

**JR**  
*feel the difference!*

INSTRUCTION MANUAL FOR AIRPLANE



**XP9303**

**9-CHANNEL COMPUTER RADIO SYSTEM**

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# Section 1: Using this manual

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This Manual is divided into three specific sections: Airplane, Sailplane and Helicopter. When writing this manual we employed three distinctly different individuals to write the sections that most pertained to their expertise. The Aircraft section was written by a top notch aerobatic pilot, the Sailplane section by a very experienced sailplane competitor and the Helicopter Section by a member of the 2003 USA F3C team. Each section may read and feel slightly different because of the different personal styles that each of these authors has used.

In this manual you will find the specifications for the radio and its various components and accessories. In addition, guidelines for the installation have been included. Instructions for setting all the functions and programs are presented in the three sections of the manual: Airplane, Helicopter and Sailplane. These features are discussed in the same order that they would normally be needed to set up a typical aircraft, helicopter and 6 servo winged sailplane respectively. An explanation of the use and purpose of each feature is provided, followed by a labeled illustration of its respective LCD display.

A blank data sheet has been included at the end of each section. Once all data has been input for a particular model, it is highly recommended that you record it on a copy of the sheet provided.

# Section 2: Features

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The computer-designed, ergonomically-styled transmitter case ensures a comfortable fit in your hands. You will also be introduced to our exclusive "Rolling Selector" on the face of the transmitter for fast and effortless movement through any programming sequence. The ultra-precision control sticks offer adjustable spring tensions and length. The throttle stick offers a ratchet in Airplane/

Sailplane configuration. 30-model memory storage allows programming of all parameters of thirty separate airplanes, helicopters or sailplanes; you can program more than one setup for a single aircraft, allowing you to instantly change the flight characteristics.

## R770 Receiver

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### R770 (Basic Air and Sailplane Systems)

---

The R770 is a high-performance PCM single-conversion receiver with 10KHz super narrow band ABC&W circuitry.

A narrow band ceramic filter for high-signal selectivity assists in rejecting cross modulations from other common radio frequencies, such as RC transmitters or local paging systems.

This receiver features Direct Servo Control (DSC) for control of servos without radio frequency output.

The receiver has low current consumption.

The R770's Slimline design allows it to fit into most model applications.

## R649 Receiver

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### R649 (Advanced Air, Basic & Advanced Helicopter Systems)

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The R649 is a high-performance PCM single-conversion receiver with 10KHz super narrow band ABC&W circuitry.

A narrow band ceramic filter for high-signal selectivity assists in rejecting cross modulations from other common radio frequencies, such as RC transmitters or local paging systems.

This receiver features Direct Servo Control (DSC) for control of servos without radio frequency output.

The receiver has low current consumption.

The R649's credit card size design allows it to fit into most model applications.

## Section 3: Component Specifications

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### Servo Specifications

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Type	DS811	DS8311	DS368
Torque	54 Oz/In	125 Oz/In	53 Oz/In
Speed	.18	.18	.21
Weight	1.44 Oz	1.87 Oz	0.80 Oz
Size (in) (L x W x H)	1.49x0.75x1.52	1.54x0.75x1.36	1.12x0.50x1.17
Ballbearing	Yes	Yes	No
Motor	Cored	Coreless	Cored

### Transmitter Specifications

---

Type	Airplane	Helicopter	Sailplane
Model Number	NET-N339FS	NTE-N339HS	NET-N339GS
Encoder	9-channel computer system		
RF Module	Plug-in Module	Plug-in Module	Plug-in Module
Modulation	PPM/SPCM	PPM/SPCM	PPM/SPCM
Output Power	Approximately 750mw		
Current Drain	200ma	200ma	200ma
Power Source	1.2Vx8 Ni-Cd (9.6V) 600Mah		
Output Pulse	1000-2000 (1500 neutral)		

### Component Specifications

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Type	Airplane	Helicopter	Sailplane
System Name	X-9303A(basic/ (advanced)	X-9303H(basic)/ (advanced)	X-9303S
Transmitter Body	NET-N339FS	NTE-N339HS	NET-N339GS
Receiver	R770(basic)/R649(advanced)	R649 PCM	R770 PCM
Charger	NEC-222	NEC-222	NEC-222
Airborne Battery	1100mah	1100mah	600mah
Servos	None(basic)/ 4-DS811(advanced)	4-DS811(basic) 4-DS8311(adv)	3-DS368
Accessories	Deluxe Switch 12" Ail Extension Charge Jack Servo Accessories Hex Wrench Instruction Manual	Deluxe Switch 12" Ail Extension Charge Jack Servo Accessories Hex Wrench Instruction Manual	Deluxe Switch 12" Ail Extension Charge Jack Servo Accessories Hex Wrench Instruction Manual

## Receiver Specifications

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Type	7 Channel SPCM	9 Channel SPCM
Model Number	R770	R649
Type	7-ch/SPCM-ABC&W/Micro	9-ch/SPCM-ABC&W
Frequency	72/75/50mhz	72/75/50mhz
Sensitivity(Microseconds)	5 uS Minimum	5 uS Minimum
Selectivity	8KHz/5 dB	8KHz/5 dB
Weight (oz)	.75 oz	1.5oz
Receiver Antenna	39" for all aircraft frequencies	39" for all aircraft frequencies

## Charger Specifications

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Type	Airplane	Helicopter	Sailplane
Model Number	NEC-222	NEC-222	NEC-222
Input Voltage	AC 100-120V	AC 100-120V	AC 100-120V
Output Current	65mAh Tx/150mAh Rx		
Charging Time	15 Hours	15 Hours	15 Hours

## Airborne Battery Pack

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### Airborne Battery Pack Specifications

---

Type	Airplane	Helicopter	Sailplane
Model Number	B1100	B1100	Extra 600
Voltage	4.8V	4.8V	4.8V
Size (in) (L x W x H)	2.24 x 0.63 x 1.70	2.24 x 0.63 x 1.70	2.64 x 1.18 x .70
Weight (oz)	4.9	4.9	2.7

# Battery Charging

## Transmitter/Receiver

**Note:** It is imperative that you fully charge both the transmitter and the receiver battery packs prior to each trip to the field. To do so, leave the charger and batteries hooked up overnight (16 hours). The first charge should be approximately 20–24 hours in order to fully charge both battery packs to peak capacity.

The charger supplied with this system is designed to recharge your batteries at a rate of 65mAh for the transmitter and 150mAh for the receiver battery pack.

### Transmitter Only

The center pin on all JR® Remote Control Systems is negative. Therefore, the center pin on all JR chargers is negative, not positive. This is different from many other manufacturers' chargers and radio systems. Beware of improper connections based on “color-coded” wire leads, as they do not apply in this instance. You must make sure that the center pin of your JR transmitter is always connected to the negative voltage for correct polarity hookup.

**Important:** Please note that the charging polarity of the transmitter and receiver are different.

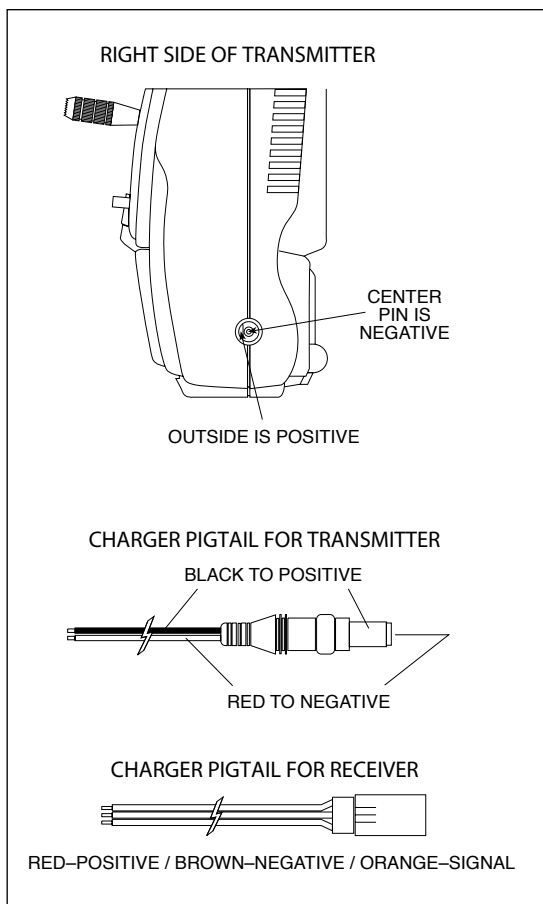
### Charger

The pilot lamps should always be on during the charging operation. If not, check to make sure that both the transmitter and receiver are switched off.

Do not use the charger for equipment other than JR. The charging plug polarity may not be the same. Equipment damage can result.

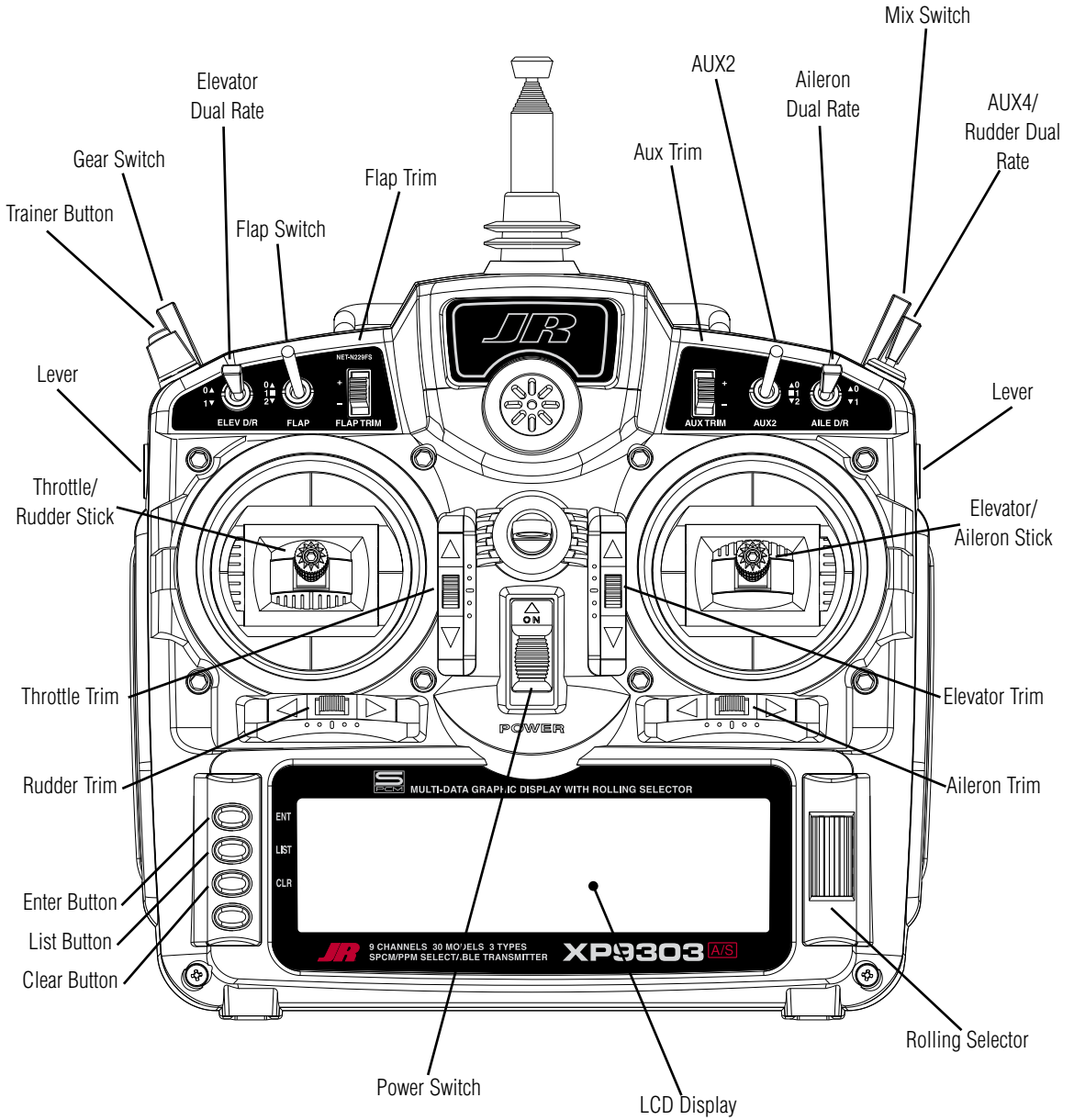
Do not use other manufacturers' after-market accessories that plug into the transmitter's charging jack if you are unsure of compatibility issues with your radio. Seek expert advice to avoid possible damage.

During the charging operation, the charger's temperature is slightly elevated. This is normal.



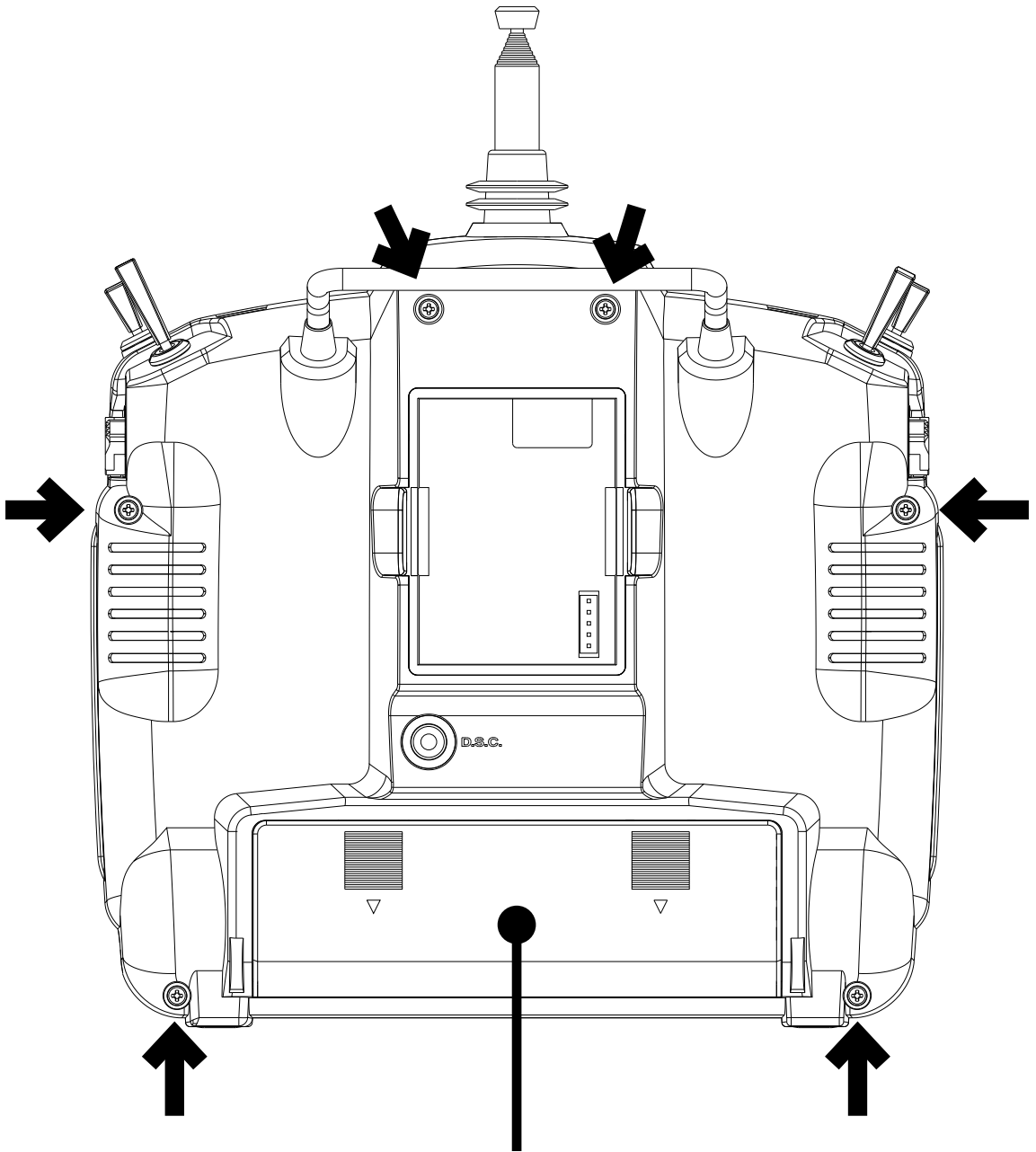


# XP9303 Transmitter Features (Front)



## XP9303 Transmitter Features (Rear)

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**Battery Cover**

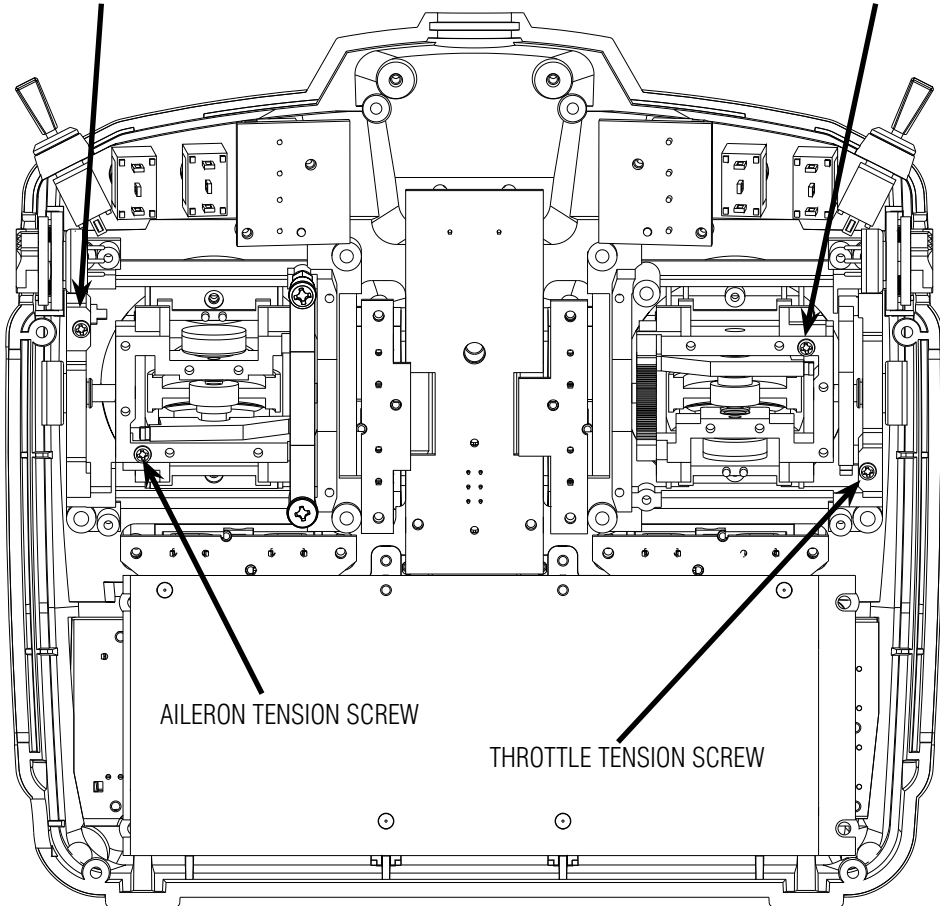
CAUTION: THE BATTERY CONNECTION IS KEYSO THAT IT CAN ONLY BE PLUGGED IN ONE DIRECTION. DO NOT FORCE

# XP9303 Transmitter Features (Internal)

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ELEVATOR TENSION SCREW

RUDDER TENSION SCREW



AILERON TENSION SCREW

THROTTLE TENSION SCREW

## Control Stick Tension Adjustment

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Remove the six transmitter back screws as shown on the previous page. Remove the transmitter back, being careful not to cause damage to any components.

Adjust each screw for desired tension (counter-clockwise to loosen stick feel; clockwise to tighten stick feel). When adjusting the throttle ratchet tension, make sure that the adjusting screw does not touch the PC board after adjustment is complete.

## Advanced Digital Trims

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The XP9303's digital trims feature the Direct Access display function. While at the Normal display screen, if a trim lever is moved, the screen will automatically change to display the graphic position for the trim being adjusted. The XP9303's Aileron, Elevator, Throttle and Rudder trim levers feature an audible center trim beep. This is helpful in determining the trim levers center position during flight.

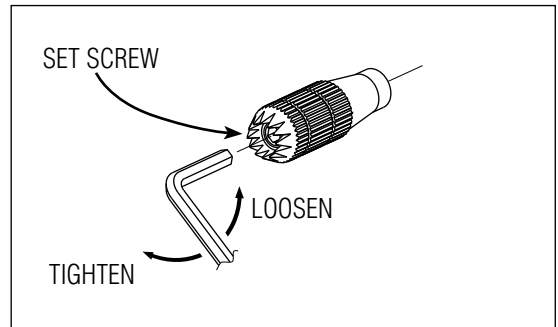
By using the Trim Step Function located in the System Mode, the movement of the ADT trims can be fine tuned as needed to match your specific application

Please also note that unlike conventional mechanical trim levers, when the XP9303 transmitter is in the off position, no changes can be made to the trim values during transportation.

## Control Stick Length

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To adjust the stick length, use the 2mm Allen wrench (supplied with your XP9303 transmitter) to unlock the set screw. Turn the wrench counterclockwise to loosen the screw. Then, turn the stick clockwise to shorten or counterclockwise to lengthen. After the control stick length has been adjusted to suit your flying style, tighten the 2mm set screw. If you desire longer sticks, JR® offers a stick (JRPA047) that is approximately one inch longer than standard. This stick, crafted from bar stock aluminum, is available at your local JR dealer.

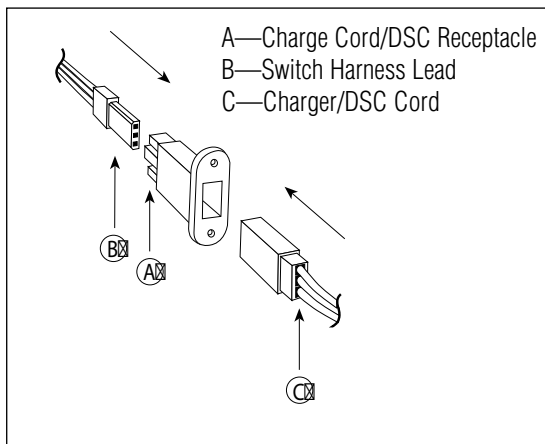


## Direct Servo Control (DSC)

For proper DSC hook-up and operation:

1. Leave the transmitter power switch in the Off position. The transmitter will not transmit any radio frequency (RF) in this position.
2. Plug the DSC cord (purchased separately, JRPA132) into the DSC port in the rear of the transmitter.
3. The encoder section of the transmitter will now be operational and the LCD display will be lit.
4. Plug the other end of the DSC Cord into the receiver charge receptacle. (You must use a 3-wire switch harness, such as the Deluxe Switch Harness – JRPA001, or a JR Chargeswitch – JRPA004, for the DSC function to work.) Turn the switch harness to the On position.

**Note:** When you install the charging jack, be sure to hook the charging jack receptacle securely into the switch harness charge cord.



## Why you should use the DSC function:

1. The DSC enables you to check the control surfaces of your aircraft without drawing the fully operational 200mAh from your transmitter battery pack. Instead, you will only draw approximately 70mAh when using the DSC function.
2. The DSC function allows you to make final adjustments to your airplane without transmitting any radio signals. Therefore, if another pilot is flying on your frequency, you can still adjust your aircraft and not interfere with the other pilot's aircraft. This is also a tremendous tool to use in the original setup of your aircraft while still in the workshop. Because of the lower current draw on your transmitter, your working time at the bench will be extended between charges.

**Note:** This function is for bench-checking your aircraft only.



## Neckstrap Attachment

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An eyelet is provided on the face of the XP9303 transmitter that allows you to connect a Neck Strap (JRPA023). This hook has been positioned so that your transmitter has the best possible balance when you use the neck strap.

