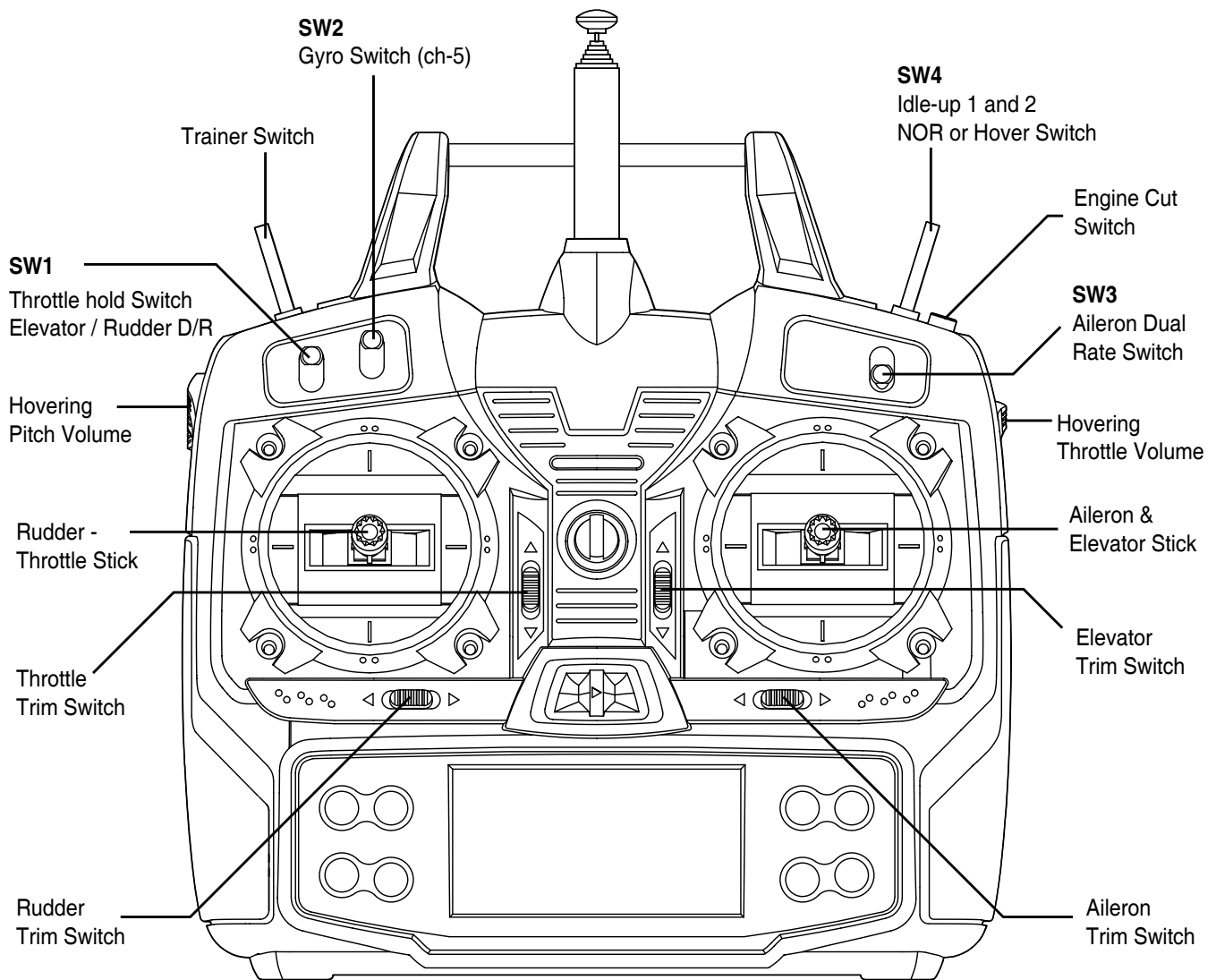
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The Optic system comes with two choices for the helicopter's swashplate arrangement, which may be found in the setup menu: normal (**NOR**) and 120° (**120°**). **NOR** is the standard swashplate where one servo each performs the collective pitch, elevator, and aileron functions. **120°** is intended for three-servo swashplates needing special mixing to get the servos to properly provide the required pitch, elevator, and aileron functions. The swashplate type **120°** is also referred to as SN-3.



Optic Helicopter Controls and Switch Assignments



This figure shows the assignments for a **Mode 2** system as supplied by the factory. Note that some of the functions will not operate until activated in the mixing menus.

Helicopter Setup Instructions

The following example shows how the **Optic** may be programmed for a helicopter model.

Your model's settings will be dependent on the setup and linkages.

If you're not sure about the settings for your particular model, please ask an experienced pilot for assistance.

The helicopter setup procedure presented below uses a standard helicopter setup, one servo each for ailerons and elevator. You can use a similar procedure to set up your own model; your settings numbers and percentages will probably be different.

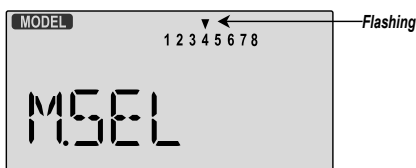
1. In the helicopter, install each servo and hook up the aileron, elevator, throttle, rudder, and collective pushrods to the servos in accordance with the model's instructions or plans. Be sure that all of your servos are plugged into the proper receiver channels:

- CH1 - Aileron (Roll Cyclic)
- CH2 - Elevator (Pitch Cyclic)
- CH3 - Throttle
- CH4 - Rudder (Gyro Yaw control)
- CH5 - Gyro (For gyro gain control)
- CH6 - Pitch (Blade Collective)

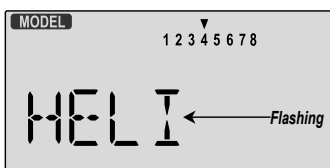
If your model uses 120° swash programming, plug in the servos as indicated in the table on page 9.

We recommend that you do this programming exercise with the servos installed in the model and connected to the respective control surfaces. This will enable you to immediately see the effect of each programming step.

2. **Model Memory.** Turn on your transmitter while holding the two **Edit Display** keys. This gets you into the model select (**M.SEL**) menu. Press the **Cursor Right** button to move to a new model memory. The model number of the model memory you select is indicated by the little arrow pointing down. The figure shows Memory #4.