## Base Loaded Antenna

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An optional base-loaded antenna is available for use with the XP9303 transmitter. It is considerably shorter than the standard antenna. However, the base loaded antenna cannot be collapsed for storage inside the transmitter. You must also use an adapter (JRPA156) to attach the antenna to your XP9303. The Base Loaded Antenna (JRPA155) is made of a flexible coil and is covered with a soft plastic material. Your range will not be affected when using the base loaded antenna.

## Frequency Notes/Aircraft Only Frequencies

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The XP9303 transmitter employs a plug-in module for the transmitter. Per FCC regulation, the transmitter crystal in the module should only be changed by a certified technician. Changing of the transmitter crystal by a non-authorized technician could result in a violation of FCC rules.

The XP9303 can transmit in either Pulse Code Modulation (SPCM) or Pulse Position Modulation (PPM, commonly referred to as FM).

Be certain to observe the following guidelines:

Do not operate your transmitter when another transmitter is using the same frequency, regardless of whether the second transmitter is PCM, PPM (FM) or AM. You can never operate two transmitters on the same frequency simultaneously without causing interference.

### Aircraft-Only Frequencies

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JR® Transmitters and receivers are available in 72MHz frequencies in the United States for use with model aircraft. Employing 72MHz frequencies does not require a special operator's license from the Federal Communications Commission (FCC).

- A chart for all available frequencies is located on page I-3 of this manual.

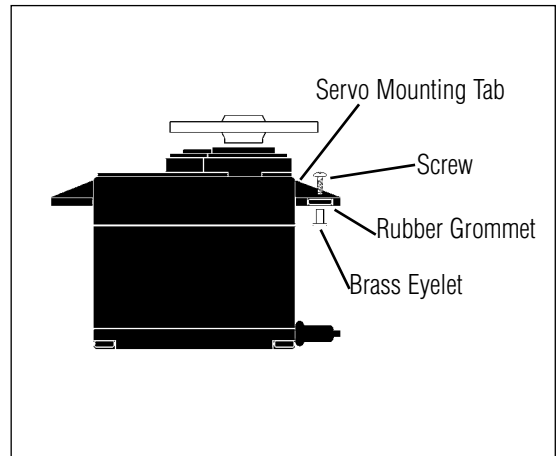
## Installation Requirements

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It is extremely important that your radio system be correctly installed in your model. Here are a few suggestions for installing your JR® equipment:

1. Wrap the receiver in protective foam rubber that is no less than 3/8 inch thick. Secure the foam to the receiver with #64 rubber bands. This protects the receiver in the event of a crash or a very hard landing.
2. The servos should be mounted using rubber grommets and brass eyelets to isolate them from vibration. Do not over-tighten the mounting screws; this will negate the vibration absorption effect of the rubber grommets. The following diagram will assist you in properly mounting your servo.  
The brass eyelets are pushed from the bottom up in the rubber grommets. When the servo screw is tightened securely, it provides the proper security as well as the proper vibration isolation for your servo.
3. The servos must be able to move freely over their entire range of travel. Make sure that the control linkages do not bind or impede the movement of any of the servos.

4. Mount all switches away from the engine exhaust and away from any high vibration areas. Make sure the switch operates freely and is able to operate over its full travel.
5. Mount the receiver antenna firmly to the airplane to ensure that it will not become entangled in the propeller or control surfaces.



## Flash Memory

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All preprogrammed data is protected by a flash memory that guards against main transmitter battery failure.

## Connections:

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Note Separate drawings for Acro, Sailplane and Helicopter with typical plug order, switch location, and battery pack connections.

## Battery Alarm and Display

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When the transmitter voltage drops below 9.0 volts DC, the display flashes "BATT LOW" and an alarm sounds.

If you are flying when this occurs, land immediately.

# AIRPLANE – ACRO MODE

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## INTRODUCTION

The ACRO mode of the XP9303 system is intended for powered fixed-wing aircraft. It contains a host of advanced features that are easy to set up and use, and are designed to assist the pilot in realizing the full potential of the aircraft. These features include but are not limited to:

- Switch Assignments
- Flight Modes (3)
- Dual Rates/Exponential (2 or 3 sets for Aileron, Elevator and Rudder)
- Wing Type (Normal, Flaperon, Delta)
- Aileron Differential
- V-Tail
- Dual Channels for All Primary Flight Controls and Flaps
- Dual Throttles (With Independent Trims and Throttle Curves)
- Adjustable Trim Rates (10–100 Trim Steps)
- Built-In Elevator-To-Flap Mixing
- Built-In Aileron-To-Rudder Mixing
- Throttle Curves (2)
- Flap System (With Elevator Trim, Auto Land, Elevator/Flap Delay)
- Snap Roll System (4 Directions/Rates Assigned to Flight Modes)
- Gyro System (In-Flight Gain Selection of 3 Gains for up to 2 Gyros)
- Servo Speed (Independent in Both Directions – Eliminates Door Sequencers)
- 6 Programmable Mixers (Includes 2 Multi-Point Mixers)
- Fail Safe (Hold or Predetermined Positions)
- Trainer System (Selectable Channels for Student Control)
- Timers (Stopwatch, Countdown, Integrated)
- Servo Monitor (Automatically Renames Channels According to Assignments)

In addition to the numerous features listed above, the XP9303 provides the ability to combine these features during flight, using a single Flight Mode switch. This capability dramatically reduces the pilot's work load, allowing the pilot to concentrate on flying the aircraft instead of worrying about how to operate the transmitter (TX).

## ACRO PROGRAMMING - PLEASE READ

For those who are comfortable with programming and would like to dive right in with a minimum amount of explanation, there are a few ACRO programming examples at the end of this manual. Those who are not so inclined are encouraged to continue reading this part of the manual in order to acquire an understanding of the basic XP9303 programming philosophy, functions, and techniques.

**The XP9303 menus and functions are presented here in the order that they should be addressed when setting up a new aircraft.** It begins with entering the SYSTEM Menu, selecting a model and activating the ACRO mode and progresses through the remainder of the SYSTEM Menu options and then through the individual functions. The descriptions are general in nature and provide enough information to identify the purpose of a function, to decide whether or not to use a function, and what types of selections and settings to make.

Those who have some experience with computer-based radios will probably be able to program their aircraft as they read through this section, owing to the fact that the individual functions are generally simple in nature and the XP9303 is a very intuitive system. In those instances where more detailed information is desired/required for a particular function, detailed descriptions of the ACRO functions are included at the end of the ACRO section.

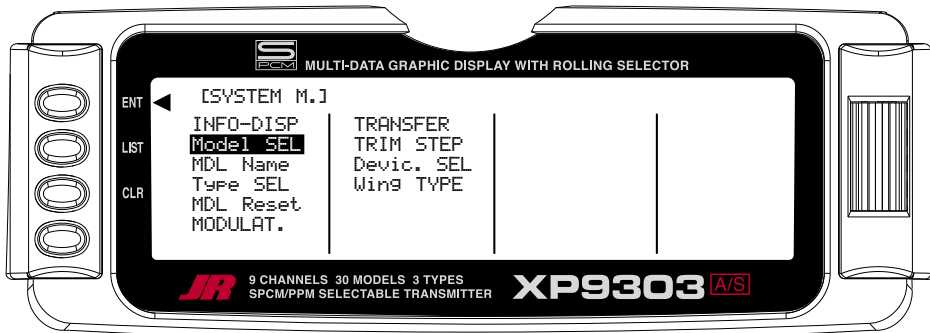
## ACRO - GETTING STARTED – SYSTEM MENU BASICS

Getting started always begins with accessing the **SYSTEM Menu**. This is where models are selected, the mode is identified, modulation type is indicated, and where other high-level information is collected about the model. It is also used to activate some of the more advanced programming features such as Flight Modes, Switch Assignments, Wing Type and Dual Control information.



## ACCESS THE SYSTEM MENU

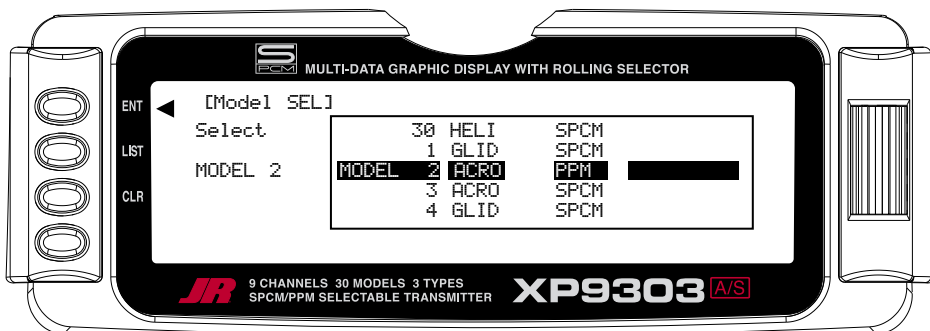
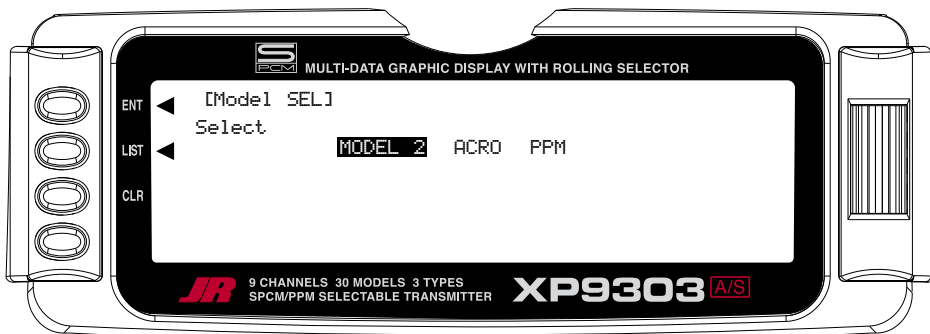
1. The System menu [**SYSTEM M.**] is obtained by holding down the *ENT* button while turning the transmitter on.



## SELECT A MODEL MEMORY

The first thing to do when setting up a new model is to select a model memory for it. It is best to select an unused model memory, however, a memory that already contains data for another model may be used, so long as data for that model is no longer required because any data in that memory will be lost.

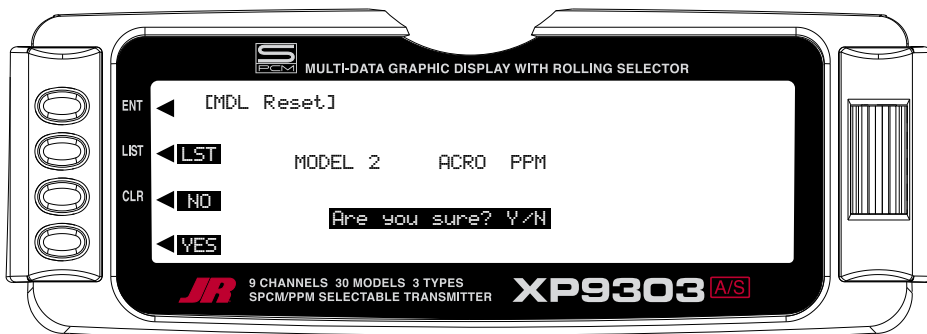
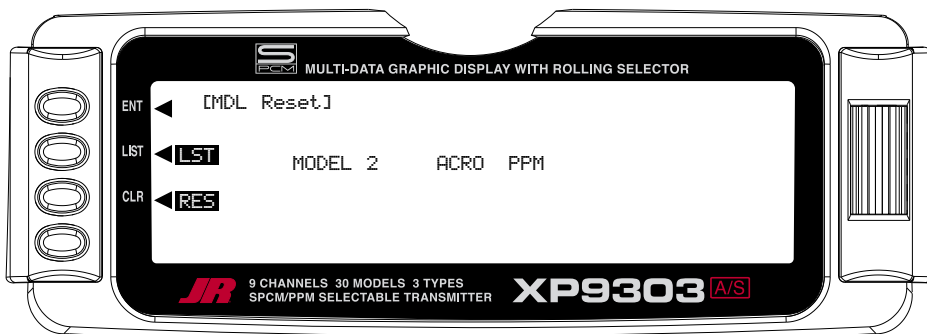
1. In the SYSTEM Menu, highlight and select **Model SEL** using the Selector. The currently selected model number is displayed. If a different model is to be selected, highlight and select the displayed model and a list of models will appear. Scroll up and down the list using the Selector.
2. Use the Selector to highlight and select the desired model memory.
3. Return to the SYSTEM Menu by pressing the *LIST* button.



## RESET THE MODEL

When setting up a new model it is important to reset all parameters to their default or factory settings before proceeding with any other programming. This is to ensure that there are no program mixes, trims or other “surprises” left over from a previous model or programming session.

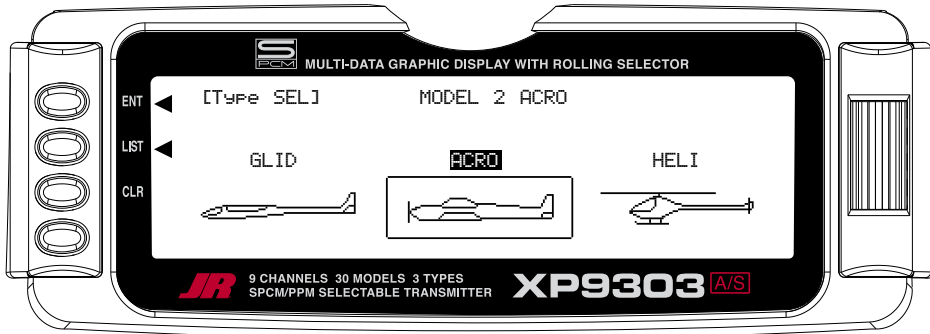
1. In the **SYSTEM Menu**, highlight and select **MDL Reset** using the *Selector*.
2. Press the **CLR** button that is next to **RES** on the display.
3. Press the lowermost button next to **YES** on the display to reset all data for this model.
4. Return to the SYSTEM Menu by pressing the *LIST* button.



## TO ACTIVATE THE ACRO MODE

After having selected and reset a model memory, it is time to tell the TX that the ACRO mode is to be used for this aircraft.

1. In the **SYSTEM Menu**, highlight and select **Type SEL** using the **Selector**.
2. Highlight and select **ACRO** using the **Selector**.
3. Return to the SYSTEM Menu by pressing the **LIST** button.

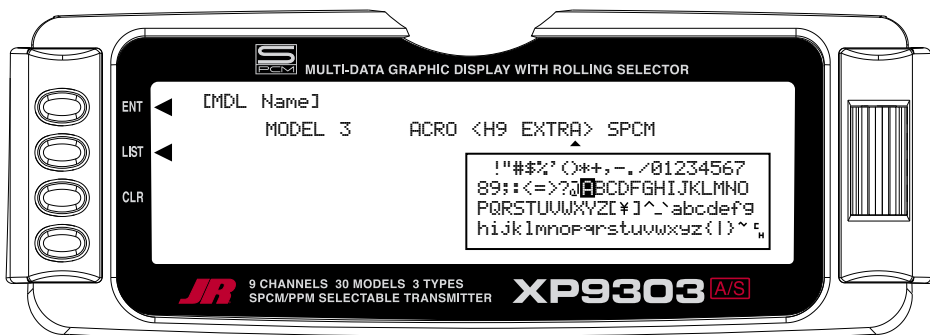


## ENTER A NAME FOR THE MODEL

Each model should be given a name to make it easy to identify in the model memory list and to identify the current model on the main display screen. The model name appears in the upper right hand corner of the main screen when the transmitter (TX) is switched on.

1. In the **SYSTEM Menu**, highlight and select **MDL Name** using the **Selector**.
2. The cursor (the little triangle that indicates where the next character will be placed), is positioned at the beginning of the model name. Press the **Selector** to obtain a list of available characters.

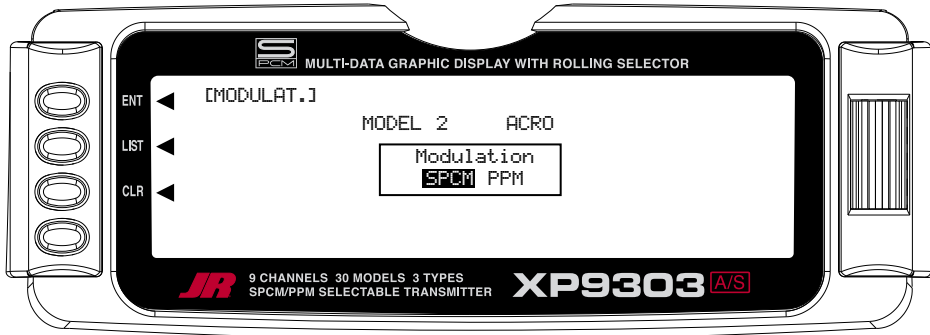
3. Highlight and select the desired character to form the model name. After the character is selected, rotate the **Selector** to position the cursor where the next character is to be placed and press the **Selector** to obtain the character list again. Repeat until the model name is completed.
4. Return to the SYSTEM Menu by pressing the **LIST** button.



## SELECT A MODULATION TYPE

The XP9303 system supports two types of modulation – SPCM and PPM (FM). The correct modulation type must be selected to match the receiver in the aircraft or the system will not function.

1. In the **SYSTEM Menu**, highlight and select **MODULAT.** using the *Selector*.
2. Highlight and select **Modulation** and then select either **SPCM** or **PPM** to match the receiver in the aircraft.
3. Return to the SYSTEM Menu by pressing the *LIST* button.



## ACRO - SYSTEM MENU - ADVANCED FUNCTIONS

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There are two functions in the SYSTEM Menu that control some of the more advanced features of the XP9303 system. They are the **Devic. SEL** and **Wing Type** functions.

The Devic. SEL function is used to activate/inhibit Flight Modes; change switch assignments; activate/inhibit switches/channels; and to activate the FLAP TRIM lever that is next to the FLAP switch on the TX.

The **Wing Type** function is used to indicate the wing type (Normal, Flaperon, Delta); to indicate if the aircraft is a V-tail configuration; and to identify any dual channels for primary flight controls (ELEV, AILE, RUDD, FLAP). It also provides for a 2nd throttle channel, complete with independent trim and throttle curves to accommodate twin-engine aircraft.

Each of the options in these two functions is described below to the extent necessary to determine if they should be used for the aircraft that is being set up. More detailed descriptions of these functions can be found later in the ACRO manual.

## FLIGHT MODES

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What is a Flight Mode? A Flight Mode represents an aircraft configuration (Dual Rate/Expo, programmed mixes, Aileron Differential, Flap System, Gyro System, etc.) that is designed and optimized to assist the pilot and the aircraft in performing a specific type of maneuver.

The objective of programming Flight Modes is to provide the ability to flip a switch to select a collection of settings that make it easy to perform a maneuver. An aerobatic aircraft, for example, may be set up such that the Flight Mode switch in its 1st position configures the aircraft for normal precision flying; positioning the switch in its 2nd position sets the aircraft up for snap rolls; and positioning the switch in its 3rd position sets the aircraft up for consecutive rolls, slow rolls, and rolling circles. The 3 Flight Modes could just as easily represent aircraft settings for Take Off, Flying, and Landing for a turbine-powered jet aircraft. The point being that Flight Modes can make the pilot's job a lot easier by configuring the aircraft to do different things by flipping a single switch.

For example, let's consider a jet aircraft and how Flight Modes might be used to make the pilot's job easier. The jet will utilize 3 Flight Modes - 1 for takeoffs, 1 for flying at high-speed and 1 for landing.

During takeoff, full control deflections are desired, with a moderate amount of Exponential to assist in rotation and control of the aircraft at takeoff speed. Steering should have a lot of Exponential to avoid over-steering during the takeoff roll. So for the 1st Flight Mode (FM0), Dual Rates and Exponential curves are set for Ailerons and Elevator to allow adequate control for rotation and control at takeoff speed, while a high percentage of Exponential is set for the rudder/steering to help prevent over-steering during take off. If the aircraft is equipped with 3 position Flaps (Retracted, Take-off position and Landing position), the Take-off flap position can be assigned to only the 1st Flight Mode to assist in takeoff. There may also be a Gyro attached to the steering/rudder and the Gyro gain can be turned-on and associated with the Take-Off Flight Mode to assist in keeping the aircraft straight during the take off roll.

For normal flight at higher speeds, the 2nd Flight Mode (FM1) would be set up to have quite a bit of Exponential and perhaps reduced control rates on all control surfaces because a lot less control deflection is required at high speeds. The retracted flap position would also be assigned to this Flight Mode and the Gyro gain could be reduced or turned-off.

For landing, the 3rd Flight Mode (FM2) would be set up to use full control throws with a moderate to high degree of Exponential to smoothly control the jet at lower

landing speeds and again have a lot of Exponential on the rudder to prevent over-steering upon the landing/roll out. A couple of program mixes can be set up to bring in some Up-Elevator to make the jet assume a positive angle of attack, and to deploy the speed brakes. The two mixers can then be assigned only to the 3rd Flight Mode for landings. The Landing flap position can also be associated with the 3rd or Landing Flight Mode and the Gyro gain can again be turned-on to assist in a straight roll-out during landing.

Most of the functions found in the 9303 that are switch selectable (including programmable mixers) can be assigned to one or more Flight Modes. This provides the ability to have 3 completely different aircraft configurations that are selectable in flight using a single switch - controlling a complex aircraft couldn't be any easier!

Three Flight Modes are available in the XP9303 system. When Flight Modes are activated, they are selected during flight by using one of the two 3-position switches (FLAP Switch or AUX2 switch). The pilot decides which switch is to be used when Flight Modes are activated in the **Devic. SEL** function in the **System menu**. Once Flight Modes are activated, the pilot has a choice of using the Flight Mode switch to select up to 3 Dual Rates and Exponential settings for each of the primary controls (ELEV, AILE, RUDD), or Dual Rates and Exponential settings may continue to be controlled by the 3 individual Dual Rate switches. However, when using the standard D/R switches, there are only 2 settings possible for each of the primary controls because the D/R switches are only 2-position switches. All other functions that can be activated by a switch can be assigned to 1 or more Flight Modes when Flight Modes have been activated.

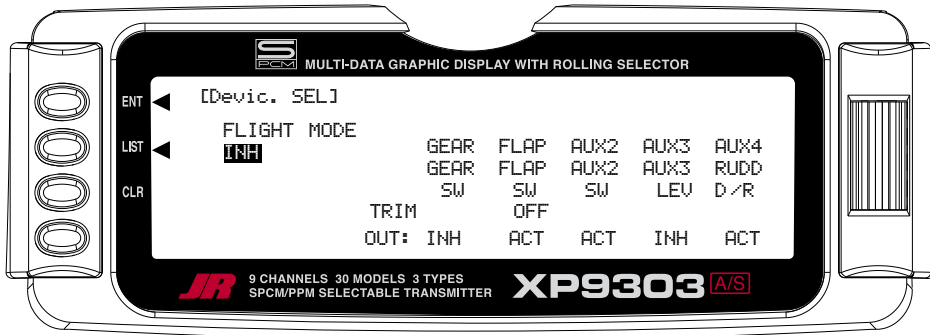
**Decide if Flight Modes are to be activated.** If 3 sets of Dual Rates and Exponential settings are desired for Elevator, Ailerons, and Rudder instead of having only 2 sets available, then continue below to activate Flight Modes.

If there is a desire to gang Dual Rates for Aileron, Elevator and Rudder together on a single switch, then continue below to activate Flight Modes.

If there is a need to group multiple functions together in order to perform certain tasks with the aircraft, then continue below to activate Flight Modes. If it is decided that Flight Modes are not to be activated, then skip to SWITCH ASSIGNMENTS below.

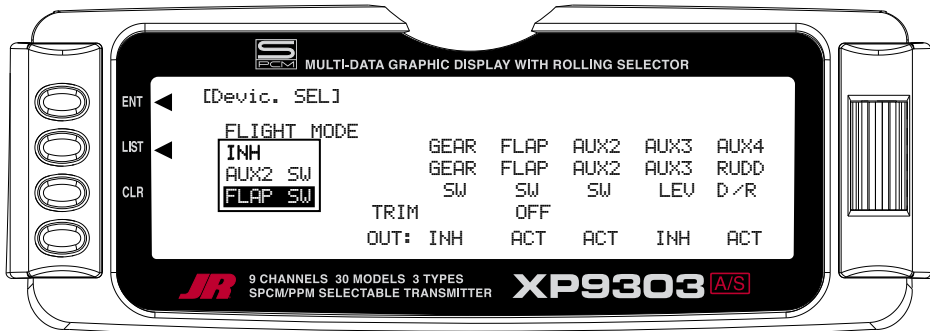
## To Activate Flight Modes

1. From **SYSTEM M**, highlight and select **Devic. SEL** using the *Selector*.



2. Using the *Selector*, highlight and select **INH** under **FLIGHT MODE**. When selected, two options appear: **AUX2 SW** and **FLAP SW**. Highlight and select the switch that is to be used to select between Flight Modes while flying. The example below shows that the **FLAP** switch has been selected.