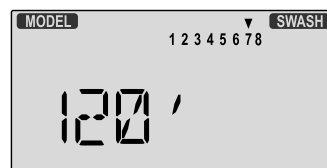
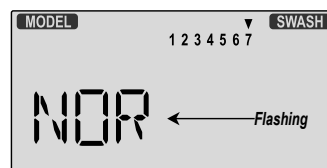


3. **Model Type.** Press the **UP** Edit arrow two times. The word **ACGL** will appear, flashing on and off. Press the **Left** or **Right Cursor** keys until **HELI** appears. You must press both **Data** keys to "**Save**" the setting. This is how you select the type of model you wish to use, either **ACGL** or **HELI**.

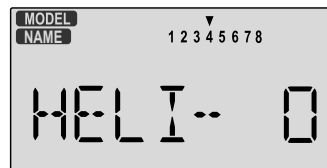


WARNING: selecting a different model type will erase the settings in the model memory. **BE SURE** you're in the correct model memory before selecting a new model type, or you might accidentally erase a model you're using.

4. **Swash Type.** Now it's time to select the swash type. Select **NOR** for helis with independent aileron, elevator, and pitch servos; **120'** for models using 120° swashplates. Press the **Up** Edit arrow until you see the word "**SWASH**" in the upper right of the display. The swash type in the lower left will be flashing.



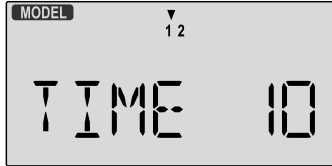
5. **Name your model.** Press the **UP** arrow once. This gets you into the model name mode (note the words **MODEL** and **NAME** in the upper left of the display).



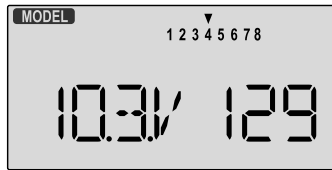
6. Now you can select four letters to identify your model. With the first of the four letters flashing, press the **Data +Increase** or **-Decrease** keys to change the letter that is displayed. Stop when the first letter is the one you want.
7. Press the **Right Cursor** key once to get to the second letter. Repeat Step 5 to choose the second letter.
8. Repeat the previous steps two more times to fill out the remaining two letters. If you like, you can hit the **right cursor** button one more time and select a number between 0 and 199 for further identification. The model's frequency number might be a good choice.

Helicopter Setup Instructions

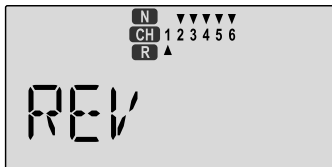
9. **Set the stopwatch.** Press the **Down** arrow four times. This gets you into the Timer menu (**TIME**). Use the **Data Increase and Decrease** keys to select the amount of time you want the stopwatch to count down. This is handy to keep track of engine running time so you don't run out of gas. You can set a second timer for a different amount of time.



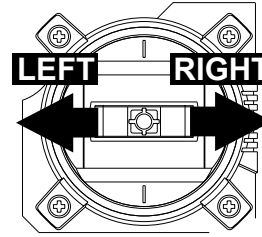
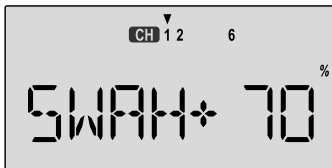
10. This completes the initial part of the setup. Now, we'll go ahead and customize the settings for your model. Switch transmitter power **OFF**.
11. Switch transmitter power back **on** and transmitter should display the model number and battery voltage as shown. The number on the right is the elapsed time, which will vary depending on how long the transmitter has been left on.



12. **Servo Directions.** Check the proper direction of throw for each servo. Use the reversing function [**REV**] to reverse channels as necessary to get proper throw directions. If you're using the 120° swashplate, please read the SWAH menu instructions on page 53 to see how your model responds to the different commands.

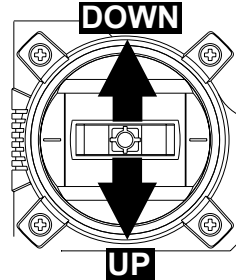


13. If you're using 120° swash type, please use the swashplate (**SWAH**) menu, page 53, to adjust these responses.



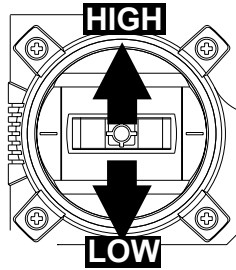
Right Aileron: swashplate tilted towards chopper's right side.

Left Aileron: swashplate tilted towards the left side.



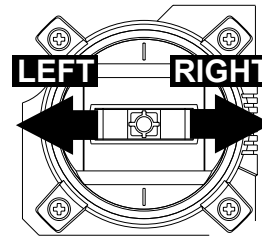
Down Elevator: swashplate tilted towards chopper's front.

Up Elevator: swashplate tilted towards the rear.

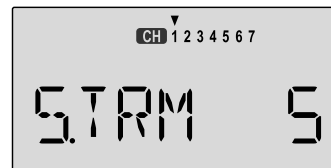


HIGH Position: high rotor pitch AND carburetor fully opened.

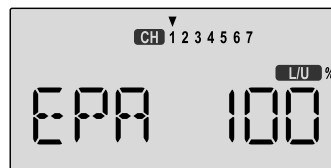
LOW Position: low rotor pitch, carburetor at idle (use trim tab to fully close)



14. **Servo Neutrals.** First, be sure the hovering pitch and hovering throttle levers on the sides of the radio are centered. Set up all linkages so that all servos are as close (**STRM**) window to make fine adjustments on the servo neutrals.

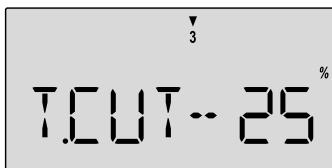


15. **Servo Travel.** Use the **EPA** command to limit servo travels to prevent binding.