Once one of the 3-position switches is selected, Flight Mode 0 (FM0) is in effect when the switch is in the upper position, Flight Mode 1 (FM1) is in effect when the switch is in the middle position and Flight Mode 2 (FM2) is in effect when the switch is moved to the lowest position.



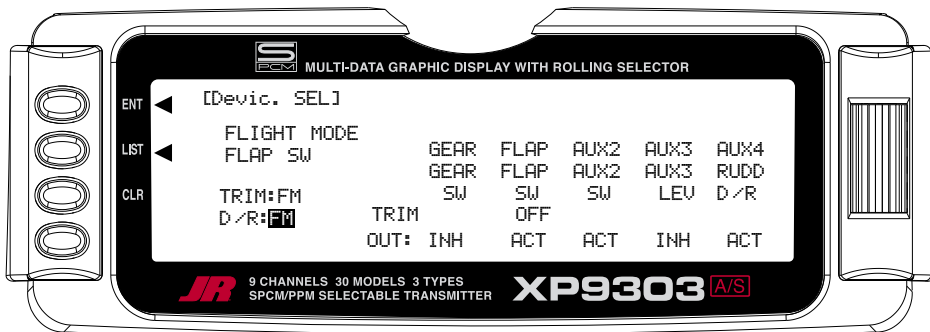
Once Flight Modes have been activated, 2 new parameters appear on the display: TRIM:COM and D/R:SW.

## TRIM:COM (Flight Modes)

The **TRIM:COM** parameter can be toggled back and forth between **COM** and **FM** by pressing the **Selector** when **COM** or **FM** is highlighted. If left in the **COM** mode, the digital trims for Elevator, Ailerons, and Rudder are Common or shared by the 3 Flight Modes. If **FM** is selected, the XP9303 keeps track of the digital trims independently for each Flight Mode, which means the pilot can re-trim the aircraft using the digital trims for each Flight Mode. This is a very useful feature if switching between Flight Modes causes the aircraft's trim to change, such as when flaps are deployed by one of the Flight Modes causing a slight roll. In this case, the pilot can simply use the Aileron digital trim to trim the Ailerons, eliminating the roll tendency when that Flight Mode is selected. Selecting other Flight Modes brings in a corresponding set of trims, ensuring the aircraft stays in trim as the pilot changes between the 3 Flight Modes during flight.

1. If Flight Modes are only going to be used to switch between 3 sets of Dual Rates/Exponential settings, then leave the TRIM parameter set to **COM**. If other functions are to be controlled by Flight Modes which may have a tendency to cause the aircraft trim to change, then select **FM** for the TRIM parameter. The example below shows **FM** selected, meaning that each Flight Mode has its own set of trims. The setting can be changed at any time by returning to this display.

**Note:** When trims are set to **FM**, be especially careful during the first flight of an aircraft to remember that the aircraft will need to be trimmed using the digital trims for Aileron, Elevator and Rudder for each Flight Mode selected during flight. If the aircraft is badly out of trim, it will probably be badly out of trim for each Flight Mode selected. If the out-of-trim condition is very severe, it might be wise to land after trimming the first Flight Mode and then note the trim settings. Switch to the other 2 Flight Modes and match the trims to these settings before flying again.



## D/R:SW (Flight Modes)

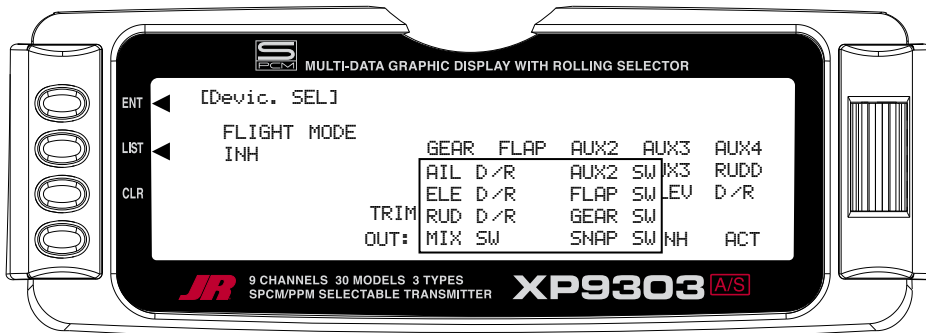
2. The **D/R:SW** parameter may be toggled between **SW** and **FM** by pressing the **Selector** when **SW** or **FM** is highlighted. If left in the **SW** mode, then the 3 Dual Rate switches will be used to select Dual Rates and Exponential settings for Elevator, Ailerons, and Rudder and there will only be 2 sets of Dual Rates/Expo settings for each control. If **FM** is selected, the Flight Mode switch will be used to select Dual Rates/Expo settings for all three controls at once (Elev, Aile, Rudd - D/R settings ganged together on the Flight Mode switch) and there will be 3 sets of D/R/Expo values available for each control.
3. If individual D/R switches (3 switches) to control only 2 sets of rates and curves for Elevator, Ailerons and Rudder are desired, set this parameter to **SW**. If 3 sets of rates and curves that are selectable by a single Flight Mode switch are desired, then set this parameter to **FM**. This setting may be changed at any time by returning to this display.



## SWITCH ASSIGNMENTS

The XP9303 provides the ability to change the standard default switch assignments for GEAR, FLAP, AUX2, AUX3, and AUX4. Changing the assignments may be a matter of preference or to help overcome a disability in one hand. In any event, the standard switch assignments may be changed in the **Devic.SEL** function contained in the SYSTEM Menu. To change one or more switch assignments:

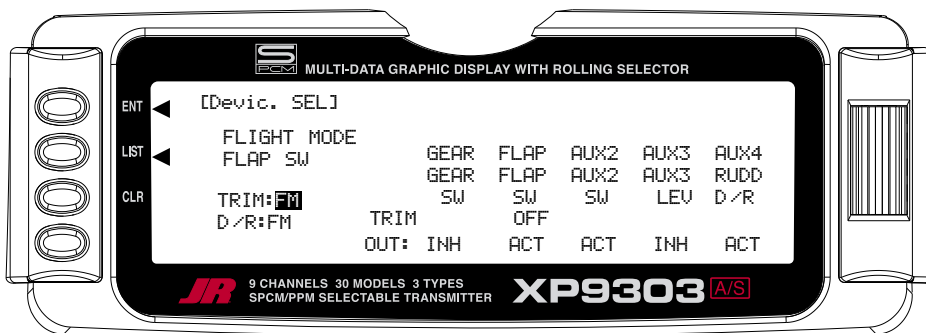
1. From within the **Devic.SEL** function, use the **Selector** to highlight and select **GEAR, FLAP, AUX2, AUX3,** or **AUX4** along the top line of the display.
2. Once a switch is selected, a list of available replacement switches is displayed. Highlight and select the desired switch with the **Selector**.
3. Repeat for as many switches as desired.



## FLAP TRIM ON/OFF

1. The digital FLAP TRIM lever is located next to the FLAP switch. It may be activated or deactivated in the **Devic.SEL** function by using the **Selector** to highlight either **ON** or **OFF** and pressing the **Selector** to toggle between these two values.

**Ordinarily this switch should be turned OFF,** even if the aircraft has flaps or flaperons, because the system provides other means of controlling flaps and disabling this switch will help prevent a serious out-of-trim condition if flaperons are used and the trim lever is accidentally moved. **Do not turn this on unless there is a specific need to do so.**



# ACTIVATE/INHIBIT SWITCHES

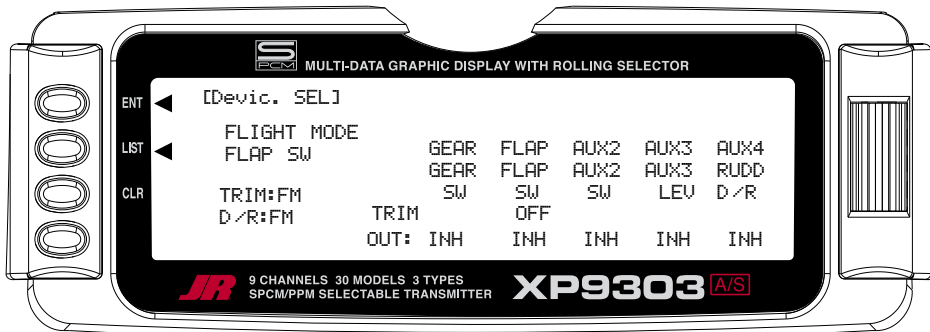
The XP9303 provides the ability to inhibit or otherwise disable a number of the levers and switches on the transmitter – GEAR, FLAP, AUX2, AUX3, and AUX4. This is very useful when auxiliary channels are used as dual primary flight controls, such as using 2 channels/servos for 2 Elevator halves and/or using 2 servos/channels to operate the Rudder. In this instance, the auxiliary channels are no longer to be operated by their auxiliary switches but rather by the Elevator and Rudder sticks.

**Note:** If any of the channels identified above are to be used as a 2nd channel for a primary flight control (AILE, ELEV, RUDD, FLAP), then be sure to Inhibit (**INH**) the switches for the channels in this function or they will not be available to use as a second control channel.

1. If **GEAR, FLAP, AUX2, AUX3, or AUX4** are to be used as a 2nd primary flight control, then inhibit the corresponding switch by highlighting either **ACT, SYS.** or **GYRO** along the bottom line of the display and pressing the **Selector** until **INH** appears under the switches that are to be turned off. The example below shows all switches as **INH** or being turned off, making them all available to be used as a 2nd channel for a primary flight control.

**Note:** When **SYS** appears under FLAP, the FLAP SYSTEM function will appear in the **FUNC.LIST** (described later). If the aircraft is equipped with flaps, or equipped with Flaperons that are actually going to be used as flaps then SYS should be set under FLAP.

**Note:** When **GYRO** appears under **AUX2** or **AUX3**, the Gyro Function will appear in the **FUNC.LIST** (described later). If the aircraft is equipped with 1 Gyro, then GYRO should be set under AUX2 or AUX3. If it is equipped with 2 gyros, then GYRO should be present under both AUX2 and AUX3. The gain lead/plug from the Gyro(s) is plugged into the AUX2 and/or AUX3 channels.



## WING TYPE

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The Wing Type function provides for 3 different wing types (NORMAL, FLAPERON and DELTA). **NORMAL** wing type is used when the Aileron channel is the only channel to be used to control ailerons, either with 1 servo, or multiple servos connected through a Y-harness to the aileron channel. It is also used when the aircraft is equipped with flaps that are separate from the ailerons. **FLAPERON** is typically used when Ailerons are controlled by separate servos that are on separate channels and there are no other flaps on the aircraft. **DELTA** is used when the Ailerons are used as both Ailerons and Elevators (Elevons) on an aircraft with a Delta wing configuration.

The Wing Type function also provides for aircraft that have a V-Tail configuration where the 2 Elevators are used for both Elevator and Rudder control. It also provides for instructing the transmitter to use one or more auxiliary channels as a 2nd or dual channel for primary flight controls (AILE, ELEV, RUDD, FLAP). Finally, the Wing Type function contains the Twin Engine (Twin E.) feature, which allows for setting up a 2nd throttle channel for a second engine, complete with its own trim and throttle curves – an excellent feature for twin-engine aircraft!

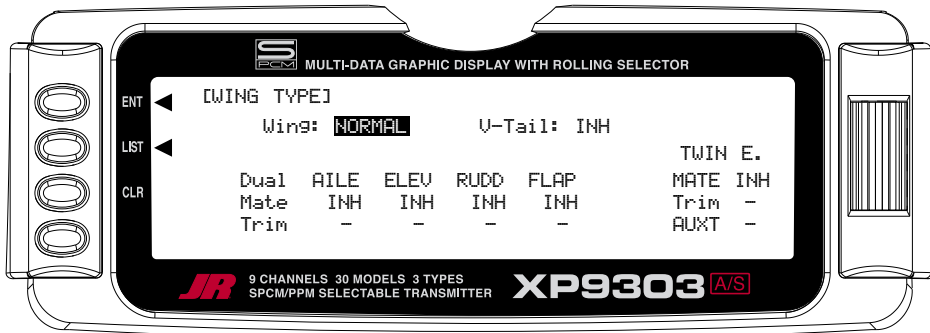
This is a very important function because a large number of sport and aerobatic aircraft use 2 servos and 2 channels to operate the Ailerons, providing the opportunity to utilize Aileron Differential to make rolls more axial and to couple Flaps with Elevator for very tight looping maneuvers and 3D flying. Unless the aircraft has separate flaps, the FLAPERON wing type should be used here, as all of the mixing is accomplished automatically by the transmitter. Setting the wing type to FLAPERON also makes available the Aileron Differential and Elevator-to-Flap mixing functions in the FUNC.LIST (described later).

If the aircraft has flaps that are separate from the Ailerons, then use the NORMAL wing type and use the Dual Channel feature to enable a 2nd Aileron channel if dual Aileron channels are desired.

## WING Parameter – (Wing Type)

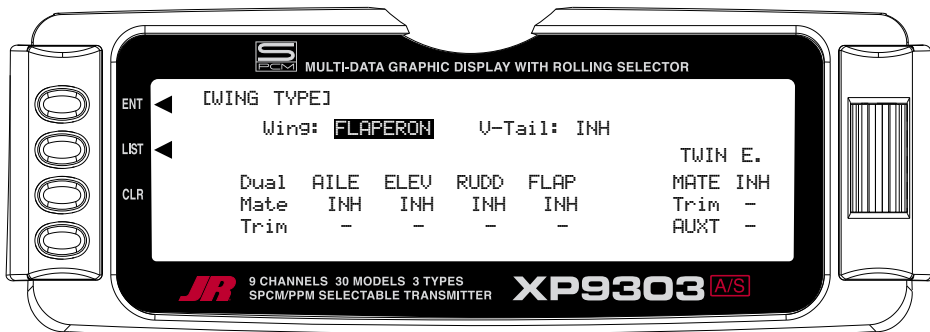
1. Highlight and select **Wing TYPE** in the **SYSTEM Menu** using the **Selector**.
2. If only the Aileron channel is to control both Ailerons, either with a single servo or with 2 servos connected together via a “Y” harness, then leave the Wing

parameter set to the default of **NORMAL** and plug the Aileron servo into the Aileron channel (Ch2) of the RX. Also use **NORMAL** if the aircraft has flaps that are separate from the ailerons.



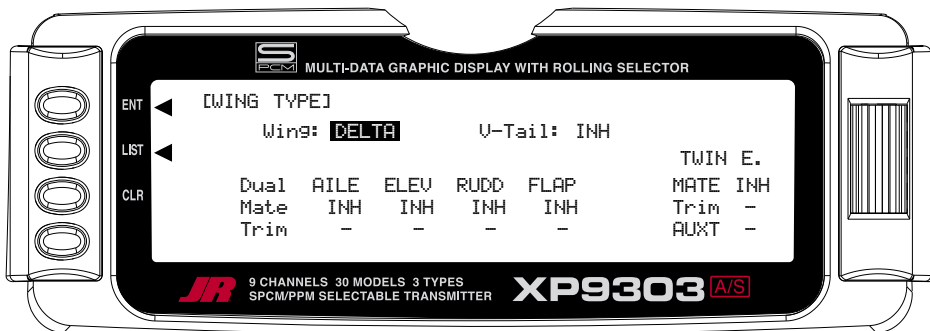
3. If 2 channels are to be used to control the Ailerons and the aircraft does not have separate flaps, highlight and select **Wing** with the **Selector** and then highlight and select **FLAPERON** as the wing type. Plug the right Aileron into the Aileron channel (Ch2) and plug the left Aileron servo into the FLAP or AUX1 channel (Ch6) of the RX. Continue with V-tail below.

**Note:** If the Ailerons are not going to actually be used as flaps, inhibit the FLAP Switch and FLAP TRIM in the **Devic.SEL** function in the **SYSTEM Menu**. This will eliminate having a severe out-of-trim condition if the FLAP Switch or FLAP TRIM is accidentally moved.



4. If the aircraft is a Delta wing configuration, highlight and select **Wing** using the **Selector** and then highlight and select **DELTA** as the wing type. Plug the

right Aileron into the Aileron channel (Ch2) and plug the left Aileron into the Elevator channel (Ch3) of the RX. Continue with V-tail below.



## V-tail (Wing Type)

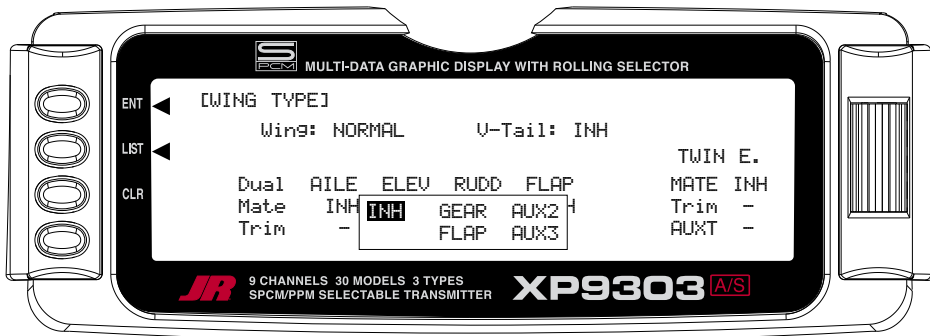
1. If the aircraft has a V-tail configuration, highlight **INH** next to V-tail in the Wing TYPE function and press the **Selector** until **ACT** appears. Plug the right Elevator servo into the Elevator channel (Ch3) and plug the left Elevator servo into the Rudder channel (Ch4). Pressing

the **Selector** toggles the parameter between **ACT** and **INH**. If the aircraft has a normal tail, make sure **INH** is selected and plug the Elevator and Rudder servos into the Elevator and Rudder channels (Ch3 and Ch4 respectively). Continue with Dual Channels below.

## Dual Channels (Wing Type)

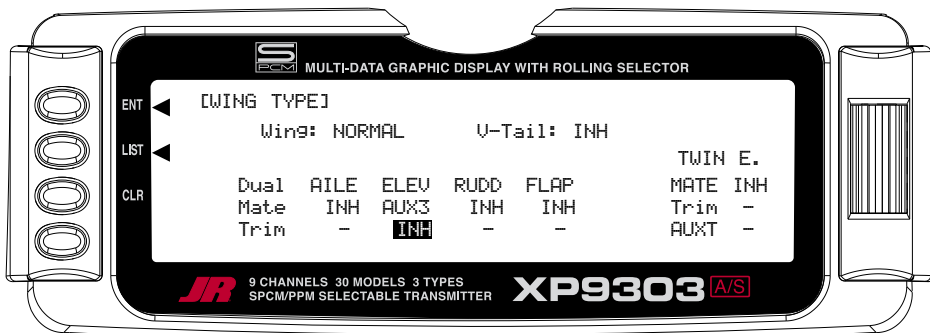
1. To assign a 2nd channel to Ailerons, Elevator, Rudder or Flaps, highlight and select **INH** under the desired channel on the **Mate** line of the **Wing TYPE** display and a list of available channels is displayed.

**Note:** Channels/Switches must be inhibited (**INH**) in the **Devic. SEL** function before they will appear in the list as an option to be used as a Dual channel.



2. Highlight and select the channel that is to be the Mate (slave) to the control channel represented above it. Plug the 2nd control surface servo into the channel selected as the Mate.
3. If **FLAP** or **AUX3** is selected as a **Mate**, **INH** will appear on the Trim Line of the display directly beneath the channel just selected. This means that the corresponding digital switch (**FLAP TRIM** or

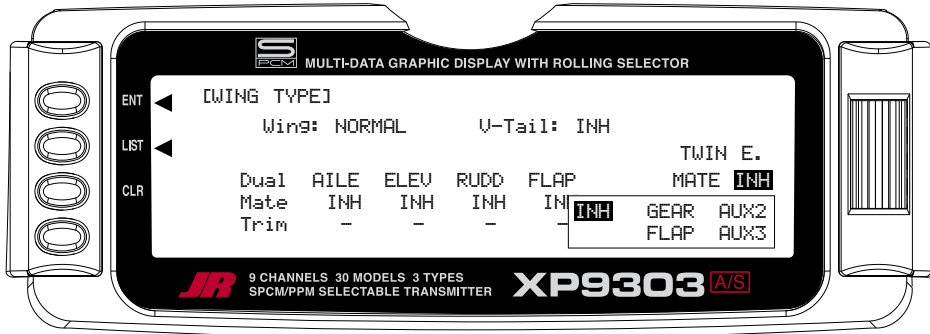
**AUX TRIM**) located next to the **FLAP** and **AUX2** switches can be used as additional trims. **However, the additional trims do not function in the same fashion as regular trims.** Instead, they trim the controls such that both channels move in the same direction – like reflexing both Ailerons or in the case of Elevator halves, the Elevators would move in opposite directions. **As a result, these additional trims should remain inhibited unless there is a special need for them.** If changed to **ACT**, the corresponding trim switch (**FLAP** or **AUX3**) will become active. If set to **INH** these additional trim switches are inactive. Normal trims continue to work regardless of the settings.



## Twin E. (Wing Type)

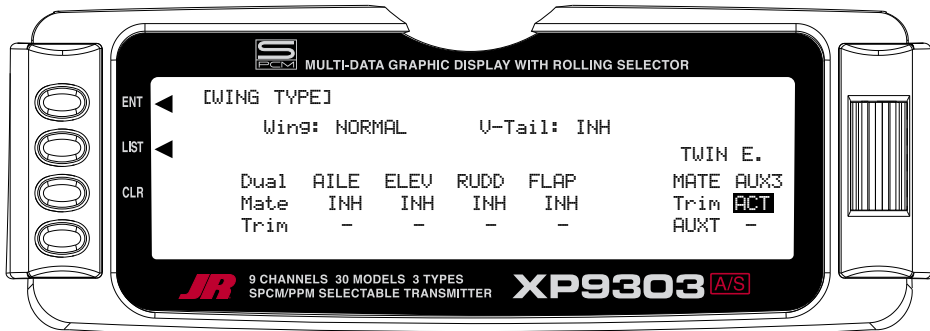
If the aircraft is equipped with twin engines, the Twin Engine feature (Twin E.) may be used for a 2nd throttle channel with an optional separate digital trim. The FLAP or AUX3 channel must be selected as the Mate for the additional trim to be available. If another channel is used as the Mate, the 2nd throttle channel can be trimmed by the regular throttle trim along with the throttle channel.

1. Highlight and select **INH** next to **Mate** under **Twin E.** A list of available channels will appear. Select the **FLAP** or **AUX3** channel if a separate trim is desired for the 2nd throttle channel. Select a different channel if an additional trim is not desired. The normal throttle trim can trim both channels at the same time. Plug the Left engine throttle servo into the channel selected as the Mate. Plug the Right engine throttle servo into the throttle channel (Ch 1).



2. If the second throttle channel is to be trimmed using either the normal throttle trim lever or a separate trim lever, highlight and select **INH** next to **Trim** under **Twin E.** causing the setting to change to **ACT**.

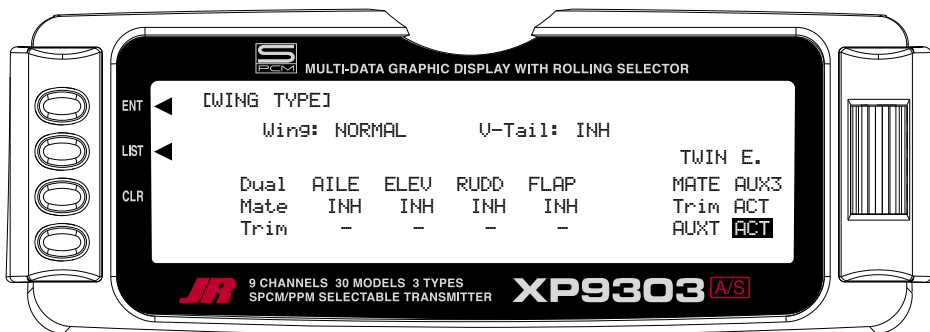
Pressing the **Selector** toggles between **INH** and **ACT**. When set to **ACT**, the 2nd throttle servo can be trimmed with either the normal throttle trim or a separate trim if Flap or AUX3 is selected as the 2nd throttle channel.



3. If **FLAP** or **AUX3** has been selected as the **Mate** and a separate digital trim is to be used for the 2nd throttle channel, highlight and select **INH** next to **AUXT**. This changes the setting to **ACT**, enabling the digital trim that corresponds to the selected channel. The

digital trim switches are next to the **FLAP** and **AUX2** switches on the transmitter.

More detailed information regarding the **Twin E.** feature may be found later in the ACRO section.



## TRIM STEP

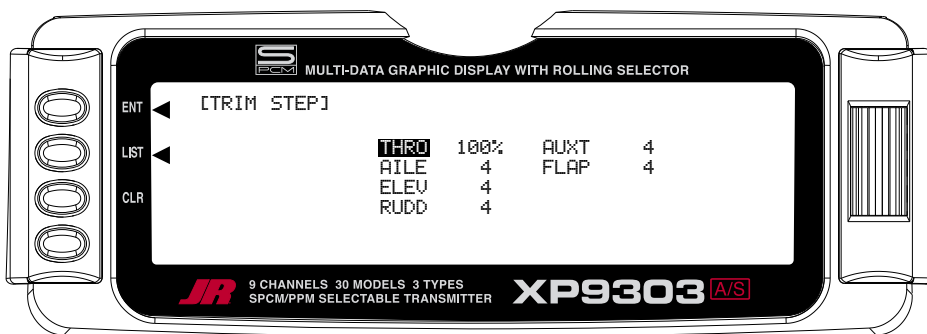
The Trim Step function provides for adjusting the sensitivity of the XP9303 trim levers and switches. It is useful during and after initial trimming of the aircraft, in order to trim the aircraft quickly at first and then to make very precise adjustments to aircraft trim. The digital trims may have a setting of 0–10 with 10 being the coarsest adjustment. When the value is set to 10, there are only 10 trim increments from center to each end. When set to 5, there are 20 trim increments from center to each end. When set to 4 there are 25 increments. When set to 3 there are 34 increments and when set to 1 there are 100 trim increments! *When set to 0 the trim levers cease to function and can no longer be used to change the trim of the aircraft.*

When adjusting the digital trims (AILE, ELEV, RUDD, FLAP, AUXT), the total trim travel does not change—only the number of increments (beeps) changes, which makes for finer or coarser trim movements. When adjusting the analog throttle trim, however, the total trim travel is actually reduced when set to less than 100%.

Use a fairly coarse setting such as 4–6 when test flying an aircraft in order to be able to trim the aircraft quickly, and then use a finer setting such as 3–1 for final precision trimming.

1. Highlight and select **TRIM STEP** in the **Devic. SEL** display of the **SYSTEM Menu** to acquire the **TRIM STEP** display.
2. Highlight and select the trim that is to be changed and use the **Selector** to set a value of 1–10 (1 = finest, 10 = coarsest).
3. Repeat for other trims as desired.

This concludes the SYSTEM Menu portion of the ACRO mode. Continue with FUNC.LIST below to complete the aircraft setup.

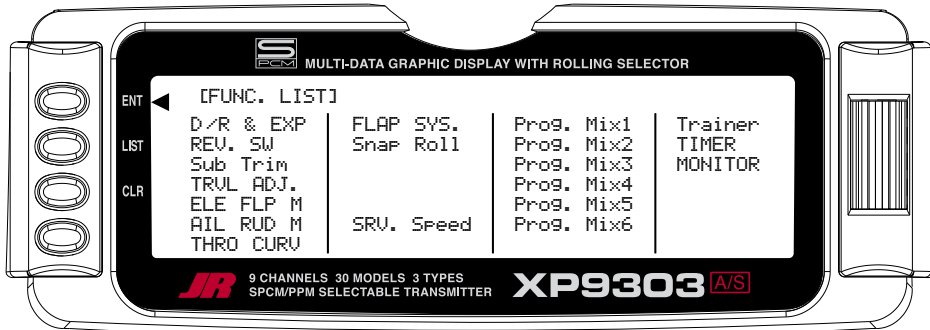


## ACRO – FUNCTION LIST

Once the basic aircraft configuration has been defined in the SYSTEM Menu, the functions found in the Function List **[FUNC.LIST]** are used to complete the setup and then to adjust how the aircraft flies. The functions are presented (to the extent practical) in the order that they should be addressed when setting up a new aircraft.

The descriptions are general in nature and are intended to provide enough information to decide whether or not to use a function and what types of selections and settings to make. If more information is required about a particular function, please refer to the detailed descriptions of the functions that are included later in the ACRO manual.

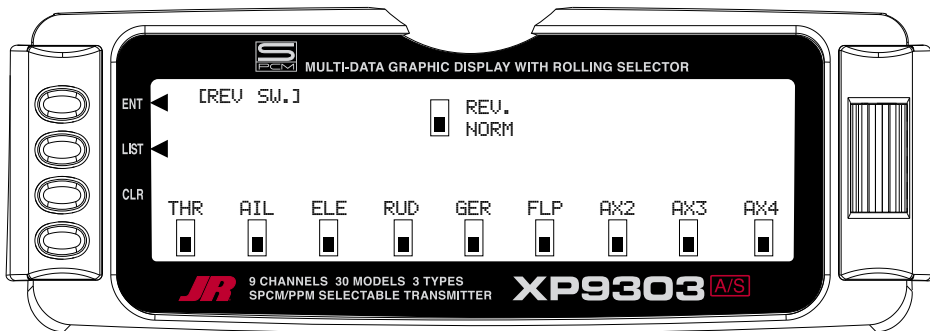
Press the **LIST** button after the transmitter is powered-up to obtain the **FUNC.LIST**.



## REV.SW – SERVO REVERSING

Once all servos have been plugged into their proper channels in the receiver, the first thing to check is the direction of travel of each servo. Move all sticks and switches/levers while observing each servo to determine if the servos are moving in the correct directions. Make note of those channels that are not traveling in the correct direction and use the REV.SW function to reverse the direction of travel for these channels.

1. Highlight and select **REV.SW** in the **FUNC.LIST** to obtain the servo reversing display.
2. Use the **Selector** to highlight and select those channels that need to be reversed. Pressing the **Selector** toggles the channel between Normal and Reverse.



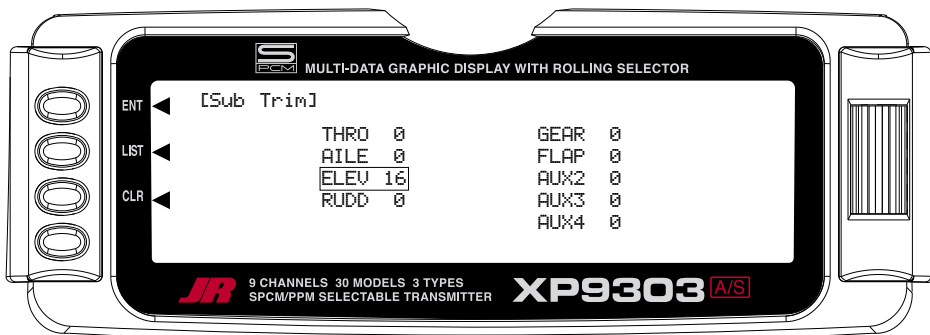


## SUB TRIM

Sub Trims are intended for relatively minor adjustments to servo linkages and not for major trim adjustments to the aircraft. Using excessive Sub Trim percentages can cause a loss in servo resolution where the servo reaches its travel limit and stops moving before the control stick is fully deflected. For more information on Sub Trims and linkage setups, please refer to the *Sub Trim Usage and Mechanical Advantage* article contained in the Glossary.

Use Sub Trims to fine-tune the alignment of servo arms. Install servo arms on the servos so that the arms are at 90° or perpendicular to the servo case/linkage. Rotate, swap and reinstall the arms or try different arms if necessary to get them as close to 90° as possible. It is not unusual for the arms to be off just a little bit. Now use the Sub Trim function to fine-tune the servo arms that are not quite at 90° to the linkage/servo case.

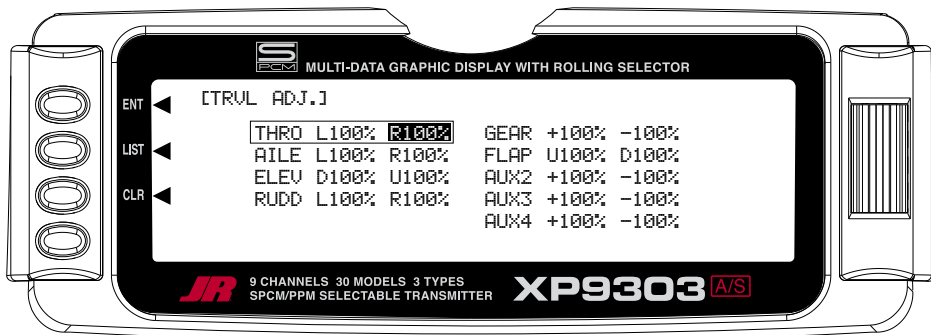
1. Highlight and select **Sub Trim** in the **FUNC.LIST** to obtain the Sub Trim Display.
2. Highlight and select the channels where the servo arms are not quite at 90° to the servo cases. Once a channel is selected, rotate the **Selector** until the servo arm is at 90° to the servo case.



## TRVL ADJ. – TRAVEL ADJUST

Travel Adjust, sometimes referred to as ATV, is used to adjust how far a servo travels in each direction. After the linkages have been installed and attached to the servos, adjust the amount of servo travel in each direction. For more information on Servo Travel and Mechanical Advantage, please refer to the *Sub Trim Usage and Mechanical Advantage* article contained in the Glossary.

1. Highlight and select **TRVL ADJ.** in the **FUNC.LIST** to obtain the Travel Adjust display.
2. Use the **Selector** to highlight and select each channel and adjust the travel in each direction by rotating the **Selector**. The direction of travel is changed by moving the stick/switch/lever back and forth.

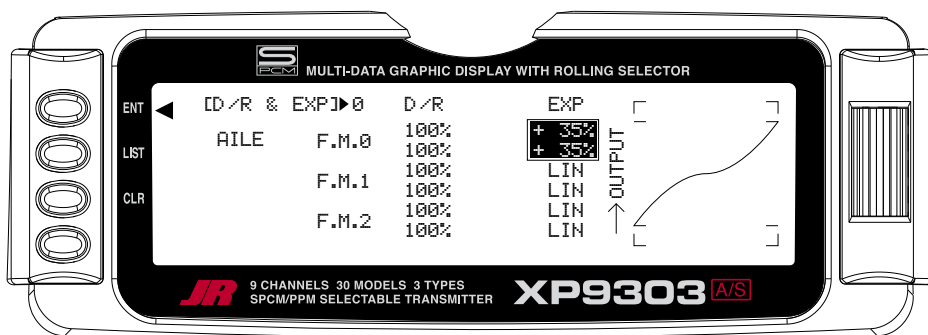


## D/R & EXP – DUAL RATE AND EXPONENTIAL

Dual Rates and Exponential curves can be very effective in setting up an aircraft to have a particular “feel” when performing different types of maneuvers. Just flipping a switch can change the aircraft’s personality, causing it to take on traits that make certain maneuvers easier for the pilot. At times the aircraft needs to feel very crisp, such as when performing point-oriented aerobatics, and then feel softer for other maneuvers such as landing and rolling circles, and yet at other times the aircraft needs to be very crisp but without the tendency to be over-controlled, like in performing snap rolls. Dual Rates and Exponential curves can be combined to produce these traits for most any aircraft. When programming a Dual Rate and Exponential curve, think about what kind of

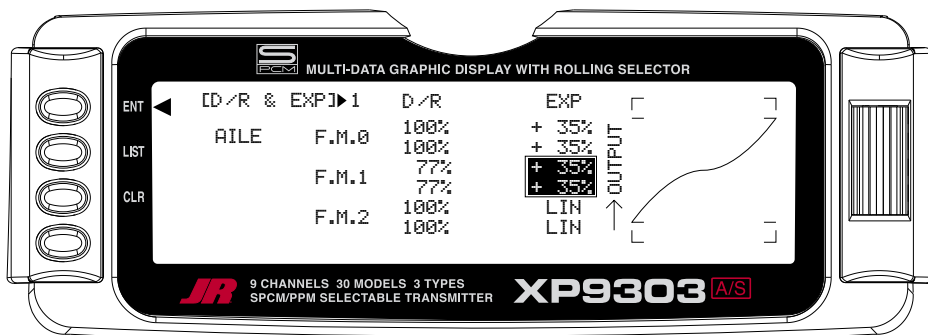
maneuver is to be performed and the response that is desired from the aircraft. For an in-depth description of D/R and Exponential, please refer to the *Dual Rates and Exponential Curves* article in the Glossary.

1. Highlight and select **D/R & EXP** in the **FUNC.LIST** to obtain the D/R & EXP display. If Flight Modes were activated earlier in the **Devic.SEL** function and **D/R** was set to **FM** in the same function, there will be 3 sets of values displayed for each channel. Otherwise, there will only be 2 sets of Dual Rate and Exponential settings for each control.



2. Use the **Selector** to change between Aileron, Elevator and Rudder by highlighting and selecting **AILE**. Then use it to select and set dual rate and exponential values. If exponential has never been used before, try a low positive value like +10. After a while increase it gradually until the desired feel is obtained.

**Note:** Use only positive (+) percentages unless there is a distinct need to do otherwise.



# THRO CURV – THROTTLE CURVE

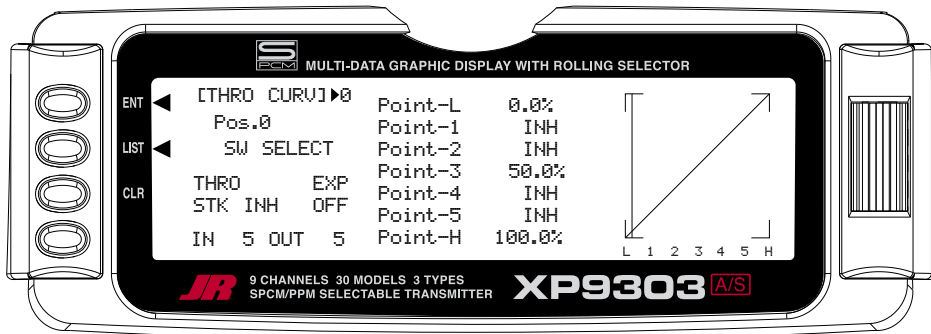
An ideal throttle setup is linear in nature where ¼ stick results in ¼ RPM, ½ stick results in ½ RPM, etc. However, many of today's gas engines employ pumping carburetors which do not produce a very linear response. Instead, they cause engine RPM to increase very rapidly from low throttle up to about ½ throttle and then very slowly from ½ throttle to full throttle. When the carb is open halfway, the engine may be running at 75–90% of its maximum RPM. Obviously not an ideal situation.

A linear throttle response can be obtained with the THRO CURV function by causing the throttle servo to move in an exponential fashion. In other words, the servo will move very little for the first ¼–½ of stick movement, and then move more rapidly as the stick is advanced further. When properly adjusted, the THRO CURV function will result in a linear throttle response where there is a noticeable RPM change with each click of throttle stick movement.

THRO CURV can also be used to set up a special throttle response where the engine quickly comes up to a certain RPM and then advances very slowly to provide precise RPM control for a specific throttle range before continuing on to full throttle. Such a curve is useful for torque rolling, rolling circles and other maneuvers where the throttle response is to be slowed or flattened-out for a particular throttle range.

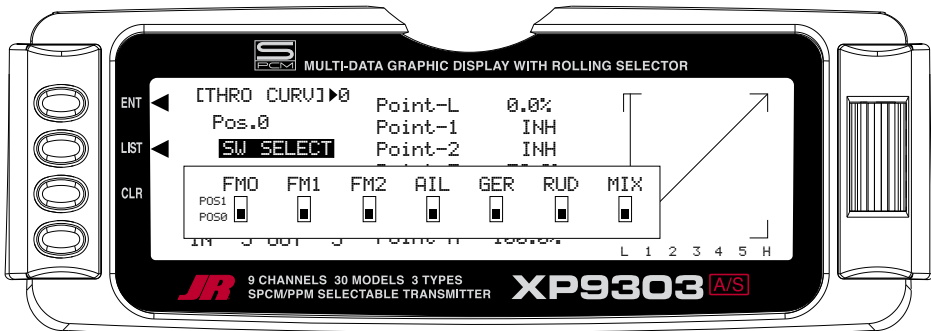
If the Twin E. function has been activated for twin-engine aircraft, independent throttle curves are available for each engine to help eliminate any discrepancies in the throttle response between the two engines.

If the aircraft is equipped with an engine that has a non-linear response, set up a throttle curve as described below.



1. Highlight and select **THRO CURV** in the **FUNC.LIST**. Two different throttle curves may be defined and they are named or otherwise referenced by Pos0 and Pos1.

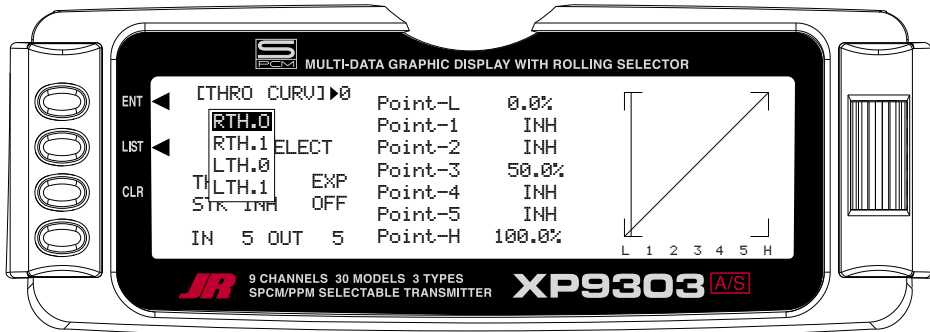
2. If there is a need to have 2 throttle curves (i.e. a regular curve and a curve for torque rolling), use the Selector to highlight **SW SELECT** and a list of available Flight Modes and switches appears. Select the Flight Mode(s) (FM0, FM1, or FM2) and/or switch(es) that is to select between the 2 curves. The switch will be used to select between the Pos0 curve and the Pos1 curve. Highlight and select **Pos0** to toggle between the **Pos0** and **Pos1**, in order to display and adjust the 2 curves.



## THRO CURV – THROTTLE CURVE (continued)

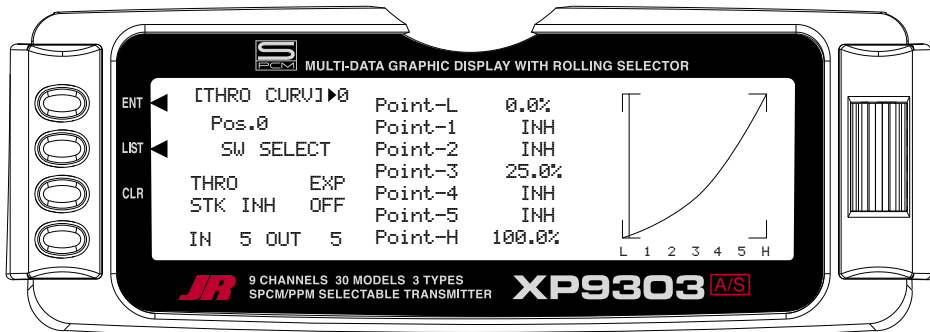
**Note:** If Twin E. has been activated for a twin engine aircraft, there will be a Pos0 and Pos1 for both the right and left engines, providing a total of 4 possible throttle curves.

However, instead of being named Pos0 & Pos1, they are named RTH.0, RTH.1, LTH.0, and LTH.1. They represent Right Throttle Pos0 & Pos1 and Left Throttle Pos0 & Pos1 respectively.



3. Scroll over to **OFF** under **EXP** and select it to turn exponential ON. This will result in a smoothed throttle curve.

4. Scroll over to Point-3 and select it. Set the Point-3 value to 25%. This will yield a preliminary throttle curve that provides a good starting point for further adjustments. The remainder of the adjustments should be made with the engine running and the aircraft securely restrained so that it cannot possibly move.



5. Warm up the engine to its normal operating temperature. Move the throttle stick to full idle and slowly advance the throttle 1 click at a time. There should be a noticeable change in RPM for each movement of the stick. If while moving the stick it seems that the engine should be running faster or slower for a given throttle stick position, select the point that is closest to the vertical line (cursor) and increase the value if the engine is running too slow or decrease the value if the engine is running too fast for the stick position. Repeat as necessary until the desired response is obtained.

## FLAP SYS. – FLAP SYSTEM

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The XP9303 features a three-position Flap System with Elevator compensation, programmable Delay, and an Auto Land feature. Its purpose is to allow the flaps to be deployed in two different positions in addition to the normal or fully retracted position. The Flap System is available in the FUNC.LIST only if **SYS.** is selected on the OUT line under FLAP in the **Devic. SEL** function within the SYSTEM Menu.

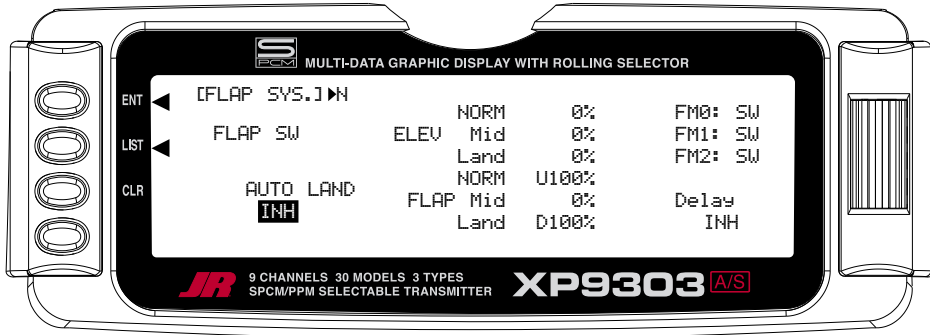
Because deploying flaps generally causes a change in pitch (Elevator trim), the Flap System provides for setting an Elevator deflection for each flap position. This is called Elevator Compensation. There is also a programmable Delay in .1 second increments up to 2 seconds maximum. The Delay determines how long it takes for the Flaps and Elevator to reach their positions. The XP9303 insures that the Flaps and Elevator reach their positions at the same time resulting in smooth Flap deployment and retraction.

The Auto Land feature, if implemented, automatically retracts the Flaps and Elevator compensation when the throttle is raised above a specified throttle position. This can be useful during a missed landing approach when a go-around is required. The Flap System allows the Flaps to be deployed using the Flap Switch, Flight Mode switch or a combination of both.

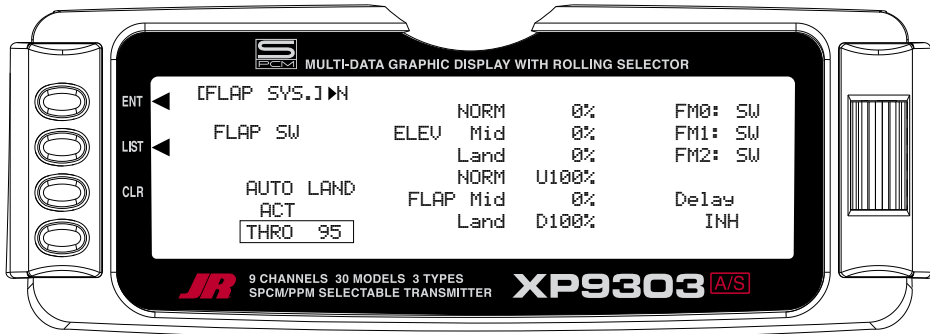
Highlight and select **FLAP SYS.** in the **FUNC.LIST** to obtain the Flap System display if the aircraft has flaps or Flaperons that are also going to be used as flaps.