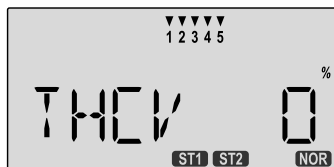


Helicopter Setup Instructions

16. **Collective Pitch.** The blade collective pitch angle (controlled by **CH6** on a conventional helicopter) should vary from -2° to $+10^{\circ}$ with full stick motion, in the "**NOR**" or hovering **Fit Mode**. We recommend setting the hovering pitch (pitch with throttle stick at center) to $+4.5^{\circ}$. Adjust servo arms and **EPA** values to get the desired travel at the end points, measuring with a pitch meter.
17. **Engine Servo travel.** On the regular display menu, enter a value of -25% for throttle trim. Use the **EPA** menu to set up the carburetor pushrod so that at full throttle there is no binding, and so the engine idles smoothly at low throttle.
18. **Throttle Cut.** Enter the throttle cut (**T.CUT**) menu and enter a value of -25% or so. Press the **Cut** button and be sure that the carburetor fully closes, which will shut off the engine. Don't pick too large a number, or binding may occur.



19. **Throttle Curve.** You can use the Throttle Curve (**THCV**) menu's five-point setting curves to fine-tune the engine servo's response. Adjust the throttle position for hover to get the desired head RPM. You can change the curve values to make a steeper curve near idle and shallower curve past hover. See the **THCV** menu description on page 52 for more details.

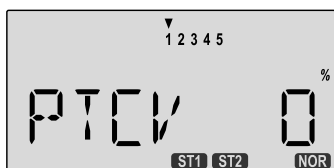


If your instructions don't give any suggested values, you may start with the following settings:

Throttle Curve **NOR**

Point	1 (low)	2	3	4	5 (high)
%	0	26	45	72	100

20. **Pitch Curve.** You can use the Pitch Curve (**PTCV**) menu's five-point setting curves to make finer adjustments to the endpoints and the middle of travel of the pitch servo.



Your model's instructions may provide suggested values for the blade pitch angles. If not, you may want to start with the following:

Pitch Curve **NOR**

Point	1 (low)	2	3	4	5 (high)
Pitch	0 deg.	+5	+6.5	+8.0	+10.0

After you've set the pitch at each of the five points, be sure to check that both aileron and elevator motions do not cause binding at extreme pitch settings. If they do, use **EPA** to reduce travels.

21. **Revolution mixing (RVMX)** uses the tail rotor to suppress the torque reaction of the main rotor due to changes in collective pitch. It is disabled whenever Idle-Up, ST2, ST3 or Throttle Hold are activated.

RVMX may be set on either side of the stick (note the letters **R/D** and **L/U** displayed). Adjust **RVMX** mixing for both travel directions as described in the trimming instructions on page 56.



22. **Gyro settings.** You can select an independent value of gyro gain for each flight condition by using the **GYRO** menu. Press one of the Cursor keys to activate the Gyro gain Function. Select the desired flight condition, with the FLT Mode SW-4 or SW-1 Switch. Then use the **Data** keys to choose the desired value. The gyro must be plugged into **CH5**. You cannot independently control this channel. It is for gyro gain control functions only. See page 51 for more information on the Gyro gain set-up.



23. **Aerobatic Setups and Flight Conditions.** Your Optic system has three built-in flight condition menus in addition to the normal (**NOR**) hovering mode. Two -- **ST1** and **ST2** -- are typically used for aerobatics, including 540° stall turns, looping, and rolling stall turns. **ST3** is used for "throttle hold" so that the throttle servo is disengaged during autorotations. These functions are switched on as follows:

- **NOR: ON** when **FLT MODE** Switch is forward.
- **ST1: ON**, when **FLT MODE** Switch is centered

Helicopter Setup Instructions

- **ST2: ON** when **FLT MODE** Switch is **AFT**.
- **ST3: ON** when **ELEV RUDD D/R, SW-1** Switch is **down**.

As these functions are switched on or off, **ST3** will override all the others, followed by **ST2** and **ST1**, which will override **NOR**. Regular settings (**NOR**) occur when the others are off.

Throttle and pitch curves, revolution mixing, and gyro gain may be independently selected for each condition.

Here are some suggested starting settings if your instructions do not provide any:

Throttle Curve **ST1**

Point	1 (low)	2	3	4	5 (high)
%	50	38	50	75	100

Throttle Curve **ST2**

Point	1 (low)	2	3	4	5 (high)
%	100	50	38	50	100

Pitch Curve **ST1**

Point	1 (low)	2	3	4	5 (high)
Pitch	-4 deg.	+0.5	+6.0	+7.5	+9.0

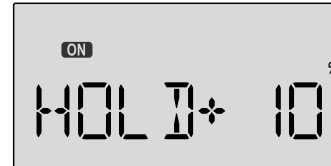
Pitch Curve **ST2**

Point	1 (low)	2	3	4	5 (high)
Pitch	-9 deg.	-6.0	0	6.0	9 or 10.0

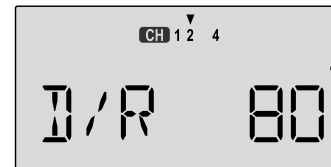
Pitch Curve **ST3 (HOLD)**

Point	1 (low)	2	3	4	5 (high)
Pitch	-4 deg.	--	+6.5	--	+12

24. **Throttle Hold Setting.** Throttle hold (**HOLD**) commands the throttle to a preset position near idle and disconnects it from pitch when activated. Move to the **HOLD** menu and move the **SW-1** switch to the forward position. Set the hold position to maintain engine speed safely above idle without engaging the main rotor clutch.



25. **Dual Rate Settings.** If you find that your aileron and elevator controls are too sensitive, you may set dual rates to reduce them. Use the dual rate (**D/R**) window to adjust them to the desired amount of response when the switch is flipped.



This is only a brief introduction to the setup procedure for helicopters. Be sure to browse through the pages following this example to see the details about the menus for helicopters.

Menu Descriptions - Helicopter

Helicopter Flight Conditions

Your Optic system's **HELI** menu provides three flight modes in addition to the normal one (**NOR**). Within each condition, you may program an independent set of dual rates, exponentials, throttle and pitch curves, revolution mixing, and gyro gain. In the **HELI** menus, these are automatically called up whenever you switch to a new condition.