## AUTO LAND (Flap System)

The Auto Land feature automatically retracts the Flaps and Elevator compensation when the throttle is raised above a specified throttle position.



1. If Auto Land is to be used, scroll to **INH** under **AUTO LAND** and select it with the *Selector*. **INH** will change to **ACT** when selected and toggles between **ACT** and **INH** each time the *Selector* is pressed.



2. Scroll down to **THRO** and press the *Selector* to show the throttle percentage. Rotate the selector until the throttle percentage (0–100%) is equal to where the Auto Land feature is to retract the Flaps and Elevator compensation.

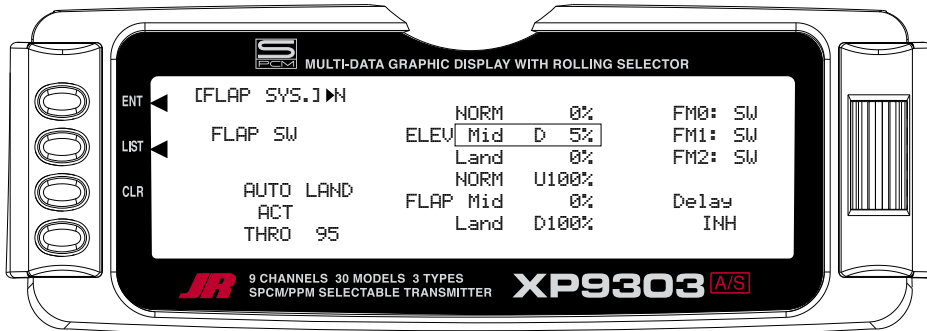
It is recommended that the throttle position be set very high at first (between 90–99%) to give the aircraft a chance to regain some speed before the Flaps actually retract. As the Flaps retract, lift will decrease and the stall speed of the aircraft will increase and may cause a crash if the airspeed is too low. When there is a missed approach, advance the throttle slowly up to about 90% and wait until the aircraft picks up some speed before advancing the throttle to full, causing the Flaps to retract.

## ELEV – ELEVATOR COMPENSATION (Flap System)

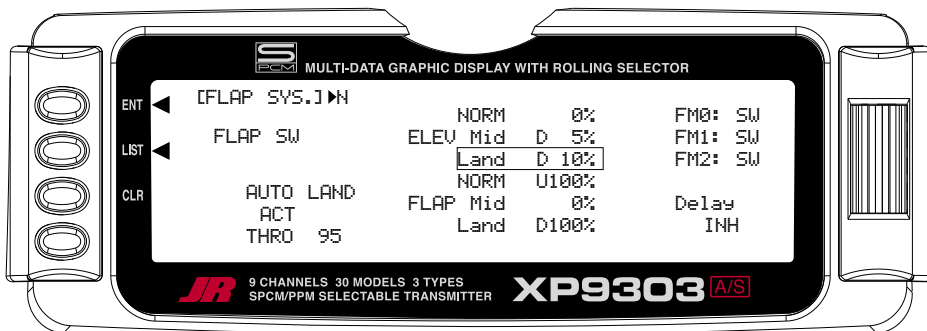
The **ELEV** values represent the Elevator deflection that will occur when the Flaps are deployed to their various positions. Some trial and error will probably be required to arrive at the right values, but once set, the aircraft will assume the proper pitch attitude for all flap positions.

1. Make sure the **NORM** value next to **ELEV** is set to 0% as there should be no Elevator deflection with the flaps in their fully retracted (up) position. If it is not 0%, scroll to **NORM** next to **ELEV**, select it, and then set the value to 0%.

2. Scroll to the **Mid** parameter beside **ELEV** and select it. Set the value either **U** (up) or **D** (down) to introduce up or down Elevator trim for the Mid position of the flaps. If not sure about which direction, aircraft typically pitch Up when flaps are deployed, requiring some Down Elevator input to compensate. Use a small percentage like 3–5% at first and, after test flying, adjust the value a little at a time until the aircraft maintains the correct pitch attitude (typically slightly nose down) when the flaps are deployed to the **Mid** position.



3. Scroll to the **Land** parameter beside **ELEV** on the display and press the **Selector** to select it. Set the value either **U** (up) or **D** (down) to introduce a small amount (5–10%) of up or down Elevator for the Land position of the flaps, in the same fashion as setting up the **Mid** position above.

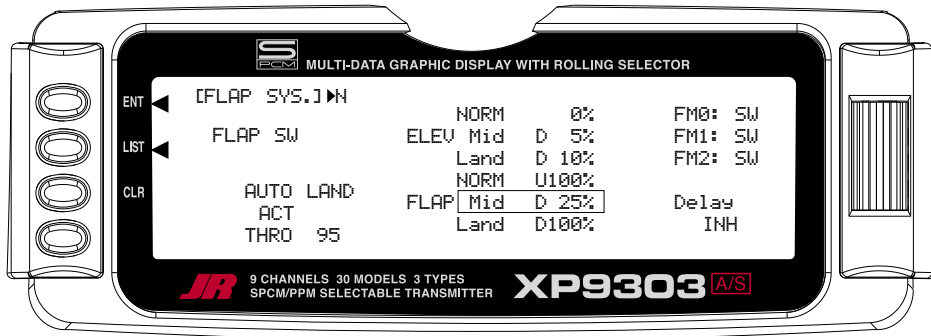




## FLAP – (Flap System)

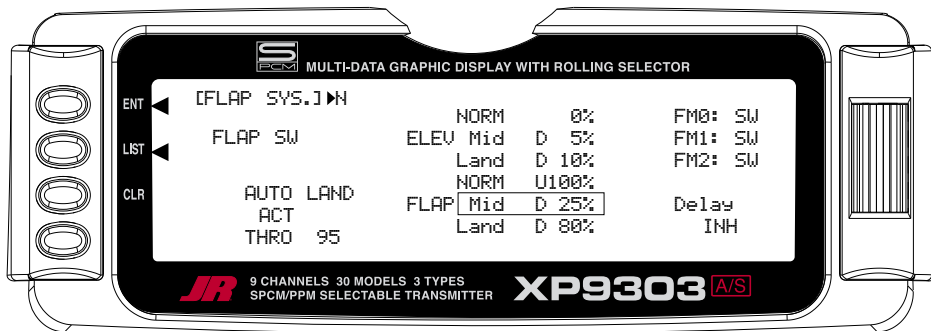
The FLAP values represent how far the flaps deflect when in the **NORM**, **Mid**, and **Land** positions. The **NORM** position represents normal flying where the flaps are fully retracted. The **Mid** position is typically used for short field takeoffs and the **Land** position is typically used for landing. Refer to the aircraft manufacturer's specifications for recommended flap deflections.

1. Put the Flap switch in its uppermost (Normal) position (no flaps deployed). Scroll to the **NORM** parameter next to **FLAP** on the display. It should be at U100%. If it is not, select it with the **Selector** and set it to 100% or the value that brings the flaps up to their normal flying position (no flaps deployed) with the Flap switch in the uppermost or Normal position.



2. Put the Flap switch in the Mid position. Scroll to the **Mid** parameter next to **FLAP** on the display and select it. Dial in a Down percentage to deflect the flaps downward the desired amount. The example above, shows a value of 25% but the aircraft manufacturer's specifications should be used to set this value to achieve the recommended partial flap deflection.

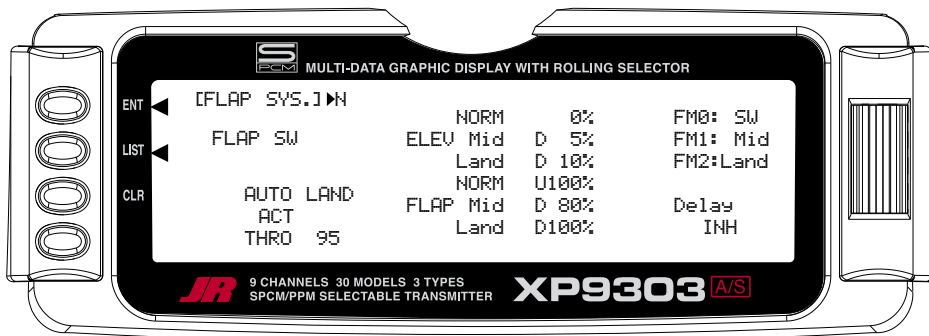
3. Put the Flap switch in the lowermost or Land position. Scroll to the **Land** parameter next to **FLAP** on the display and select it. Dial in a Down percentage to deflect the flaps downward the amount required for landing. The illustration below shows a value of 80% but the aircraft manufacturer's specifications should be used to set this value to achieve the recommended deflection.



## FM0-FM2 (Flap System)

If Flight Modes have been activated in the **Devic. SEL** function of the SYSTEM Menu then FM0, FM1 and FM2 will appear along the right side of the Flap System display to represent the 3 Flight Modes. Each of the Flight Modes can be assigned one of the Flap values (**NORM**, **Mid**, or **Land**), so when that Flight Mode is selected during flight, the Flaps deploy to that position. **SW** is also an option. When **SW** is selected for a Flight Mode, flap operation is controlled by the Flap switch when in that Flight Mode.

If Flight Modes have not been activated, skip this portion of the Flap System.



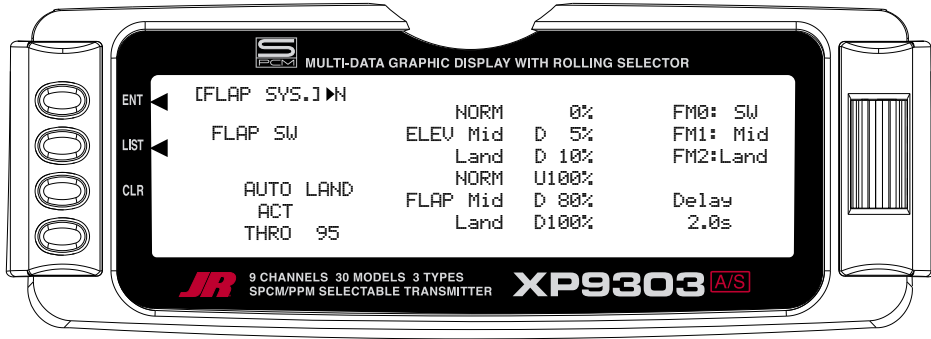
1. For each Flight Mode, highlight and select **FM0-FM2** and select either a flap position (**NORM**, **Mid**, **Land**) that the flaps are to assume when in that Flight Mode, or select **SW** if the Flap switch is to control the flaps when in that Flight Mode.

The example above shows that Flight Mode 0 (FM0) is set to **SW** which means that the Flap switch will be used to control flaps when in this Flight Mode. FM1 is set to **Mid**, resulting in the flaps deflecting to the Mid position when Flight Mode 1 is selected and FM2 is set to **Land**, indicating that the flaps will deploy to the **Land** position when Flight Mode 2 is selected.

## Delay (Flap System)

The Delay parameter determines how long it takes for the flaps and Elevator to reach their positions. The XP9303 automatically times the Flaps and Elevator so that they reach their positions at the same time, resulting in very smooth Flap deployment and retraction. The Delay is adjustable in .1 second increments up to a maximum of 2 seconds.

1. Highlight and select **Delay** in the **Flap System** display using the **Selector**. Then use the rotary to select a delay between .1 second and 2.0 seconds.



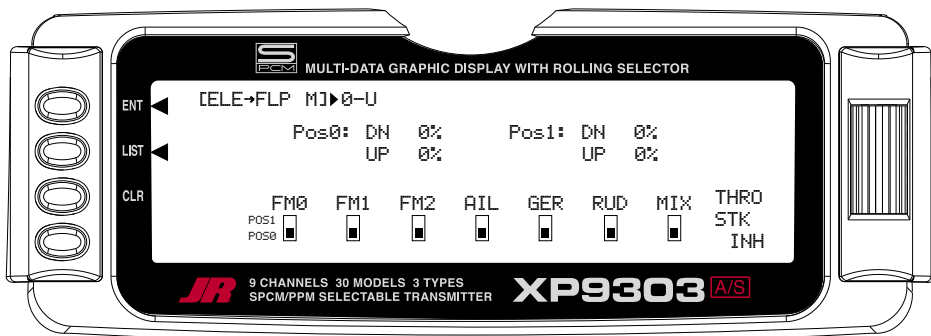
## ELE→FLP M – ELEVATOR-TO-FLAP MIXING

The XP9303 features a built-in mixer for Elevator-to-Flap. The mixer causes the Flaps (or Flaperons) to move when the Elevator is moved, resulting in tighter looping maneuvers, or to provide some Aileron reflex for some 3D maneuvers such as Harriers. Typically, the flaps are set to travel downward with up Elevator and to travel upward with down Elevator. The direction that the flaps travel

with Elevator input can be changed by using positive and negative values.

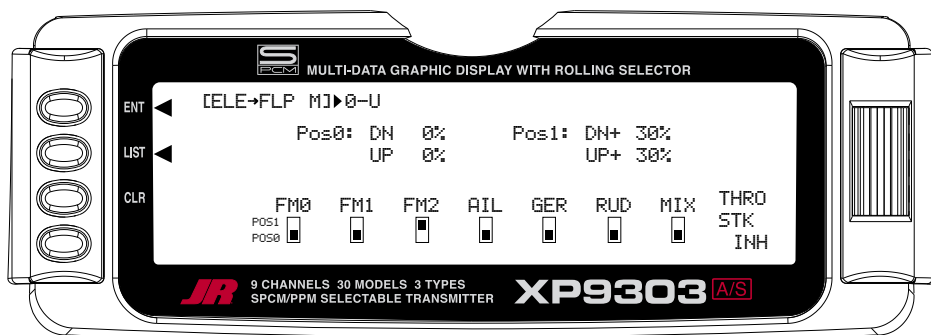
If Elevator-to-Flap mixing is desired for the aircraft, perform the steps below.

1. Highlight and select **ELE→FLP M** in the **FUNC.LIST** to obtain the Elevator-to-Flap mix display.



2. There are 2 sets of mixing values available – Pos0 or Pos1. If the Pos0 values are left at 0% then the mixer may be turned on and off – Pos0 will be OFF and Pos1 will be ON (this can be reversed by leaving the Pos1 values at zero and putting values in Pos0). Highlight and select **DN** next to Pos1 and set the value to give the desired amount of Flap travel in the Down direction when full Up Elevator is applied.

3. Highlight and select **UP** next to Pos1 and set the value to give the desired amount of Flap travel in the UP direction when full Down Elevator is applied.



4. Scroll down to the bottom line of the display to select the Flight Mode(s) and/or switch(es) that is to be used to turn the mixer on and off. The throttle may also be used to turn the mixer on and off by highlighting and selecting **THRO STK** and setting the percentage of throttle to the point where the mixer is to switch between on and off.

**Note:** Pos1 always has priority over Pos0. In other words, if multiple switches are selected to turn the mixer on and off and one of the switches is in its Pos1 position, then all other switches are ignored and the Pos1 values are in effect.

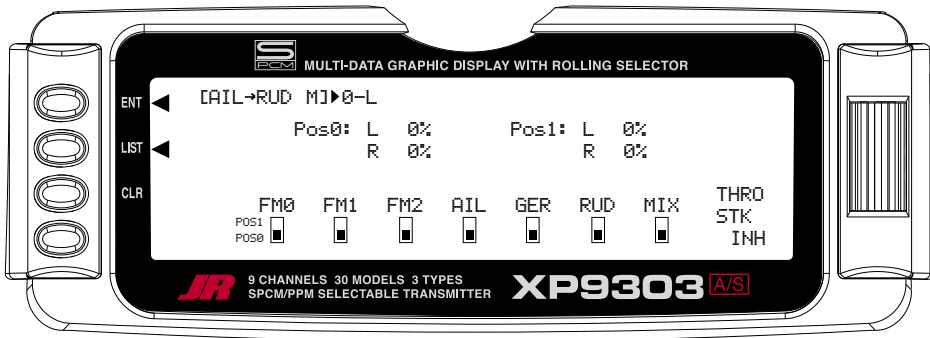
## AIL→RUD M – AILERON-TO-RUDDER MIXING

The XP9303 also features a built-in mixer for Aileron-to-Rudder. The mixer causes the Rudder to deflect when the Ailerons are moved resulting in coordinated turns. This is a useful function for high-wing aircraft with flat-bottomed airfoils because the Ailerons are typically not very effective, and Rudder input combined with Aileron input dramatically improves the turn and bank authority for these aircraft. The Rudder normally moves in the same direction as the Ailerons, however, the Rudder can

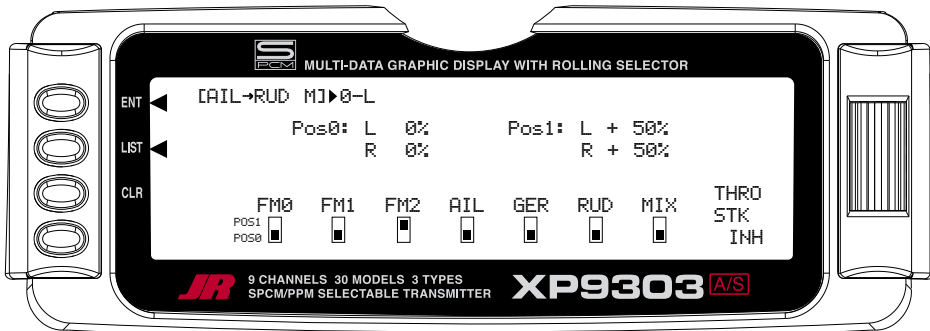
be made to move in either direction by using positive or negative values.

If the aircraft requires Aileron-to-Rudder mixing, perform the steps below.

1. Highlight and select **AIL→RUD M** in the **FUNC.LIST** to obtain the Aileron-to-Rudder mix display.



2. There are 2 sets of mixing values available – Pos0 and Pos1. If the Pos0 values are left at 0% then the mixer may be turned on and off – Pos0 would be off and Pos1 would be on (this can be reversed by leaving the Pos1 values at zero and putting values into Pos0). Highlight and select **L** next to Pos1 and set the value to give the desired amount of Left Rudder. A negative value will reverse the direction.
3. Highlight and select **R** next to Pos1 and set the value to give the desired amount of Right Rudder. A negative value will reverse the direction.
4. Scroll down to the bottom line of the display to select the Flight Mode and/or switch(es) that is to be used to turn the mixer on and off. The example below shows Flight Mode 2 set to Pos1, turning on the Aileron-to-Rudder mix. The throttle may also be used to turn the mixer on and off by highlighting and selecting **THRO STK** and setting the percentage of throttle to the point where the mixer is switched on/off.



**Note:** The Pos0 values can also be set to something other than zero causing a different amount of Rudder deflection to occur when there is Aileron input. One or more switches can then be selected to switch between the two sets of values. With this setup there will always be some mixing, as indicated by either Pos0 or Pos1, and the mixing cannot be turned off.

**Note:** Pos1 always has priority over Pos0. In other words, if multiple switches are selected to turn the mixer on and off and one of the switches is in its Pos1 position, then all other switches are ignored and the Pos1 values are in effect.

## AIL DIFF. – AILERON DIFFERENTIAL

When Ailerons are deflected, the Aileron that deflects downward typically creates more drag than the Aileron that deflects upward. If the difference in drag is great enough, it will cause the aircraft to yaw in the direction of the down Aileron, i.e. a roll to the right will cause the aircraft to yaw to the left because the left Aileron deflects downward and creates more drag. This, of course, is an undesirable tendency that results in non-axial rolls and a loss of heading.

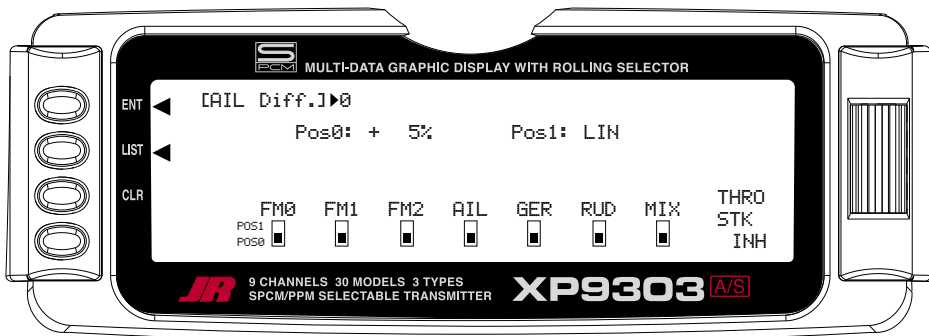
The XP9303 provides an Aileron Differential function that allows adjustment of the Aileron that deflects downward without affecting the Aileron that travels upward and, therefore, can eliminate yaw tendencies in rolling maneuvers. It can also affect only the Aileron that travels upward—this is called negative differential and is useful if an aircraft yaws in the same direction as the Aileron input.

Aileron differential is available in the FUNC.LIST only if the FLAPERON Wing Type was selected in the Wing Type function in the SYSTEM Menu or a Dual channel has been assigned to ailerons in the **Wing TYPE** function.

The Aileron Differential function provides for 2 differential settings that are switch or Flight Mode selectable – Pos0 and Pos1. The 2 settings can be combined in different ways to provide one setting that is on all of the time, or one setting that is on and one that is off (0 differential), or 2 different amounts of differential—maybe one for normal flying and another for flat spins.

To use the Aileron Differential function, highlight and select **AIL Diff.** in the **FUNC.LIST** to obtain the Aileron Differential display.

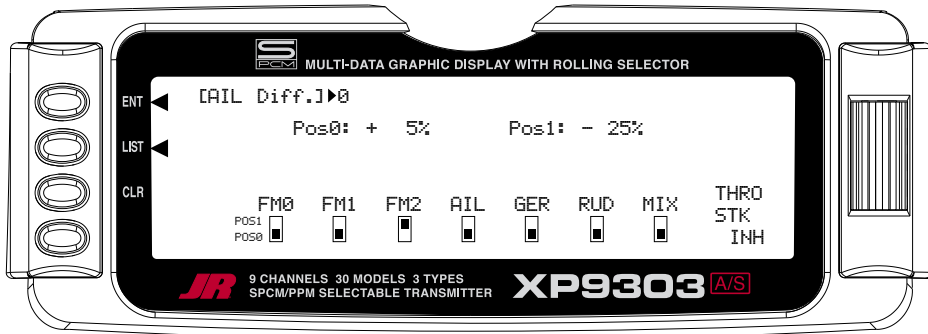
1. If there is to be a single Aileron differential setting that is on all of the time, highlight and select **Pos0** and set a small percentage of differential. A positive value causes the downward Aileron to travel less while a negative value causes the upward Aileron to travel less (negative differential). Test fly the aircraft and return to this function to make adjustments until the yaw tendency has been eliminated. That is all that is required to set up a single differential setting that is always on. Proceed with the next topic.



## AIL DIFF. – AILERON DIFFERENTIAL (continued)

2. At this point, it is assumed that there are to be 2 Aileron differential values. If one of these values is set to zero, Aileron differential can be turned off by selecting the position that has the 0 values. Highlight and select **Pos0** and set a small percentage of differential or leave it set to zero (0) if the ability to turn

differential off is desired. Highlight and select **Pos1** and set the percentage of differential. A positive value causes the downward Aileron to travel less, while a negative value causes the upward Aileron to travel less (negative differential). The example below shows a positive percentage in **Pos0** for precision flying and a negative differential for **Pos1** for flat spins, which is selectable with Flight Mode 2 (FM2).



3. Scroll down to the bottom line of the display to select the Flight Mode and/or switch(es) that is to be used to switch between the Aileron Differential settings. The throttle may also be used to switch between differential settings by highlighting and selecting **THRO STK** and setting the percentage of throttle to the point where the values are switched. Test fly the aircraft and return to this function to make adjustments until the yaw tendency has been eliminated.

**Note:** Pos1 always has priority over Pos0. In other words, if multiple switches are selected and one of the switches is in its Pos1 position, then all other switches are ignored and the Pos1 values are in effect.

## SRV. SPEED – SERVO SPEED

The XP9303 system provides the ability to adjust the speed of servos on each channel in both directions. The speed may be adjusted downward (servo slowed) from its normal speed but it cannot cause a servo to move faster than its rated specifications. Furthermore, each servo can have 2 sets of speeds in both directions that are Flight Mode or switch selectable.

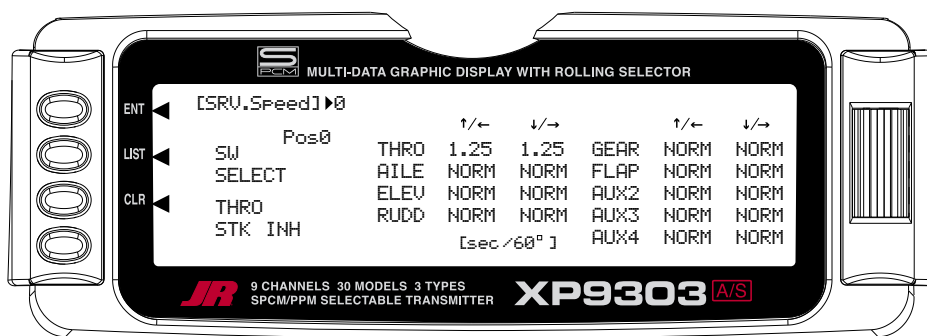
The servo speed function is very useful for scale models with retractable landing gear and gear doors, since in many instances the need for gear door sequencers can be eliminated. If the gear door servos move at normal speed and the landing gear servos move at a slower speed when the gear is lowered, the gear doors will be open before the landing gear begins to come down. In the opposite direction, if the gear door servos move slowly and the landing gear servos move at normal speed, the gear can retract before the gear doors begin to close.

Servo speed can also be useful on the throttle channel. The throttle servo can be slowed down such that the engine will not flameout because the carburetor is opened or closed too quickly when the throttle stick is jammed from low to high and vice versa.

To adjust servo speed, highlight and select **SRV. Speed** in the **FUNC.LIST**.

1. If there is to be a single set of servo speeds that are in effect all of the time, make sure the display is showing **Pos0**. If it is not, select **Pos1** and change it to **Pos0**.

Highlight and select the channel and direction for each servo that is to be adjusted. Once a direction for a servo is selected, the servo speed may be set so the servo travels from .176 seconds for 60 degrees of rotation all the way up to 15 seconds for 60 degrees of rotation. Adjust the speed of each servo until the desired speed is obtained. The example below shows the throttle servo slowed down so that it traverses 60 degrees in 1.25 seconds in both directions. That is all that is required when there is only 1 set of servos speeds. Continue with the next topic.



2. At this point it is assumed that there are to be 2 sets of servo speeds that are Flight Mode or switch selectable. If one set of values is set to **NORM** for all channels, slowing of servos can be turned off by selecting the position (Pos0 or Pos1) that has the **NORM** values. Highlight and select **Pos0** and change it to **Pos1** and then highlight and select the channel and direction for each servo that is to be adjusted. Once a direction for a servo is selected, the servo speed may be set so the servo travels from .176 seconds for 60 degrees of rotation all the way up to 15 seconds for 60 degrees of rotation. Adjust the speed of each servo until the desired speed is obtained. Highlight and select **Pos0** and then highlight and select the channel and direction for each servo that is to be adjusted. Switch between **Pos0** and **Pos1** to view and adjust the 2 sets of values for each servo.

3. Scroll over to and select **SW SELECT** to identify the Flight Mode and/or switch(es) that is to be used to switch between the 2 sets of servo speeds. The throttle may also be used to switch between differential settings by highlighting and selecting **THRO STK** and setting the percentage of throttle to the point where the values are switched.

**Note:** Pos1 always has priority over Pos0. In other words, if multiple switches are selected and one of the switches is in its Pos1 position, then all other switches are ignored and the Pos1 values are in effect.



## SNAP ROLL

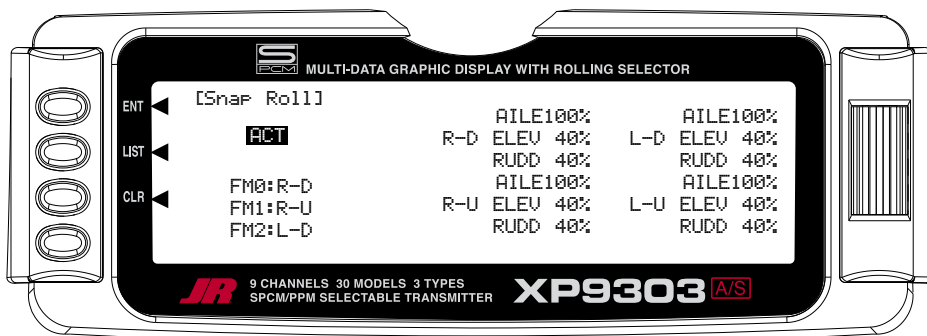
The XP9303 has a Snap Roll system that is comprised of a Snap Roll switch that is used in conjunction with Flight Modes to select a direction (Right/Up, Right/Down, Left/Up, and Left/Down) and deflections for Aileron, Elevator and Rudder. Up to four directions and corresponding rates can be programmed and a Direction/Rate combination can be assigned to 1 or more of the 3 Flight Modes. Pressing the Snap Roll switch causes the aircraft to snap roll in the direction and according to the rates assigned to the Flight Mode that is currently selected.

If Flight Modes have been activated, 3 of the Snap Roll directions/rates can be assigned to them —one per Flight Mode. If Flight Modes have not been activated then only one of the directions/rates may be active and it must be set/selected in the Snap Roll function. The Snap Roll function is inhibited as a default and must be turned on in order to use it.

If the Snap Roll function is to be used, highlight and select **Snap Roll** in the **FUNC.LIST** and then select **INH** to activate it.

1. If Flight Modes were activated in the **Devic. SEL** function, **FM0**, **FM1**, and **FM2** will appear down the left hand side of the display. Select each one and assign a direction (**RIGHT-DOWN**, **RIGHT-UP**, **LEFT-DOWN**, **LEFT-UP**) from the list for each of the 3 Flight Modes.

If Flight Modes are not activated, only a single direction appears along the left hand side of the display. Highlight and select it and pick one of the directions.



2. Scroll over to the **AILE** deflection of the first direction (R-D) and set it to a rather high percentage. Scroll down to the **ELEV** deflection for the same direction and set it to a modest value of perhaps 40% to prevent "burying" the aircraft with too much Elevator during the snap. Now scroll down to the **RUDD** deflection and set it to a modest value like the Elevator.
3. Repeat step 2 for the other 3 directions.

## GYRO SYS. – GYRO SYSTEM

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The XP9303 features a very sophisticated Gyro Gain Sensitivity System that allows in-flight selection of 3 gyro gains for two separate gyros. It provides for fixed gain values as well as a Stick Override Gain, where gyro gain is progressively reduced as the stick is moved further off center. Stick Override Gain is an absolute “must” for controlling gyros in aerobatic aircraft.

**Note:** In order for the GYRO System to appear in the **FUNC.LIST**, the **AUX2** and/or the **AUX3** channels must be set to **GYRO** on the **OUT** Line of the **Devic.SEL** display. If neither of these are set to **GYRO**, then **GYRO System** will not appear as a function in the **FUNC.LIST**.

Up to 2 gyros may be used to control two of the three primary flight controls (Elevator, Rudder, or Aileron). Typical applications involve gyros on the Rudder and/or Elevator. The FLAP and/or AUX2 switch can be used to switch between the 3 different gains for each gyro. The gyro gains can also be controlled by Flight Modes. The gains can be fixed or variable using the Stick Override Gain feature. If one set of gains for each gyro is set to zero, then the gain/gyro can essentially be switched off during flight.

**Note:** This function is designed to be used only with gyros that have in-flight proportional gain adjustment capability. Single and dual rate gyros that use a potentiometer to adjust the gain will not work properly with this function.

## GYRO CONNECTIONS (Gyro System)

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Plug the gain connector of one gyro into the AUX2 port of the receiver. Plug the gain connector of another gyro (if any) into the AUX3 of the receiver. If only one gyro is to be used, connect its gain to either AUX2 or AUX3.

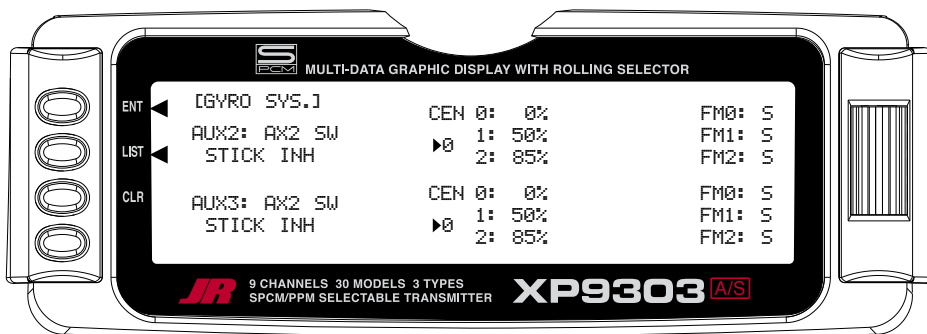
**Note:** The **OUT** line at the bottom of the **Devic.SEL** function must be set to **GYRO** for **AUX2** and/or **AUX3** if they are to be used to control Gyros.

## FIXED GYRO GAIN (Gyro System)

Fixed Gyro Gain does not use the Stick Override Gain feature. Whichever of the 3 gains is presently selected remains in effect and moving the control stick does not affect the gain.

1. To access the GYRO System, highlight and select **GYRO SYS.** in the **FUNC.LIST**.

AUX2 gain settings appear in the top half of the display while the AUX3 settings appear in the lower half of the display. They will appear only if **AUX2** and/or **AUX3** have been set to **GYRO** on the **OUT** line of the **Devic.SEL** function.



3. Each gyro has 3 possible gain settings. They are labeled **0**, **1**, and **2** next to **CEN** on the display, with a percentage next to each (CEN stands for gyro gain when the control stick is at center – no stick deflection). They correspond to the positions of a 3-position switch where **0** represents the switch being in the upper position; **1** represents the middle position; and **2** represents the lower position. It is recommended that the 0 position (upper switch position) for each gyro be set to zero (0%) which allows the gyro to be turned off in flight (very useful if a gyro suddenly becomes overly-sensitive).
4. Use the **Selector** to highlight and select the number **0** position for each gyro and set the percentage to 0% if not already at a 0% value.
5. Select the number **1** gain for each gyro and set it to some moderate value. The example shows 50% gain set for both gyros.
6. Select the number **2** gain for each gyro and set it to a relatively high value. The example shows 85% gain set for both gyros.
7. If Flight Modes have not been activated, skip to next step below.

2. Decide on which switch to use to control gyro gain. The Flap switch and the AUX2 switch are the only 3-position switches that can be used by the Gyro System. One switch can be used to select the gain for both gyros, or each gyro can use a different switch to select the gain. Typically, one switch is used to control the gain, even when 2 gyros are used.

Highlight and select **AX2 SW** or **FLP SW** next to **AUX2** and **AUX3** until the desired switch is displayed next to each. The example below shows the AUX2 switch selected for both gyros.

If Flight Modes have been activated in the **Devic.SEL** function, a list of Flight Modes (**FM0**, **FM1**, **FM2**) is displayed to the right of the display for each active Gyro. The default setting for each Flight Mode is **S**, indicating that the 3-position gyro switch will control the gyro gain when in that Flight Mode. The **S** can be changed to **0**, **1**, or **2** to represent the gain values associated with the positions of the 3-position switch. For example, if FM1 is set to **0**, then when in Flight Mode 1, the gain will be 0% which corresponds to the gain of the upper position of the 3-position switch. If FM1 is set to 1, the gain will be 50%, and if FM1 is set to 2, the gain will be 85% when in Flight Mode 1.

Highlight and select each **FM** parameter and set it to **S**, **0**, **1**, or **2** to indicate if the Gyro switch will control gyro gain while in that Flight Mode, or to assign one of the gains to the flight Mode. The example above shows all Flight Modes as deferring gyro gain control to the 3-position gyro gain switch – in this case the AUX2 switch.

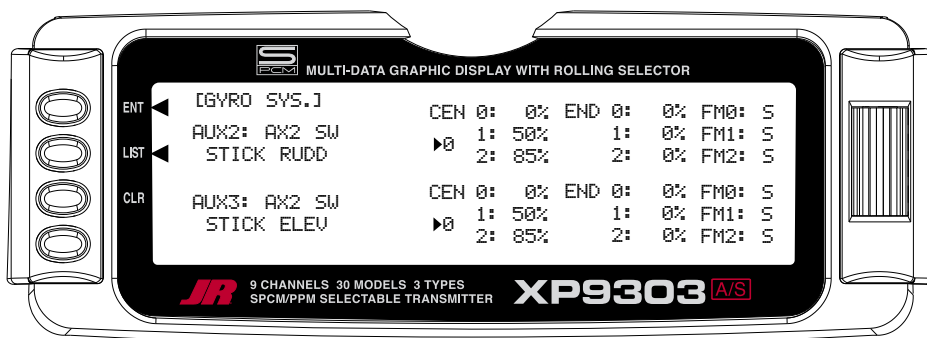
8. This completes the Fixed Gyro Gain setup. In the example, the AUX2 switch is being used to select the gain of both gyros at the same time. The upper position of the switch selects 0%, essentially turning the gyros off. The middle position selects 50% for both gyros and the lower position selects 85% gain for both gyros. The selected gain does not change when the sticks are moved.

## STICK OVERRIDE GYRO GAIN (Gyro System)

Stick Override Gyro Gain is very popular with aerobatic pilots, as it allows the pilot to instantaneously override the gyro by moving the stick. Gyro gain decreases as the stick is moved further from neutral and is typically set up so that gyro gain is reduced to zero when the stick is at full deflection. When the stick is released and allowed to center, gyro gain is instantaneously restored. In other words, the pilot assumes control of the channel by moving the stick and returns control of the channel to the gyro by releasing the stick. This helps in performing excellent hammerheads/stall turns, as the gyro is overridden by the Rudder stick in performing the pivot, but instantly dampens out any “wobble” as soon as the pivot is completed and the Rudder stick is released.

Stick Override Gyro Gain is identical to Fixed Gyro Gain in all regards except that the control stick(s) progressively reduces the presently selected gyro gain as the stick(s) is moved off of center. As mentioned before, it is typically set up so that when the stick reaches full deflection, the gyro gain is reduced to zero.

1. To access the Stick Override Gyro Gain feature, highlight and select **GYRO SYS.** in the **FUNC.LIST**.
2. Perform all of the steps outlined for Fixed Gyro Gain above.



3. Scroll over to and select **STICK** for each gyro and select the stick that corresponds with the control surface being controlled by the gyro. For example, if AUX2 is controlling the gain for the Rudder gyro, select **RUDD** as the stick for **AUX2**. If AUX3 is controlling the gyro for Elevator, select **ELEV** as the stick for **AUX3**.

4. Once a stick has been selected, a new set of END percentages appears on the display— all with a value of 50%. These new percentages indicate the gyro gain when the stick is moved to full deflection. If set to 0%, the gain will be progressively reduced as the stick is moved off center until it reaches 0% when the stick is at full deflection.

It is recommended that all END percentages be set to 0% unless there is a specific need to do otherwise. The default value of all END percentages is 50%. Use the **Selector** to highlight and select each END percentage and set each one to 0%.

## PROG MIX – PROGRAMMABLE MIXERS

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The XP9303 System provides 4 Standard programmable mixers (PROG.MIX3 - PROG.MIX6) and 2 Multi-Point programmable mixers (PROG.MIX1 & PROG.MIX2). Programmable mixers are used whenever the pilot wants a channel to react or move as a result of providing input to another channel, or to simply cause a channel to move by moving a switch or lever. They are typically used to compensate for deficiencies in aircraft design/setup, such as eliminating pitch- and roll-coupling in knife-edge flight, and to activate special aircraft functions like smoke systems, speed brakes, bomb drops, idle-up, etc.

Multi-Point Mixing provides the ability to define a customized “curve” of travel that the Slave channel will follow as it reacts to the Master channel. It is different from Normal Mixing in the sense that Normal Mixing results in a linear movement of the Slave channel in relation to the Master. With Multi-Point Mixing there are 7 points (including end points) along the travel of the Master channel that can be adjusted to control the action of the Slave channel (more or less travel in the same/opposite direction) providing the ability to deviate from a linear mixing action.

The channel that receives the original input from the pilot is called the Master channel, while the channel that reacts to the Master is called the Slave channel. Mixing occurs when the pilot provides an input to the Master channel by moving a stick, switch, or lever. The transmitter automatically generates an input for the Slave channel based on the pilot's input to the Master channel and the parameters defined in the programmable mixer.

Mixes are programmable, allowing any of the 9 channels to be Master, Slave or both. The mixing parameters are also programmable and include the direction of travel of the Slave channel; the amount of travel for the Slave channel; the Offset (where the mix starts and changes direction) and the switches/levers/sticks that are used to turn a mixer on and off. All of these elements are adjustable in Programmable Mixers.

Some examples of how programmable mixers might be used include but are certainly not limited to:

- **Eliminate Roll-Coupling** where the aircraft rolls when there is Rudder input. The mixer causes the Ailerons to move just a little bit in the opposite direction of the Rudder in order to keep the aircraft from rolling, while holding Rudder for knife-edge flight. This standard mixer would designate the Rudder as the Master and the Ailerons as the Slave.
- **Eliminate Pitch-Coupling** where the aircraft pitches to the gear or canopy when holding Rudder for knife-edge flight. The mixer causes the Elevator to move a little when Rudder is applied to keep the aircraft from pitching while holding Rudder during knife-edge flight. This Multi-Point mixer would designate the Rudder as the Master and the Elevator as the slave. A Multi-Point mixer would be used because pitch-coupling is typically non-linear in nature and requires a customized curve to counteract pitching that is induced by different amounts of Rudder deflection.
- **Eliminate pulling out on down lines** where the aircraft has a tendency to pull out towards the canopy when flying vertical down lines at idle. The mixer generates a bit of down Elevator when the throttle stick is pulled back to idle, making the aircraft track straight down with no input from the pilot. This mixer would designate the Throttle as the Master and the Elevator as the Slave and would be turned on and off with a switch so the down Elevator would not be generated during landing.
- **Controlling a Smoke System** where a switch is used to activate the smoke system and once activated, the smoke system comes on when the throttle stick is advanced beyond a certain point. This standard mixer would designate Throttle as the Master and an Auxiliary channel as a slave and would be turned on and off by a switch.
- **Idle-Up** where flipping a switch causes the engine RPM to increase a bit at idle to protect against a flameout during flying and then returning to low idle for landing. This standard mixer would designate an auxiliary channel as the Master and the Throttle channel as the Slave. It would also use a switch to turn the mixer on and off.

The possibilities are endless and limited only by the imagination.

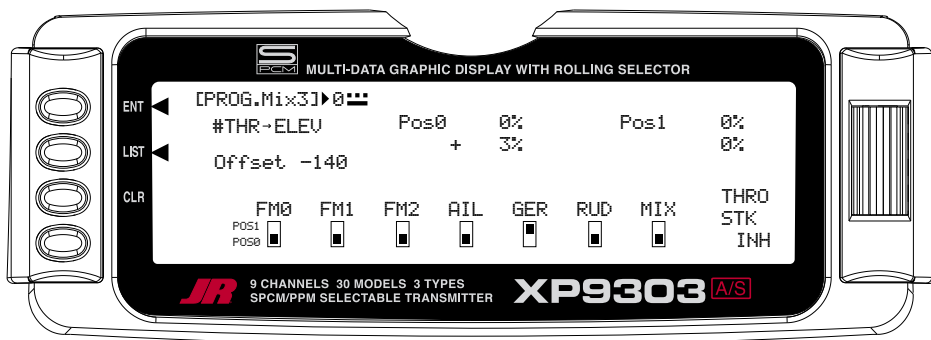
## STANDARD PROGRAMMABLE MIXER – Example: DOWN ELEVATOR AT IDLE

Perhaps the best way to describe a Programmable Mixer is by example. The example below demonstrates a program mix for an aircraft that pulls-out or pitches towards the canopy when trying to fly a vertical down line at idle. If a mix is set up to provide a couple of degrees of down Elevator when at idle, the aircraft will track straight down without input from the pilot. Once the throttle is advanced above idle, the mixer is turned off and the down Elevator is removed. The mixer can also be turned off so the down Elevator input does not occur during landing.

This mixer uses the Throttle as the Master and the Elevator as the Slave. The mix is turned on and off with the GEAR switch in combination with the position of the throttle stick – ON at idle and OFF above idle with the GEAR switch ON. When the GEAR switch is OFF, the mixer is turned off regardless of throttle setting.

The Mix parameters will be selected and set in the following order: Program Mix number, Master, Slave, Switch, Travel/Direction, and Offset. This is generally a good sequence to follow when setting up Programmable Mixers. For more information regarding Programmable Mixers, please see the detailed descriptions of the functions that are included later in the ACRO manual.

1. **Program Mix Number.** Highlight and select one of the Standard Programmable Mixers (**PROG.MIX3 - PROG.MIX6**) to obtain the first Programmable Mix display. Then press **ACT** next to **CLR** or highlight and select **INH** to obtain the main mix display. The example is using **PROG.MIX3**.
2. **Select Master.** All Programmable Mixers default to Throttle as both the Master and the Slave (**THRO THRO**). The first **THRO** is the Master and the 2nd **THRO** represents the Slave.



Highlight and select the first THRO to the left of the arrow to obtain a list of channels that can be used as the Master. Highlight and select the **#THR** channel as the Master, bypassing any throttle curve settings. This will cause the physical position of the throttle stick to control the mixer.

3. **Select Slave.** Highlight and select **THRO** to the right of the arrow to obtain a list of channels that can be used as the Slave. Highlight and select **ELEV** as the Slave.
4. **Select Switch.** Scroll down, highlight, and select **GER** as the switch to be used to turn the mixer on and off. The **GER** indicator should now be in the upper or **Pos1** position at the bottom of the display. Any of the switches along the bottom of the display can be used and multiple switches can be used if so desired. The example is using only the Gear switch.

5. **Select Switch Position.** Move the Gear switch back and forth while observing the number directly to the right of the Program Mix Name in the upper left hand corner of the display. The number will change from 0 to 1 as the switch is moved back and forth. When the number is 0, the mixer is looking at the **Pos0** values (not programmed yet) and when it is a 1, it is looking at the **Pos1** values (also not programmed yet).

Put the switch in the position that is to turn the mixer ON. Look at the number directly to the right of the Program Mix Name. If it is 0, highlight and select **Pos0** on the display. If it is 1, highlight and select **Pos1** on the display. The example shows **Pos0** as the position to turn the mixer ON.

6. **Travel and Direction.** With the switch still in the **ON** position, move the throttle stick to the full low position and the lower value next to the selected position should be highlighted. Set the lower position parameter to a low positive value like +3%. This is the amount of deflection of the Elevator (Slave channel) that is to occur when the mixer is turned on and the throttle is reduced to idle, or just enough to see a little down elevator deflection.

## STD PROGRAMMABLE MIXER – Ex: DOWN ELEV AT IDLE (continued)

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The Elevator should barely move downward when the throttle is set to idle. If the Elevator moves upward, change the +3% to a -3% to reverse the direction that the Elevator travels. The Elevator can be made to move more by increasing the percentage (more negative or more positive) and move less by decreasing the percentage. After test flying the aircraft, adjust the percentage as may be necessary. Leave the upper value of the selected position at 0% because there is to be no Elevator input above idle.

7. **Offset.** Highlight and select **OFFSET** and set the value to -140 to -160. This represents a throttle stick position that is about 2–3 clicks up from full low stick. This is also the point where the mixer causes the Elevator to deflect the +3% set in the lower position value. Above this position there is no Elevator deflection and the Elevator returns to normal.