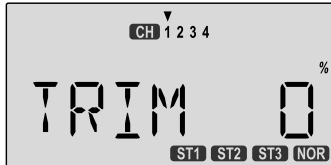
NOR is intended for hovering flight. **ST1** may be used for forward flight and mild aerobatics, **ST2** may be used for inverted, and **ST3** is used for autorotations as it includes a throttle hold feature which disengages the throttle servo from collective commands. These conditions are activated whenever the model memory is chosen to be **HELI** type.

The defaults for the switches controlling these flight conditions are as follows:

- **NOR: ON** when **Flt. Mode (SW-4)** Switch is **FORWARD**.
- **ST1: ON** when **Flt. Mode (SW-4)** Switch **CENTER**.
- **ST2: ON** when **Flt. Mode (SW-4)** Switch is **AFT**.
- **ST3: ON** when **SW-1** is **DOWN**.

Menu Descriptions - Helicopter

As these functions are switched on or off, **ST3 = HOLD** has highest priority, followed by **ST2** and **ST1**. Regular settings (**NOR**) occur when all of the others are **off**. You can see which condition your transmitter is currently in by viewing the display. The current condition may be found flashing in the lower right of the **TRIM** display.



EPA - End point adjust

See **ACGL** instructions on page 27.

D/R - Dual Rates

Refer to **ACGL** instructions on page 27.

EXP - Exponential

See the **ACGL** instructions on page 28.

STRM - Subtrim

Refer to the **ACGL** instructions on page 28.

REV - Servo Reverse

See **ACGL** instructions on page 29.

T.CUT - Throttle Cut

Described in the **ACGL** instructions on page 29.

PMX1, PMX2 - Programmable Mixing

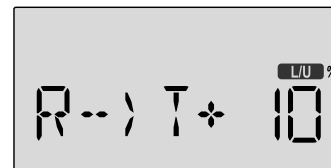
See **ACGL** PMX instructions on page 38. These instructions are the same for the **two** programmable mixers in the helicopter menus.

R->T - Rudder Throttle Mixing

Rudder→ Throttle (R->T) mixing is used to maintain rotor speed so that altitude is kept constant when the rudder stick is operated in hover. The reason for this mixing is that when rudder is commanded, the tail rotor consumes a little more power, which reduces the power at the main rotor and the helicopter drops or climbs. For helicopters with normal rotor rotation, commanding right rudder (which requires more power) should also increase throttle slightly, while using left rudder (requires less power) should decrease the throttle slightly. **R->T** mixing is handy for hovering but may also be used in 540° stall turns, hovering eights, nose-in circles, Top Hats, Pirouettes, and other aerobatics. This function only operates when the **NOR** menu is selected.

Setting Up Rudder->Throttle Mixing

1. Press one of the **Up Down Edit** buttons repeatedly to select the **R->T** window. To begin with, the function is already activated, but it's set to 0% on both sides so there is no differential.



2. To set the mixing amount for the left rudder, hold the rudder stick to the left side (display shows **L/U**), and press the **Data Decrease** key. Continue reducing the percentage until you reach about 10%. If for some reason you want a 0% setting, press the **Active/Inhibit (Clear)** key.
3. Input the mixing amount for right rudder by moving the rudder stick to the right (display shows **R/D**), and press the **Data Increase** or **Decrease** key to reach about 10%.
4. After you try these settings out, you can adjust them higher or lower to suit your machine. The signs shown here may need reversing depending on the way the servo is mounted.
5. You may select which ON-OFF switch turns this function on. See the Switch Select instructions on P. 53 for information on how to select the ON-OFF switch.
6. Note that **R->T** mixing may only be set up, and only operates, in the **NOR** menu.

Menu Descriptions - Helicopter

GYRO - Gyro settings

Gyro settings are used to automatically control the gyro's gain in different flight modes. It may be set to different values in **NOR**, **ST1**, **ST2**, and **ST3** flight modes, allowing you to pick the gain you need for each circumstance. The Gyro settings Control the output at receiver CH5. You cannot independently control this channel with a switch or slider.

Using Gyro Settings

1. Press one of the **Up Down Edit** buttons repeatedly to get to the **GYRO** menu. To begin with, the function is inhibited. Press one of the Cursor keys to activate it. Once activated, it's set to 50% in all four flight modes.



2. To set the mixing amount for the normal (**NOR**) flight mode, flip the **Fit. Mode (SW-4)** switch all the way **forward**. **NOR** will be flashing on and off. Set the percentage to yield the desired gyro gain (this is usually a high-gain setting). If for some reason you want a 0% setting, press the **Active/Inhibit (Clear)** key.
3. Flip the **Fit. Mode (SW-4)** switch to its **center** position. **ST1** will be flashing on and off. Set the percentage to yield the desired gyro gain in this flight mode (this will usually be a lower-gain setting for reduced damping in stunts).
4. Flip the **Fit. Mode (SW-4)** switch all the way **aft**. **ST2** will be flashing on and off. Set the percentage to yield the desired gyro gain.
5. Now flip the **SW-1** switch fully down. You may now input a setting for ST3.
6. Make some test flights to try these settings out. Take note of when more gain is need, and when less gain is needed. You can adjust all of the gyro settings in each flight mode to suit your machine.

HOLD - Throttle Hold

The Throttle Hold function moves the engine throttle servo to a selected position near idle, and disengages it from the throttle stick. It is commonly used during autorotation, and activated with the **SW-1** switch on the left front of the transmitter. You can set the throttle position to be held over a -50 to +50% range centered about the throttle idle position. Activating throttle hold also disables revolution mixing (**RVMX**).

Setting Up Throttle Hold

1. Press one of the **Up Down Edit** buttons until the **HOLD** window appears. The default is for the function to be inhibited. To activate the throttle hold function, press the down **Data -Decrease** key. This will cause the flashing INH display to change to a -6% value with an **ON** or **OFF** display, depending on the **SW-1** switch's position.
2. Now you can adjust the throttle hold position with the **Data +Increase** or **-Decrease** keys, anywhere between -50 and +50% (to return to the default 0%, press the **Active/Inhibit (Clear)** key).

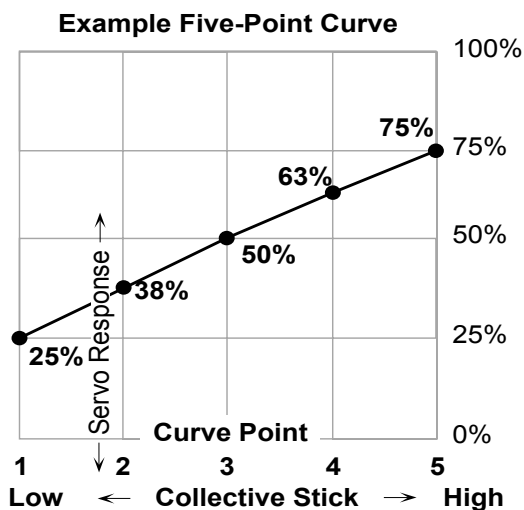


3. Check that your throttle goes to the desired hold position by flipping the **selected on-off** switch one way and the other. Adjust the number as needed. Be sure to choose an engine speed that's fast enough to keep the engine from accidentally quitting but slow enough to not engage the main rotor clutch.
4. You may select which ON-OFF switch turns this function on. See the Switch Select instructions on P. 53 for information on how to select the ON-OFF switch.

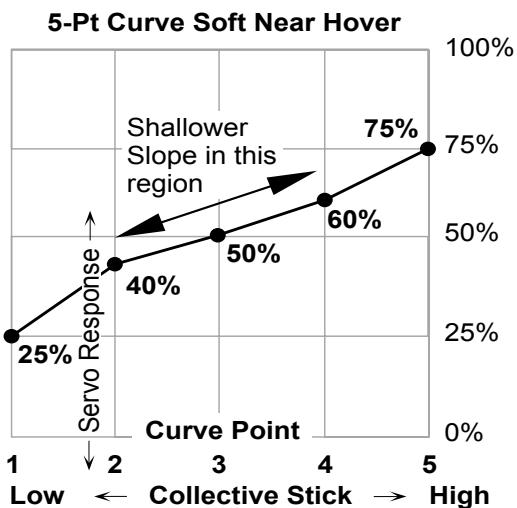
Menu Descriptions - Helicopter

THCV - Throttle Curve

The throttle & pitch curves are tied to the position of the collective stick, and are specified at five points labeled 1 through 5 below. These "curves" are really straight lines connecting the settings at the five points, and are defined by assigning servo movement percentages to five positions of the left stick: lowest = Point 1, the 1/4-up stick position = Point 2, half-stick = Point 3, 3/4 position = Point 4, and top position = Point 5. With the numbers defined as shown, the servo would move 50% of full travel to one side at low collective stick position, and 50% of full travel to the other side at high stick position.

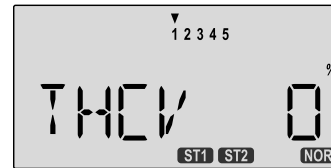


You can get a linear response by making the five settings line up as shown above. But if you want another shape, you're free to do it. You can "flatten out" or "soften" the curve around hover as shown here. This is handy for making the control less sensitive around hover.

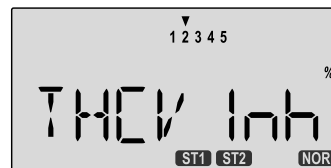


Setting Up The Throttle Curve

1. Press one of the **Up Down Edit** buttons until the **THCV** window appears. The default is for a linear curve, a straight line from 0 to 100% passing through 50% at hover (center, point 3).
2. Be sure you're in the desired flight Mode by moving the **Fit. Mode (SW-4)** switch to its proper position. Remember, you can input separate, independent throttle curve settings for each separate idle-up mode (except for **ST3**, throttle hold)! Also, be sure to center the hovering throttle lever
3. You begin at set point #1, idle. A small arrow should appear over the number 1 in the display, and a value of 0% should be shown. Press the **Data +Increase** or **-Decrease** key to change the setting to your desired value.



4. When you're finished with Point 1, move to the next point with the **Cursor Right** key. A small arrow over the number **2** indicates you are setting the value for Point 2. Note that the function is inhibited (Inh) to start with. If you leave it, you get a straight line from points 1 to 3. Otherwise, you can change this setting with the **Data +Increase** or **-Decrease** keys.



5. Repeat this procedure for Points 3, 4, and 5 by pressing the **Cursor Right** key, then adjusting as desired with the **Data +Increase** or **-Decrease** keys.
6. When you've completed the settings for the first flight mode (**NOR**), test fly your model. When you're satisfied with the settings, use them as a basis for the other flight mode. Flip the switches as necessary to get into the new modes, verify on the display that you are in the desired flight mode, then set all the five points in by going through the steps given previously.

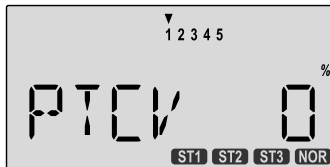
Menu Descriptions - Helicopter

PTCV - Pitch Curve

Like the throttle curve described previously, **pitch curves** are tied to the position of the throttle collective stick, and are specified at five points labeled 1 through 5 below. Setup instructions are the same as those for throttle curve, except that you may also input a curve for the throttle hold/**ST3** flight mode. You can get a linear response by making the five settings line up as shown above. But if you want another shape, you're free to do it. You can "flatten out" or "soften" the curve around hover, which is handy for making the control less sensitive there.

Inputting The Pitch Curve Values

1. Press one of the **Up Down Edit** buttons until the **PTCV** window appears. The default is for a linear curve, a straight line from 0 to 100% passing through 50% at hover (center).
2. Be sure you're in the desired flight Modes by moving the **Flt. Mode** switch (**SW-4**) to its proper position. Remember, you can input separate, independent throttle curve settings for each separate idle-up mode.
3. You begin at set point #1, idle. A small arrow should appear over the number 1 in the display, and a value of **0%** should be shown. Press the **Data +Increase** or **-Decrease** key to change the setting to your desired value.



4. When you're finished with Point 1, move to the next point with the **Cursor Right** key. A small arrow over the number 2 indicates you are setting the value for Point 2. Note that the function is inhibited (**Inh**) to start with. If you leave it, you get a straight line from points 1 to 3. Otherwise, you can change this setting with the **Data +Increase** or **-Decrease** keys.
5. Repeat this procedure for Points 3, 4, and 5 by pressing the **Cursor Right** key, then adjusting as desired with the **Data +Increase** or **-Decrease** keys.
6. When you've completed the settings for the first flight mode (**NOR**), test fly your model. When you're satisfied with the settings, use them as a basis for the other flight Modes. Flip the switches as necessary to get into the new mode, verify on the display that you are in the desired flight mode, then set all the five points in by going through the steps given previously.