8. **Verify Operation.** Highlight and select the position containing the +3% value using the **Selector**, move the Gear switch to the ON position, and move the throttle stick upwards from idle while observing the position values. When the stick is brought down to idle, the lower **Pos0** value is highlighted indicating the down Elevator deflection (+3%). Verify that the Elevator is deflecting downward just a bit. When the stick is advanced above idle, the upper value is highlighted (0%) and the Elevator returns to normal (no mixing). Now turn the Gear switch to the **OFF** position and note the number next to the Program Mix Name is now changed, indicating that the mixer is looking at the values in the other position. Since both of the values in this position are at 0% there is no deflection of the Elevator – the mixer is turned **OFF** regardless of throttle stick position. Verify that the Elevator does not move when the throttle stick is moved.

**Note: To completely disable or otherwise inhibit a mixer, highlight either the Master or Slave and press the CLR button.**

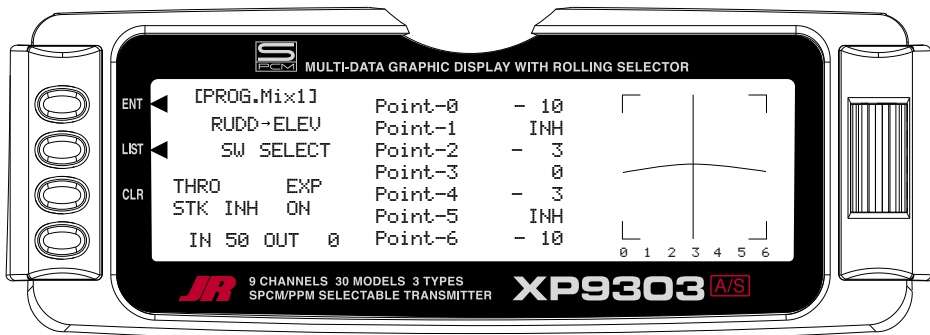
## MULTI-POINT MIXER – Example: ELIMINATE PITCH-COUPLING

The example below demonstrates a Multi-Point Program Mix for aircraft that pitch towards the landing gear when holding Rudder for knife-edge flight – commonly known as Pitch-Coupling. If a mix is set up to provide an appropriate amount of up Elevator for different amounts of Rudder input, the aircraft will fly straight without pitching to the gear while holding Rudder during knife-edge flight.

This Multi-Point mixer uses the Rudder as the Master and the Elevator as the Slave. The mix is turned on and off with the GEAR switch.

The Mix parameters will be selected and set in the following order: Program Mix number, Master, Slave, Switch, Set Points Travel/Direction, and Offset. This is generally a good sequence to follow when setting up Multi-Point Programmable Mixers. For more information regarding Multi-Point Programmable Mixers, please see the detailed descriptions of the functions that are included later in the ACRO manual.

1. **Program Mix Number.** Highlight and select one of the Multi-Point Programmable Mixers (PROG. MIX1 or PROG.MIX2) to obtain the first Multi-Point Programmable Mix display. Then press **ACT** next to CLR or highlight and select **INH** to obtain the main mix display. The example is using PROG.MIX1.

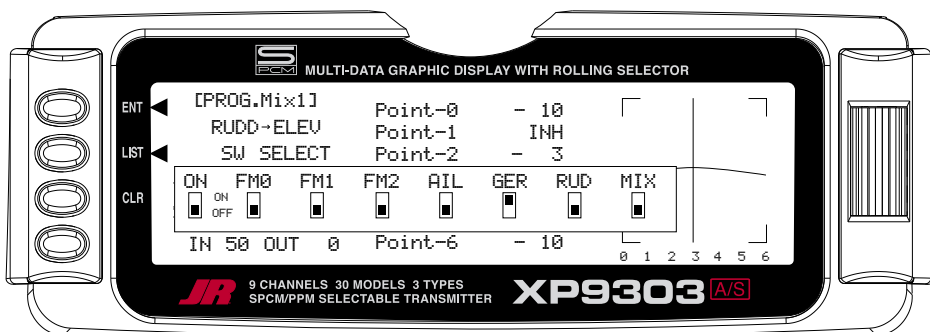


2. **Select Master.** All Programmable Mixers default to Throttle as both the Master and the Slave (**THRO**  **THRO**). The first **THRO** is the Master and the 2nd **THRO** represents the Slave.

Highlight and select the first **THRO** to the left of the arrow to obtain a list of channels and select **RUDD** as the Master.

3. **Select Slave.** Highlight and select **THRO** to the right of the arrow to obtain a list of channels that can be used as the Slave. Highlight and select **ELEV** as the Slave.

4. **Select Switch.** Scroll over to and select **SW SELECT** to obtain a list of switches and then highlight and select **GER** as the switch to be used to turn the mixer on and off. The **GER** indicator should now be in the upper or ON position at the bottom of the display. Any of the switches can be used and multiple switches can be used if so desired. The example is using only the Gear switch.





## MULTI-POINT MIXER – Ex: ELIMINATE PITCH-COUPPLING (continued)

5. **Set Points for Travel and Direction.** There are 7 points along the travel of the Rudder (the line that is intersected by the vertical line that moves right and left with the Rudder stick). At each point an Elevator deflection may be defined. A point that is set to 0% represents no Elevator deflection at that point. A negative value at a point typically indicates Up Elevator movement while a positive value results in Down Elevator movement. A point set to INH takes on the value of the curve/line between the 2 adjacent points. The direction of travel may be reversed (Up Elevator vs. Down Elevator) by changing values from negative (-) to positive (+) (moving the point values above and below the 0% line).

Since the aircraft pitches to the gear with the application of both Right and Left Rudder, the Elevator deflection will be zero at the center (Point-3) (no mixing) and the points either side of Point-3 will be negative, indicating Up Elevator movement. The more negative a point value, the more Up Elevator deflection. Set the points initially to the following values.

### Point-0

-10% (At full Right Rudder the Elevator will deflect Up 10%)

### Point-1

INH (Takes on the value along the curve between Point-0 & Point-2)

### Point-2

-3% (Elevator deflects Up 3% when Rudder is moved to Point-2)

### Point-3

0% (no Mixing – no Elevator deflection when Rudder is at neutral)

### Point-4

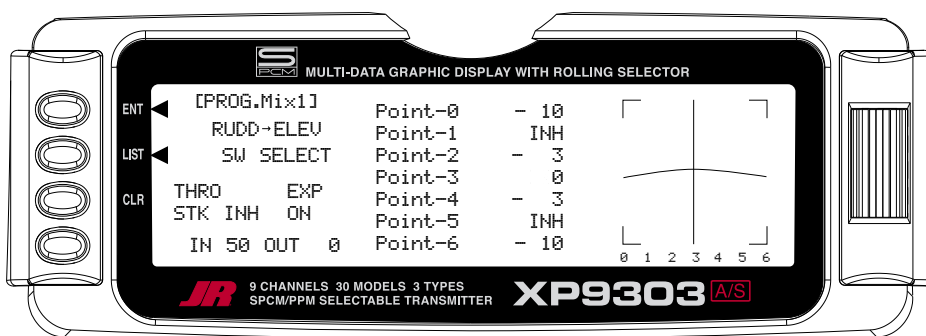
-3% (Elevator deflects Up 3% when Rudder is moved to Point-4)

### Point-5

INH (Takes on the value along the curve between Point-4 & Point-6)

### Point-6

-10% (At full Left Rudder the Elevator will deflect Up 10%)



6. **Offset.** Point-3 represents the Offset position and corresponds to the Rudder stick being at neutral. *It is important to leave Point-3 set at 0% to make sure there is no mixing and therefore no Elevator deflection when the Rudder is at neutral.*

7. **Verify Operation.** Turn the RX on and turn the mix on using the Gear switch. Move the Rudder stick from full right to full left. The Elevator should deflect Up when the Rudder is moved in both directions. If it moves down instead, change the percentages to (+) values instead of (-) values at each point. If the Elevator appears to be moving too much, reduce the point values (less negative). If the Elevator does not seem to move enough, then increase the point values (more negative). Now turn the Gear switch to the OFF position and verify that the Elevator does not move.

While test flying the aircraft, make note of the mixing and whether it is generating enough up-Elevator during knife-edge to stop it from pitching to the gear, or generating too much Elevator input, causing it to pitch to the canopy instead of the gear. Also note the approximate position of the Rudder stick when pitching occurs. Land the aircraft and adjust the points closest to the position of the Rudder stick when pitching occurs for more or less Elevator deflection until the aircraft no longer pitches during knife-edge. More negative generates more Up Elevator and less negative generates less Up Elevator. Points 1 and 5 may be activated and their value changed if necessary to fine-tune the mix.

**Note: To completely disable or otherwise inhibit a mixer, highlight either the Master or Slave and press the CLR button.**

## FAIL SAFE

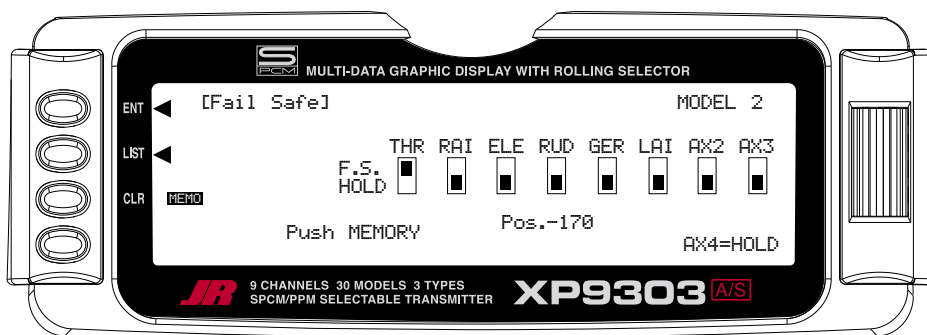
Fail Safe is available only when SPCM has been selected as the **Modulation Type** in the **SYSTEM Menu**. The receiver must be of the PCM variety, as Fail Safe does not function in the PPM/FM mode. Fail Safe will appear in the FUNC.LIST only if SPCM has been selected as the modulation type in the MODULAT function of SYSTEM Menu.

When interference occurs on the frequency of operation, PCM receivers do not pass the interference on to the servos. Instead, the receiver commands the servos to either hold their last good position (HOLD) or to move to a pre-determined position (FAIL SAFE). Both options exist for each channel and the settings are adjustable in the Fail Safe function.

Many experienced pilots designate all channels as HOLD, except for the throttle—it is commanded to assume a Fail Safe position that corresponds to idle. In this configuration the aircraft will continue to do whatever it was doing before the interference occurred, except the throttle will reduce to idle. The servos will continue to hold their last position and the throttle will remain at idle until the interference subsides, at which time normal operation is resumed.

More often than not, the pilot will not realize the system went into Fail Safe except for hearing the throttle momentarily reduce RPM. This is also a good configuration if interference is encountered while the aircraft is on the ground because the throttle reduces to idle, reducing the chances of the aircraft careening out of control at a higher throttle setting. In the event that the interference does not subside and the system remains in Fail Safe, it is better for the aircraft to crash with the engine at idle than at a higher throttle setting.

1. Run the engine in the aircraft and adjust the throttle stick/travel and trim so the engine has a dependable idle—perhaps a click or 2 above low idle. Leave the throttle and trim in these positions.
2. Access the Fail Safe function by highlighting and selecting **Fail Safe** in the **FUNC.LIST**.



3. Highlight and select **THR**, moving its indicator from the **HOLD** position to the **F.S.** (Fail Safe) position. This instructs the Fail Safe function to move the throttle servo to a pre-determined position when the receiver detects interference.
4. Press the **CLR** button next to **MEMO** to the left of the display. This memorizes the current position of all channels that are set to F.S. - in this case the throttle which should be at idle. Whenever the RX detects interference it will move the throttle to this position. The remainder of the servos will hold their last good position.

## TRAINER – TRAINER SYSTEM

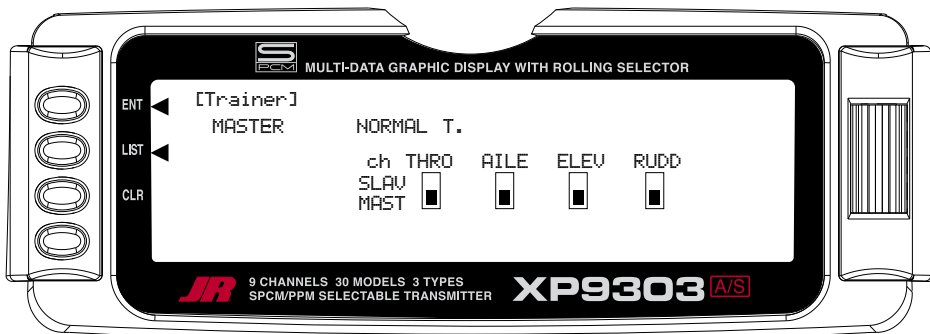
The XP9303 contains a Trainer System that allows the instructor to transfer some or all of the primary flight control functions (Throttle, Aileron, Elevator and Rudder) to the student. It also allows for indicating if the transmitter (TX) is to be the Master (controlled by the instructor) or Slave (controlled by the student). The Snap Roll button is used to transfer control to the student when the XP9303 is being used as the Master/Instructor transmitter.

All Dual rates and Exponential settings in the Master TX are transferred to the Slave TX. The Slave TX battery must be charged.

1. Connect the Trainer cord between the Master and Slave transmitters. Turn the power on to the Master transmitter (the Slave TX remains powered off and can even have the module removed).
2. Make sure the Slave TX is in the PPM/FM modulation mode. See **MODULAT** in the **SYSTEM Menu** if the Slave TX is a XP9303 or refer to the owners manual if the TX is not a XP9303.
3. Highlight and select **Trainer** in the **FUNC.LIST** to obtain the Trainer Display.

## XP9303 USED AS MASTER (INSTRUCTOR) – (Trainer System)

1. If the XP9303 is being used as the Master TX (the TX operated by the instructor), select the channel(s) that are to be operated by the Slave TX (TX operated by the student) when the trainer switch is depressed.



When all channel selectors are in the MAST position, **NORMAL** appears on the display and all 4 channels are transferred to the student when the trainer switch is depressed.

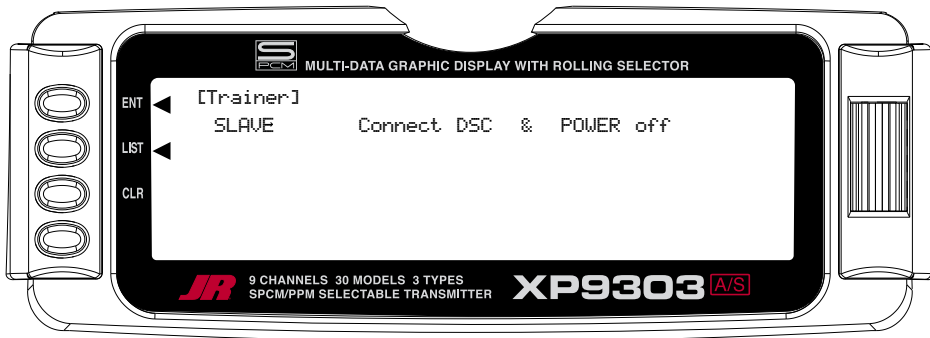
If only certain channels are to be transferred to the student, highlight and select the channels that are to be transferred, moving the indicator for these channels to the SLAV position for these channels. When less than all channels are selected as SLAV, **PROGRAM T** appears on the display indicating that the Trainer System has been programmed to transfer only selected channels.

The XP9303 is now ready to be used as the Master or instructor TX. Depress the Snap Roll button to transfer control to the student. Control will remain transferred until the Snap Roll button is released.

## XP9303 USED AS SLAVE (STUDENT) – (Trainer System)

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1. If the XP9303 is to be used as the Slave TX (TX used by the student), be sure that the currently selected model is set to PPM Modulation (see **MODULAT** in the **SYSTEM Menu** if the Slave TX is a XP9303).



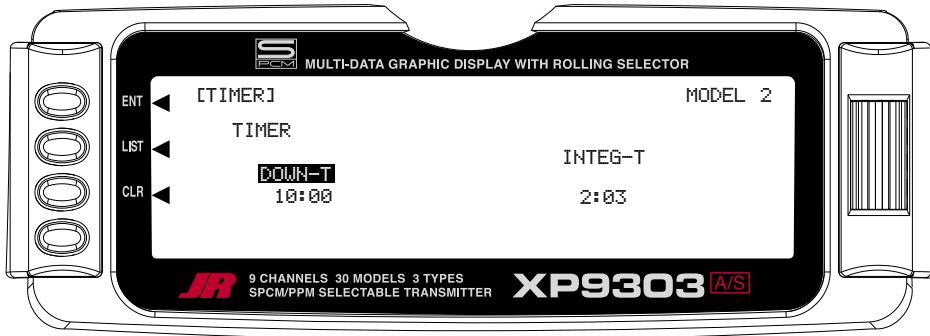
2. Highlight and select **MASTER** and the display will switch to **SLAVE**. A message will appear instructing to **Connect DSC & POWER off**. Make sure the TX power switch is in the Off position and the DSC cord is connected between the 2 transmitters.

The XP9303 is now ready to be used as the Slave or student TX.

## TIMER – TIMER SYSTEM

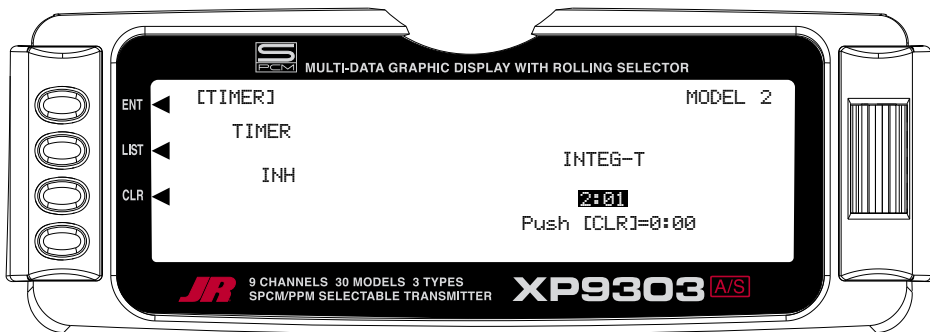
The XP9303 contains a Timer System that contains two timers. One is an integrated timer that keeps track of total time that the TX has been on for the model and it is displayed on the Main display. The other timer can be configured as either a Countdown timer or as a Stopwatch. This timer also appears on the Main display when active and can be started, stopped and reset from the Main display. It is a good idea to use the Countdown timer as a reminder that it is time to land so as not to run out of fuel.

1. To configure the timer as a Countdown timer highlight and select ***Timer*** in the ***FUNC.LIST*** to obtain the Timer display.



Highlight and select ***INH*** under ***TIMER*** and then select ***DOWN-T***. Use the *Selector* to set the countdown start time. Once the timer is set, ***TIM*** will appear on the Main display in the lower left corner. Pressing the button next to ***TIM*** on the Main display starts and stops the timer while pressing the button next to ***CLR*** resets the timer to the programmed value.

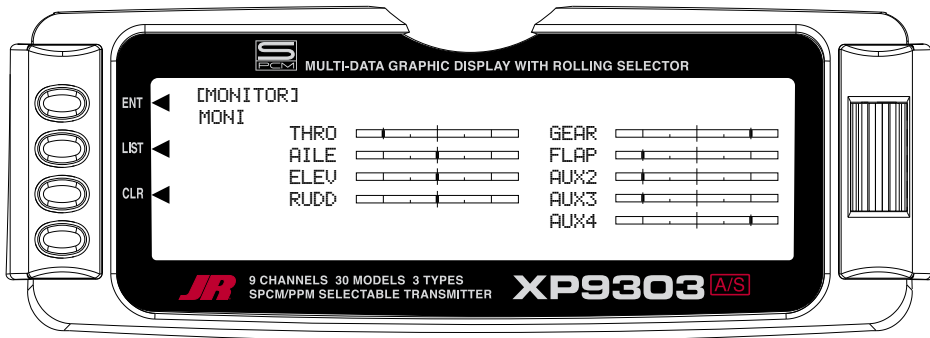
2. To Reset the Integrated Timer, highlight and select the time under ***INTEG-T*** and ***Push[CLR]=0:00*** appears on the display. Press the ***CLR*** button to the left of the display to reset the Integrated timer.



# MONITOR

The Monitor function displays each channel and shows the movement of channels when sticks, levers and switches are moved. It renames channels according to special assignments to assist in identifying what is moving. For instance, when Flaperon is the wing type, the Monitor will display **RAIL** for right Aileron and **LAIL** for left Aileron instead of displaying channel 2 and channel 6. It is a handy way to determine what channels are mixed with other channels and to verify programming when the aircraft is not at hand. The Monitor function also displays the current value of all digital trims

1. To access the Monitor function, highlight and select **MONITOR** in the **FUNC.LIST** to obtain the Monitor display.



2. The default display shows the settings of all digital trims. To view the Monitor display of all channels, highlight and select **TRIM**. View the display while moving sticks, switches and levers to see the movements of various channels.

## UTILITY FUNCTIONS

The XP9303 System includes two utility functions to help with managing the settings that have been programmed into the XP9303 model memories. These functions include **Copy** and **TRANSFER**, both of which are located

in the **SYSTEM Menu**. The Copy function is actually part of the **Model SEL** function while the **TRANSFER** function has its own set of displays.

### COPY – COPY THE CURRENTLY SELECTED MODEL TO ANOTHER MODEL MEMORY

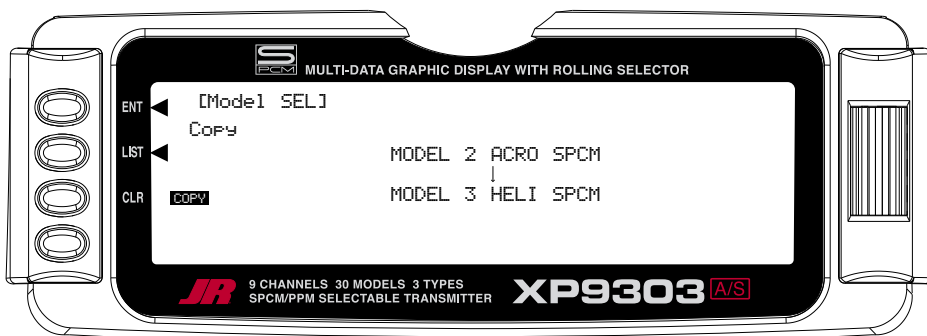
The **Copy** function is part of the **Model SEL** function described earlier and allows the contents of the current model memory to be copied into another model memory in the same transmitter. It is not used to transfer the model to another transmitter or to a DataSafe unit – the **TRANSFER** function provides for these activities.

The Copy function is very valuable because it can provide some insurance against losing programs (aircraft setups) that may have been time-consuming to create. It is strongly recommended that the Copy function be used to make a backup copy of the model memory for safekeeping after programming for a model has been completed, tested

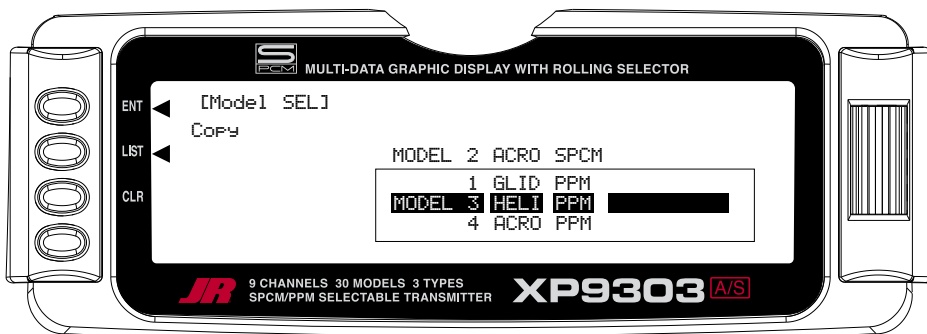
and refined.

Making a backup copy of the model memory protects against losing the original program and also allows one to experiment with the original program, knowing that the original settings can be restored by copying the backup copy back to the original model memory.

1. The model to be copied must be currently selected – see **Model SEL** description at the beginning of the ACRO section.