S/W SEL -

Switch Selection For Auxiliary Functions

Your **Optic** system allows you customize your radio and choose what switches are used to turn on the following helicopter functions: **AIL D/R**, **ELEV D/R**, **RUDD D/R**, **R->T**, **HOLD**, **PMX1**, and **PMX2**. Note that each of these functions may be chosen to be turned on by flipping a switch. Some may be selected to be on all the time.

Choosing The On-Off Switch For Certain Radio Functions

1. Call up the **Switch Select** screen by repeatedly pressing one of the **Edit Up Down** keys until the highlighted words **S/W SEL** appear. The window may appear with any of the following displayed: **AIL D/R**, **ELEV D/R**, **RUDD D/R**, **R->T**, **HOLD**, **PMX1**, and **PMX2**. Note that if you change switch locations, the switch labeled (for example) **AIL D/R** or **SW-4** will not control aileron dual rate afterwards. You should carefully consider how you assign all the switches in consideration of the flight mode switches. **See also Item 3a below.**
2. Use the **Data +Increase** or **-Decrease** keys to select the desired function.
3. Use the **Left Right Cursor** keys to select from the following on-off possibilities for the selected function
 - a. **On** indicates the function is ALWAYS on. You can also, for example, set **HOLD** to be On at all times. This will permanently disable the throttle servo, not a good thing! Be very careful choosing ON as a possible setting for all of these functions.
 - b. **1** represents **Switch SW-1**, the "ELEV RUDD D/R" switch. On is **down**.
 - c. **2** represents **Switch SW-2**, the "GEAR AUX" switch. On is **down**.
 - d. **3** represents **Switch SW-3**, the "AIL D/R" switch. On is **down**.
 - e. **4** represents **Switch SW-4**, the "FLT MODE" switch. The FLT MODE switch has three positions to select from:
 - i. **NOR** = on at **forward** position
 - ii. **ST1** = on at **middle** position
 - iii. **ST2** = on at **aft** position
4. Repeat Steps 2-3 for any additional functions you wish to set

RVMX - Revolution mixing

The **revolution mixing** function mixes **pitch** commands into **rudder** (pitch→rudder) in order to suppress the torque generated by changes in the main rotor's pitch angle and rotational speed. You can input independent values for revolution mixing **above** and **below** one-half throttle for each of the **NOR**, **ST1**, and **ST2** flight conditions. Revolution mixing is disabled whenever throttle hold (**ST3**, operated by switch **SW -1**) is on.

For a clockwise-turning rotor, revolution mixing should apply right rudder when pitch is increased; for a counterclockwise-turning rotor, the opposite should occur. Remember to set the value for **both** sides of the throttle stick's motion.

Revolution mixing has no preprogrammed values input at the start. You will need to input values for your helicopter as described in the setup example.

Note: A procedure for adjusting revolution mixing is given in a table on page 56.

Revolution Mixing Programming

1. Call up the revolution mixing screen by repeatedly pressing one of the **Up Down Edit** buttons until the **RVMX** window appears. The function is active with 0% mixing turned on. Put the throttle stick to its idle position.



2. Now press the **Data +Increase** key. This will increase the percentage of **RVMX** mixing for the low side of throttle. You may set a value of 0% to 100% for this side. If you wish to return the mixing percentage to the default 0% value, press the **Active/Inhibit (Clear)** key.
3. Move the throttle stick to a position above half-throttle, and change the percentage number to suit.
4. Now verify that the rudder responds both the correct direction and amount for travel on both sides when throttle is commanded.
5. Set up the **RVMX** values for the other flight conditions (**ST1**, **ST2**) by flipping the **Flt. Mode (SW-3)** switch and repeating these procedures.

FAIL - Failsafe

See the instructions on page 41.

SWAH - Swashplate adjust (120° swash only)

The **swashplate** menu is intended only for helicopters whose collective pitch is controlled by more than a single servo at a time, and is sometimes referred to as CCPM (Collective & Cyclic Pitch Mixing). The **Optic** contains settings for 120° swashplates. Consult your model's setup instructions to find out whether you need special swash settings.

The swashplate menu is used to control the response of all three collective servos as a group. It should NOT be used for reversing or individual servo travel adjustment. Perform these settings in the **REV** and **EPA** menus respectively.

When you move the collective stick, all swashplate servos should move in the same direction and the same amount to lift or drop the swashplate without tilting. If the swashplate should tilt to one side when you command collective, one or more servos is moving the wrong direction or the wrong amount, and must be adjusted in the **SWAH** menu. If the swashplate moves down when pitch should be increasing or vice versa, change the sign in front of all three servos from (+) to (-) or vice versa. Note that there is no **SWAH** menu when the **NOR** menu is selected, but the 120° swash type does contain the **SWAH** menu. The swash default settings are shown below.

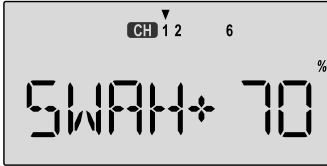
NOR	120'
No SWAH menu	CH1 +70%, CH2 +70%, CH6 +70%

Swashplate Programming

1. Consult your model's setup instructions. If three servos are needed to move the swashplate in a 120° CCPM set-up, go to the model setup instructions (page 21) and select the 120° swash type.
2. With all the servos hooked up, and the transmitter and receiver turned on, move the throttle/collective stick up and down. The swash should move up and down with no rotations. Move the aileron stick left and right. The swash should tilt left and right without pitching or rising. Move the elevator stick. The swash should tilt fore and aft with no rotations. If there are rotations when collective is moved, or the swash moves up and down with aileron or elevator, you need to adjust the settings in the swash menu.
3. If the servos do not all respond in the same direction for collective or opposite directions for aileron and elevator, you will need to reverse one or more of them in the reversing menu (**REV**). It may take a little trial and error trying different combinations of normal and reverse rotation to get the servos to respond properly. Don't worry about the direction they respond, just that they all move the same for collective and tilt for aileron and elevator.

Menu Descriptions - Helicopter

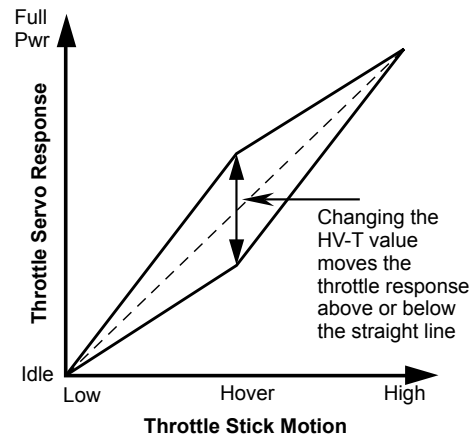
4. Call up the swash screen by repeatedly pressing one of the **Up Down Edit** buttons until the **SWAH** window appears. The function is automatically active when you select **120'** mixing in the model setup menu.



5. If all the servos **raise** the swash with increasing collective, go to the next step. If they **lower** the swash, press the **Cursor Right** key twice to get to the collective setting menu (the arrow appears over the number **6**). Now press the **Data -Decrease** key until the sign is reversed in front of the percentage value. Now the swash should properly respond to collective. If you've done the wrong thing, you can reset the percentage by pressing the **Active/Inhibit (Clear)** key.
6. If all the servos **tilt** the swash to the **right** with right aileron stick, go to the next step. If they tilt the swash to the **left**, press the **Cursor Right** key once to get to the aileron setting menu (the arrow appears over the number **1**). Reverse the sign in front of the percentage with the **Data -Decrease** key. Now the swash should properly respond to aileron.
7. If all the servos **tilt** the swash **aft** with up elevator stick, go to the next step. If they tilt the swash forwards, press the **Cursor Right** key once to get to the elevator setting menu (the arrow appears over the number **2**). Now press the **Data -Decrease** key until the sign is reversed in front of the percentage value. Now the swash should properly respond to elevator.
8. Double check that all three functions, collective, aileron, and elevator, produce the desired result on the swashplate. Do not set any **SWAH** values to 0% or you will disable the response to that control!

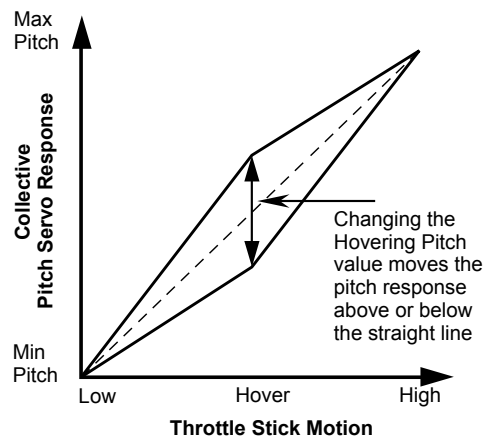
Hovering Throttle Adjustment Lever (Pilot Control)

The **Hovering Throttle lever** may be used to adjust the throttle servo's position around hover without affecting main rotor pitch. It's handy to make up for changes in rotor speed caused by variations in temperature, humidity, or other conditions. To change the hovering throttle setting, simply move the **Hovering throttle lever (Left Lever)** to get the desired setting. As shown in the figure, moving the lever has the largest effect in the hovering region and leaves the endpoints alone. **Center this lever before you set neutrals or input throttle curves.**



Hovering Pitch Adjustment Lever (Pilot Control)

The **Hovering Pitch lever** may be used to trim the collective pitch servo(s) near hover without affecting throttle. Like hovering throttle, it's handy to make up for changes in rotor speed caused by variations in temperature, humidity, or other conditions. You can adjust the hovering pitch value simply by moving the Hovering pitch lever (**Right Lever**). Like hovering throttle, this lever only works near hover and tapers off at either end of throttle. **Center this lever before you set neutrals or input throttle curves.**



Helicopter Flight Trimming Chart

This procedure assumes helicopter is trimmed for hovering. Trimming must be done in near-calm conditions. Repeat tests several times before making adjustments. If any changes are made, go back over the previous steps and verify, or further adjust as necessary.

To test for...	Test Procedure	Observations	Adjustments
1. RVMX mixing - Up settings (Part 1)	Fly the model straight and level into the wind at 100 ft altitude, lower pitch to 0°	Observe rotation as helicopter descends A. No rotation B. Model rotates counterclockwise C. Model rotates clockwise	A. None B. Add right rudder trim C. Add left rudder trim
2. RVMX mixing - Up settings (Part 2)	Bring the helicopter into hover, add full pitch and ascend 75 ft	Observe rotation as helicopter ascends A. No rotation B. Model rotates counterclockwise C. Model rotates clockwise	A. None B. Increase UP RVMX mix C. Decrease UP RVMX mix
3. RVMX Down mixing settings	Begin Down RVMX mixing with same number as UP mix. From inverted flight (top of loop, or mid-point of roll, or inverted part of split-S), add full negative pitch	Observe rotation as helicopter ascends A. No rotation B. Model rotates clockwise C. Model rotates counterclockwise	A. No adjustment B. Increase Down RVMX mix C. Decrease Down RVMX mix

Adjusting Hovering Pitch and Hovering Throttle

RPM	Stick	Primary Corrective Action
High	Below 1/2	Decrease hovering throttle
Low	Below 1/2	Decrease hovering pitch
Perfect	Below 1/2	Decrease hovering throttle, decrease hovering pitch
High	1/2 stick	Increase hovering pitch, decrease hovering throttle
Low	1/2 stick	Decrease hovering pitch, increase hovering throttle
Perfect	1/2 stick	Don't touch a thing!
High	Above 1/2	Increase hovering pitch
Low	Above 1/2	Increase hovering throttle
Perfect	Above 1/2	Increase hovering pitch, increase hovering throttle
Want more	Keep 1/2	Decrease hovering pitch, then increase hovering throttle
Want less	Keep 1/2	Increase hovering pitch, then decrease hovering throttle

GLOSSARY

The abbreviations used with the Optic are defined below alphabetically.
Related pages are given in parenthesis following the definition.

A		M	
ACGL	Acrobatic/Glider aircraft menu (15)	MAS	Master channel in mixer (38)
ADIF	Aileron differential. Ailerons move more to one side than other (31)	M.SEL	Model select menu (11)
AILV	Differential elevator servos, for 3-D aerobatics (39)	N	
ATL	Adjustable Travel Limit. Limits throttle trims to only the throttle idle position. (built in to your system)	NOR	Normal helicopter swashplate (1 servo each for elevator, aileron, pitch. (12)
A->R	Aileron Rudder mixing (36)	O	
C		OFF	Function or Switch in OFF position.
CAMB	A function which droops or raises the entire trailing edge of a wing. (32)	ON	Function or Switch in ON position.
COPY	Data copy: command used to copy one memory to another (11)	P	
CROW	Airbrake function (37)	PPM	Pulse-Position Modulation, also known as "FM". (14)
CURSOR	Button used to step through menus (9)	PCM	Pulse-Code Modulation. (14)
D		PMX	Programmable mixer. Mixing between arbitrary channels. (38)
D/R	Dual rate: switch-controlled function reduces control travels. (27)	PTCV	Pitch curve function (53)
DATA	Editing keys change numbers (9)	Q	
E		QPCM	Pulse-Code Modulation. (14)
ELVN	Elevon function combines ailerons & elevators for tailless models. (34)	R	
EPA	End Point Adjust. Function that adjusts the servo travel at the left and right sides. (27)	R/D	Indicates Right or Down stick motion
EXP	Exponential function, reduces sensitivity around neutral (28)	REV	Reverse. Servo operating direction switching function. (29)
E->F	Elevator Flap mixing (36)	REST	Reset model memory (15)
F		RVMX	Revolution mixing (54)
FAIL	Failsafe function moves servos to preset locations if interference is received. (41)	R->T	Rudder Throttle mixing (50)
FLPN	Flaperon function gives the ailerons a flap function. (30)	S	
FLPT	Flap travel function. (30)	S/W SEL	Select on-off switches for different functions (39,53)
G		SFT.N	Negative transmit shift direction (13)
Gear	Landing gear control switch. (8)	SFT.P	Positive transmit shift direction (13)
GYRO	Gyro setting menu (51)	SLV	Slave channel in program mixer (38)
H		STCK	Choose Mode of transmitter. (13)
HELI	Helicopter settings menu. (45)	STRM	Subtrim function used to adjust servo neutrals. (28)
HOLD	Throttle hold function holds the throttle in a near-idle position (used for autorotation). (51)	SWAH	Swash type (12,54)
I		T	
INH	Inhibit. Function will not operate	T.CUT	Throttle cut function used to kill engine without moving trims (29)
L		THCV	Throttle curve function (52)
L/U	Indicates Left or Up stick motion	TIME	Timer/Stopwatch function (14)
LAND	Landing function (33)	V	
Lock	Lock throttle button (9)	VTAL	V-tail function combines the elevators and rudder. (35)
		Numerical	
		120'	Helicopter swashplate, 120° (12,54)

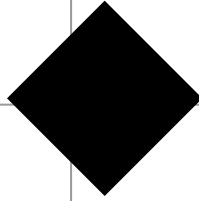
HELI Model Data Recording Sheet

Make copies before using

Model Name _____ - _____

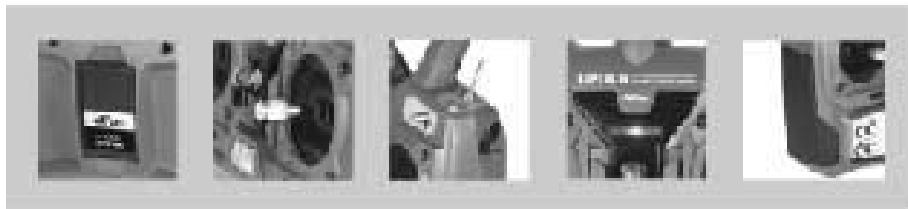
Memory No. 1 . 2 . 3 . 4 . 5 . 6 . 7 . 8

MENU FUNCTION	CH 1	CH 2	CH 3	CH 4	CH 5	CH 6
REV Servo Rev (circle)	N . R	N . R	N . R	N . R	N . R	N . R
EPA End Point Adj.	R/D	%	%	%	%	%
	L/U	%	%	%	%	%
SBTR Subtrims Value	%	%	%	%	%	%
D/R NOR	Up	%	%	%	%	%
	Down	%	%	%	%	%
EXP NOR	Up	%	%	%	%	%
	Down	%	%	%	%	%
T.CUT	%					
PMX1 Programmable Mixer 1	ON.INH	MAS CH ___ SLV CH ___ R/D + o - ___% L/U + o - ___%				
PMX2 Programmable Mixer 2	ON.INH	MAS CH ___ SLV CH ___ R/D + o - ___% L/U + o - ___%				
R->T Rud-Thr Mixing		Right Side (R/D) + o - ___% Left Side (L/U) + o - ___%				
GYRO Gyro setting		NOR ___% ST1 ___% ST2 ___% ST3 ___%				
HOLD Throttle Hold setting		___%				
THCV Throttle Curve NOR	%	%	%	%	%	%
THCV Throttle Curve ST1	%	%	%	%	%	%
THCV Throttle Curve ST2	%	%	%	%	%	%
PTCV Pitch Curve NOR	%	%	%	%	%	%
PTCV Pitch Curve ST1	%	%	%	%	%	%
PTCV Pitch Curve ST2	%	%	%	%	%	%
PTCV Pitch Curve ST3	%	%	%	%	%	%
RVMX Revolution Mixing NOR		High Side (R/D) + o - ___% Low Side (L/U) + o - ___%				
RVMX Revolution Mixing ST1		High Side (R/D) + o - ___% Low Side (L/U) + o - ___%				
RVMX Revolution Mixing ST2		High Side (R/D) + o - ___% Low Side (L/U) + o - ___%				
SWAH Swash settings	%	%	%			



OPTIC 6

6 CH DIGITAL PROPORTIONAL
FM RADIO CONTROL SYSTEM



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Multiplex is a registered trademark of the Multiplex corporation.

English manual

Made in the Philippines

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