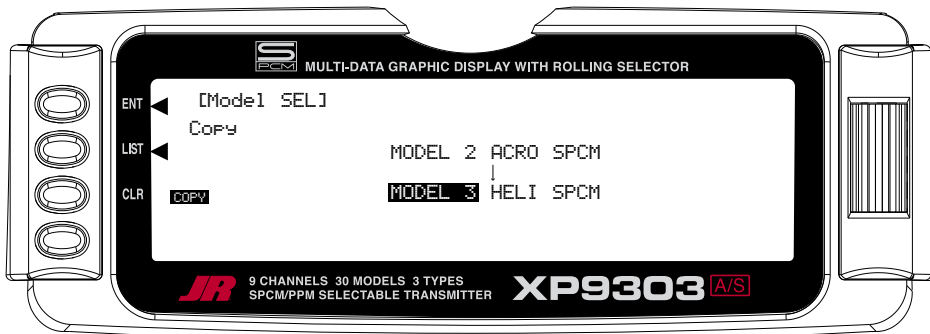
2. Highlight and select **Model SEL** in the **SYSTEM Menu**. Then highlight and select **Select** to obtain the Copy display.



## COPY – COPY CURRENT MODEL (continued)

The display shows the currently selected model on top with a down-arrow pointing to the lower model memory that the current model will be copied into. The data that is presently in the lower model memory will be entirely replaced by the data in the currently selected model, so be sure that the lower model memory is either empty or contains data that is no longer required.

**To change the lower model memory that is to receive the copy of the current model,** highlight and select the lower model name and number. Then scroll to an unused model memory or a memory that contains data that is no longer required, and select it.



3. Verify that the top model is the model that is to be backed-up and the lower model is empty or contains a model that is no longer required. When satisfied that all is well, press the **CLR** button on the left side of the display next to **COPY**. The entire contents of the currently selected model is copied to the lower model on the display and there is now a complete backup of the current model. The upper and lower model memory names are now the same because the two model memories are now identical in every regard.

The backup copy can now be used to restore the original at any time by performing the Copy function and reversing the order of models where the backup is copied into the original (Backup copy on the top line and the original model memory on the bottom line).



## TRANSFER – TRANSFER THE MODEL TO ANOTHER TRANSMITTER OR TO DataSafe

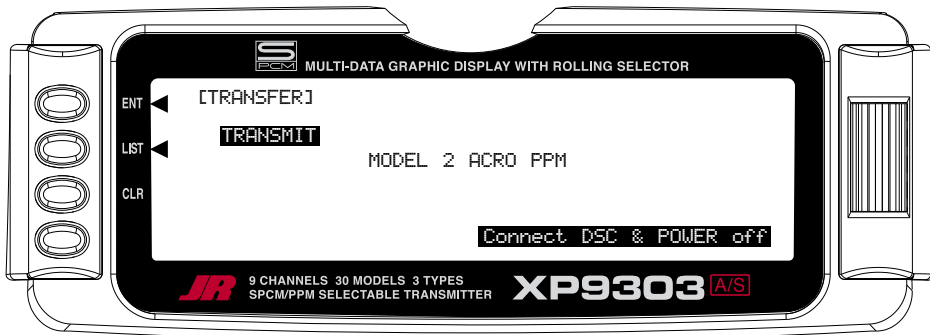
The **TRANSFER** function can be found in the **SYSTEM Menu** and is used to copy the contents of a model memory to another XP9303 transmitter or to a DataSafe device on a Personal Computer (PC). It is also used to receive data for a model, either from another XP9303 transmitter or from a DataSafe unit.

### RECEIVE A MODEL INTO THE XP9303 – (Transfer function)

1. Hold the ENT button while plugging the DSC cord into the back of the transmitter to obtain the **SYSTEM Menu**.

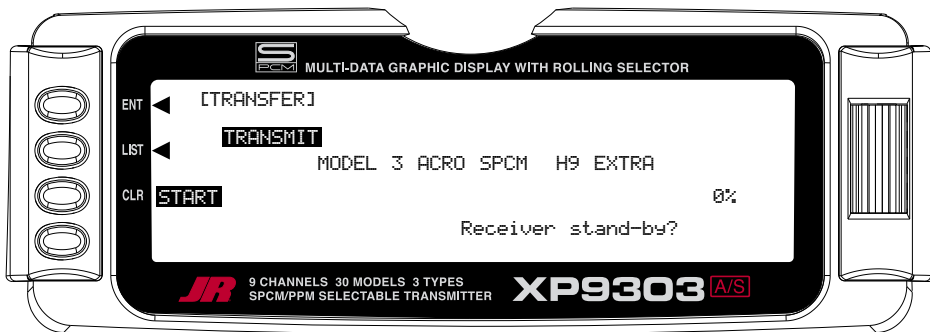
Plug the other end of the DSC cord into another XP9303 transmitter while holding the **ENT** button down and prepare that transmitter for Receive as described below. Or, plug the other end of the DSC cord into a DataSafe unit and prepare the DataSafe for Receive.

2. Highlight and select **TRANSFER** in the **SYSTEM Menu** to obtain the Transfer display.



3. The model to be transferred must be the currently selected model. If the model to be transferred is not currently selected, see **Model SEL** in the **SYSTEM Menu** to select the model to be transferred to another XP9303 or DataSafe unit.

4. When the receiving device is ready, press the **CLR** button next to **START** on the left side of the display. The data for the currently selected model is transferred to the receiving device.

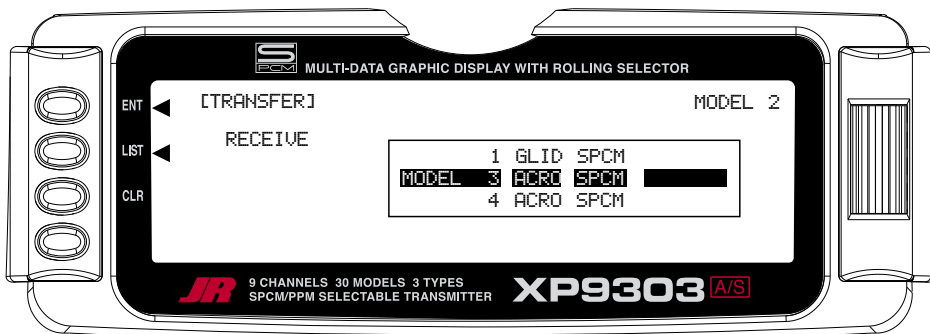
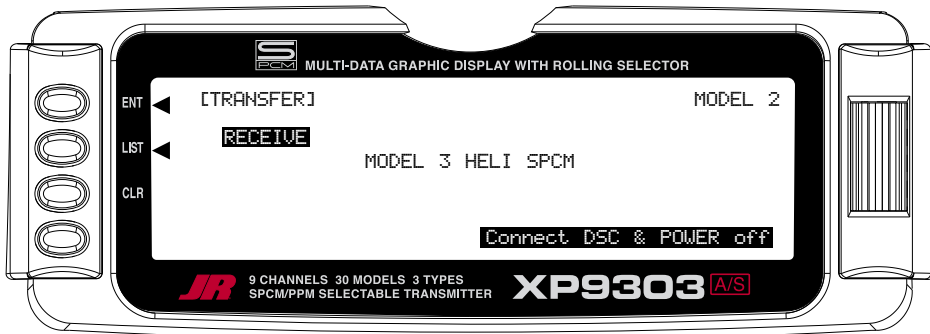


## RECEIVE A MODEL INTO THE XP9303 – (Transfer function)

1. Hold the **ENT** button while plugging the DSC cord into the back of the transmitter to obtain the **SYSTEM Menu**. Plug the other end of the DSC cord into another XP9303 transmitter while holding the **ENT** button and prepare that transmitter for Transmit as

described above. Or, plug the other end of the DSC cord into a DataSafe unit and prepare the DataSafe for Transmit.

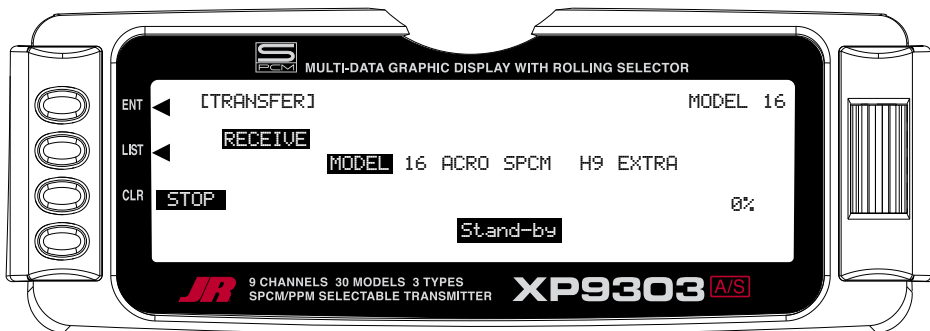
2. Highlight and select **TRANSFER** in the **SYSTEM Menu** to obtain the Transfer display.



3. If **RECEIVE** is already displayed, continue with the next step. If **TRANSMIT** is displayed, highlight and select **TRANSMIT**, changing it to **RECEIVE**.

4. Select the model memory that is to receive the data by highlighting and selecting the model name/memory number and then scrolling to and selecting the model memory that is to receive the data. Be careful to select an unused model memory or a memory that contains data for a model that is no longer needed because the data in this model memory is going to be replaced by what is transmitted and will be permanently lost.

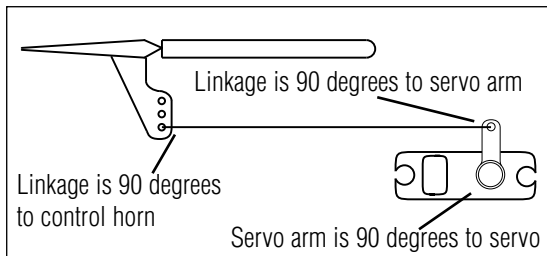
5. Press the **CLR** button next to **START** on the left side of the display. Stand-by appears at the bottom of the display indicating that the XP9303 is ready to receive data. Press start on the transmitting XP9303 or DataSafe unit to begin the data transfer to the XP9303.



# SUB TRIM USAGE AND MECHANICAL ADVANTAGE

## SUB TRIM

Sub Trims are intended for relatively minor adjustments to servo linkages and not for major trim adjustments to the aircraft. Using excessive sub trim percentages can cause a loss in servo resolution, where the servo reaches its travel limit and stops moving before the control stick is fully deflected.



The diagram below illustrates an ideal servo/linkage setup when the servo is at neutral (no sub trim and digital trims centered). Notice that the servo arm is positioned at 90° or perpendicular to the servo. Also note that the linkage or rod is attached at 90° to both the servo arm and the control surface horn. This setup will result in the same amount of throw in both directions (0 differential throw). If the servo cannot be mounted parallel to the linkage/rod then just make sure the servo arm is at 90° to the control rod when the servo is at neutral.

## MECHANICAL ADVANTAGE

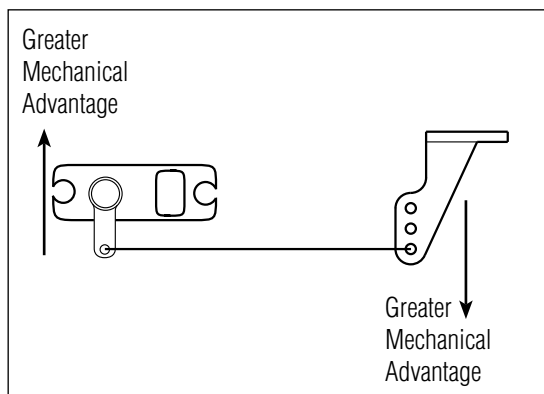
Mechanical Advantage is a very important concept when dealing with larger aircraft. It refers to the leverage that the servo can exert on the control surface. Since the control surfaces are rather large, it is important for the servo to have enough mechanical advantage or leverage to control them, regardless of the servo's rated torque. A large amount of torque is of little value if there is not enough leverage to use it. Insufficient leverage can lead to control surface flutter (usually a catastrophic event) and blow-back, where the air flow pushes the control surface backwards resulting in mushy or no control at higher speeds.

There are two ways to increase the mechanical advantage of the servo. One is to make sure that the control horn device, whether it be a horn as shown in the illustration above or a bolt with a Rocket City-type fastener, is long enough. The horn is the lever that the servo uses to control the surface. The longer the horn, the more leverage the servo has. It's like a Lug Wrench – when you can't get a lug nut loose you put a piece of pipe over the end of the lug wrench to extend the handle and that gives you more leverage to break the lug nut free. It's the same thing—the lug nut is the control surface and you are the servo trying to move it. As a general rule-of-thumb, try to attach the linkage at the control surface so that it is at least 1" away from the surface – longer is better.

The second way to increase the mechanical advantage for the servo is to attach the linkage at the servo arm as far inward (towards the servo arm retaining screw) as possible while still providing enough throw. It's the "lever thing" again, but in reverse, as we are taking leverage away from the control surface by providing it with a shorter lever to work against the servo.

Ensure that the attach point is the same distance from the hinge line for like surfaces (two Ailerons, two Elevators and two Rudder horns). If the attach points are not the same distance from the hinge line there will be unequal throw and it will be more difficult to synchronize the surfaces for equal deflection. This is especially critical for the Rudder where two servos are attached to the same surface – unequal throw will cause the servos to fight one another causing excessive battery drain, and in severe cases may cause servo damage.

Always try to use the maximum amount of Travel (100%) that the radio provides. If it is too much travel, don't reduce the percentage of travel in the radio. Instead, move the linkage further away from the hinge line at the control surface and/or move the linkage inward on the servo arm or use a shorter arm. If you use high percentages of travel, you maintain resolution (fine movements of the stick result in fine positive movements of the control surface). When we decrease travel percentages, we lose resolution.



## DUAL RATES AND EXPONENTIAL CURVES

Dual Rates and Exponential curves can be very effective in setting up an aircraft to “feel” the way you would like it to feel when performing different types of maneuvers. You can essentially change the aircraft’s personality just by flipping a switch, causing the aircraft to take on traits that make certain maneuvers easier for the pilot. At times you may want the aircraft to feel very crisp, such as when performing point rolls and sided-loops and then feel softer for other maneuvers, such as rolling circles and consecutive rolls, and yet other times when you would like the aircraft to be very crisp but without a the tendency to be over-controlled, like in performing snap rolls. Dual Rates and Exponential curves can be combined to produce these traits for most any aircraft. When programming a Dual Rate and Exponential curve, always think about what kind of maneuver or flying style you plan to accomplish with it.

Dual Rates (D/R) limit how far a control surface travels. Without dual rates your control surfaces deflect to their full travel – the travel that you previously established with the TRVL ADJ. function and linkage setup. When a D/R is programmed, it limits the amount of deflection that occurs when the stick is moved to its extremes. For example, if you set an Elevator D/R to 75%, the Elevator will only deflect 75% or 3/4 of its full travel; if set to 50%, it will be limited to 1/2 of its full travel; and so forth. A D/R setting of 100% results in full travel again, as though there were no D/R programmed at all.

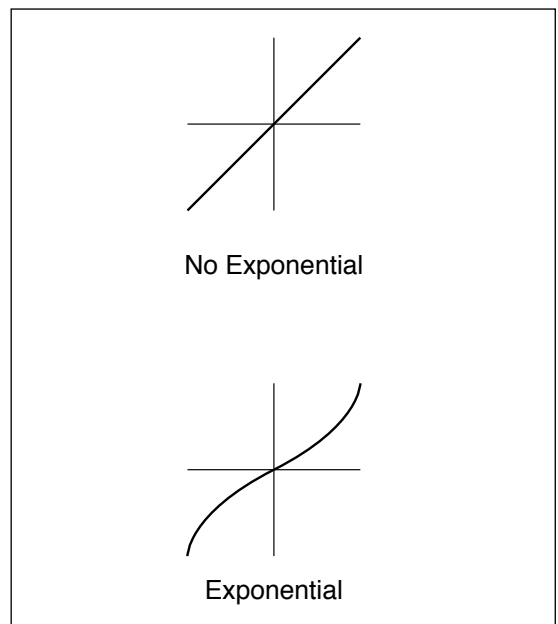
An example of programming a D/R for the Ailerons would be to set up an Aileron D/R for flying consecutive rolls by setting the Aileron D/R to 25% (actual percentage will vary). At this setting, moving the Aileron stick full left or full right would result in a roll rate of about 1 roll per second. This allows you to deflect the Aileron stick all the way and just hold it there while concentrating on Elevator and Rudder inputs – flying consecutive rolls just became easier.

EXPONENTIAL (EXP) does not limit the total deflection of a servo/control surface – the surface still moves 100% of its travel. It does, however, determine how the surface reaches its full travel, or how the control surface moves relative to the stick. When Exponential is not used, the servo response is said to be linear. That is, every movement of the stick causes the same movement in the servo--if the stick moves 20%, the servo moves 20% and the control surface follows the stick throughout the entire travel range. When plotted on a graph where the X-axis (left and right) = stick movement and the Y-axis (up and down) = servo movement, the result is a straight line that is at 45 degrees.

When using Exponential, a positive (+) exponential percentage causes the servo to move less when the stick is close to the neutral point, and to move more as the stick moves further from the neutral point. For instance, the stick is moved from neutral to 30% and the servo only moves from neutral to 10%. As the stick is moved further from center (from 30% to 50%), the servo moves further and faster (from 10% to 35%). The further the stick is moved away from center, the higher the rate of servo movement. The larger the positive (+) Exponential percentage, the further the stick must be moved from center before the servo rate increases, and the faster the servo rate becomes when it gets close to the end of its travel. When stick travel (left and right) versus servo travel (up and down) is plotted on a graph, the result is a “curve.” The curve stays close to the X-axis at the center (small servo movement) and moves away from the X-axis at a greater rate (more servo movement) as the stick is moved further off center.

Exponential is typically used to reduce sensitivity or otherwise dampen movements around the neutral stick position without sacrificing full servo travel. This provides the pilot with very smooth and precise control of the aircraft while allowing relatively large movements in the control stick. It becomes easier to make very smooth and precise corrections that are difficult to detect.

If negative exponential is used, it has the opposite effect. Servo travel is increased around center and slows towards the ends. Care must be taken with negative exponential, as an aircraft that is already overly sensitive may become uncontrollable with negative exponential. It can prove useful, however, when hovering a 3D type aircraft.



## Servo Precautions

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- Do not lubricate servo gears or motors.
- Do not overload retract servos during retracted or extended conditions.  
Make sure they are able to travel their full deflection. Overloading or stalling a servo can cause excessive current drain.
- Make sure all servos move freely through their rotations and no linkages hang up or bind. A binding control linkage can cause a servo to draw excessive current. A stalled servo can drain a battery pack in a matter of minutes.
- Correct any control surface “buzz” or “flutter” as soon as it is noticed in flight, as this condition can destroy the feedback potentiometer in the servo. It may be extremely dangerous to ignore such “buzz” or “flutter.”
- Use the supplied rubber grommets and brass servo eyelets when mounting your servos. Do not over-tighten the servo mounting screws, as this negates the dampening effect of the rubber grommets.
- Ensure the servo horn is securely fastened to the servo. Use only the JR® servo arm screws provided; the size is different from other manufacturers.
- Discontinue to use servo arms when they become “yellowed” or discolored. Such servo arms may be brittle and can snap at any time, possibly causing the aircraft to crash.
- Check all related mounting screws and linkages frequently. Aircraft often vibrate, causing linkages and screws to loosen.

## General notes

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Radio controlled models are a great source of pleasure. Unfortunately, they can also pose a potential hazard if not operated and maintained properly.

It is imperative to install your radio control system correctly. Additionally, your level of piloting competency must be high enough to ensure that you are able to control your aircraft under all conditions. If you are a newcomer to radio controlled flying, please seek help from an experienced pilot or your local hobby shop.

### Safety Do's and Don'ts for Pilots

- Do not fly during adverse weather conditions. Poor visibility can cause disorientation and loss of control of your aircraft. Strong winds can cause similar problems.
  - Do not fly unless your frequency is clear.
- Warning:** Only one transmitter at a time can operate on a given frequency. If you turn on your transmitter while someone else is operating a model on your frequency, both pilots will lose control of their models. Only one person can use a given frequency at a time. It does not matter if it is AM, FM or PCM—only one frequency at a time.
- Do not point the transmitter antenna directly toward the model. The radiation pattern from the tip of the antenna is inherently low.
  - Do not take chances. If at any time during flight you observe any erratic or abnormal operation, and immediately and do not resume flight until the cause of the problem has been ascertained and corrected. Safety can never be taken lightly.
- Ensure your batteries have been properly charged prior to initial flight.
  - Keep track of the time the system is turned on so you will know how long you can safely operate your system.
  - Perform a ground range check prior to the initial flight of the day. See the “Daily Flight Checks Section” for information.
  - Check all control surfaces prior to each takeoff.
  - Use frequency flags.
  - Do not fly your model near spectators, parking areas or any other area that could result in injury to people or damage of property.

# Federal Aviation Administration

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## 1. Purpose

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This advisory outlines safety standards for operations of model aircraft. We encourage voluntary compliance with these standards.

## 2. Background

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Attention has been drawn to the increase in model aircraft operation. There is a need for added caution when operating free flight and radio controlled craft in order to avoid creating a noise nuisance or a potential hazard to full-scale aircraft and persons and/or property on the surface.

## 3. Operating Standards

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Modelers generally are concerned with safety and exercise good judgment when flying model aircraft. However, in the interest of safer skies, we encourage operators of radio controlled and free flight models to comply with the following standards:

- a. Exercise vigilance in locating full-scale aircraft (get help if possible) so as not to create a collision hazard.

- b. Select an operating site at sufficient distance from populated areas so you do not create a noise problem or a potential hazard.
- c. Do not fly higher than 400 feet above the surface.
- d. Always operate more than three miles from the boundary of an airport unless you are given permission to be closer by the appropriate air traffic control facility in the case of an airport for which a control zone has been designated or by the airport manager in the case of other airports.
- e. Do not hesitate to ask for assistance in complying with these guidelines at the airport traffic control tower or air route traffic control center nearest the site of your proposed operation.

Information Provided By:

Director, Air Traffic Service Federal Aviation Administration, Washington, D.C.

## Daily Flight Checks

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1. Check the battery voltage on both the transmitter and the receiver battery packs. Do not fly below 9.0V on the transmitter or below 4.7V on the receiver. To do so can crash your aircraft.

**Note:** When you check these batteries, ensure that you have the polarities correct on your expanded scale voltmeter.

2. Check all hardware (linkages, screws, nuts, and bolts) prior to each day's flight. Be sure that binding does not occur and that all parts are properly secured.
3. Ensure that all surfaces are moving in the proper manner.
4. Perform a ground range check before each day's flying session. The range check should be as follows:

- Do not extend the transmitter antenna at this time. Turn the transmitter "on."
- Turn the model "on."
- Slowly walk away from the model while moving the control surfaces. The aircraft should function properly at a distance of 60–75 feet.
- For PCM Only: With the throttle fail safe preset to idle, bring the throttle slightly above idle. Walk away until the throttle drops to idle. This will be the distance of the range check.

5. Prior to starting your aircraft, turn off your transmitter, then turn it back on. Do this each time you start your aircraft. If any critical switches are on without your knowledge, the transmitter alarm will warn you at this time.
6. Check that all trim levers are in the proper location.
7. All servo pigtailed and switch harness plugs should be secured in the receiver. Make sure that the switch harness moves freely in both directions.

# Frequency Chart

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72 MHz requires no special license to operate.

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

### Transmitter Crystal Replacement Notice:

The Federal Communications Commission (FCC) requires that changes in transmitter frequency must be performed only by an authorized service technician (Horizon Service Center).

Any transmitter frequency changes made by a non-certified technician may result in a violation of FCC rules.

Channels 12–14 are not available through JR®.

## Warranty Information

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**Important:** Be sure to keep your original dated sales receipt, as you will be required to provide proof-of-purchase date for the equipment to be serviced under warranty.

### Warranty Coverage

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Your new JR® Remote Control Radio System is warranted to the original purchaser against manufacturer defects in material and workmanship for an unprecedented 3 years from the date of purchase. During this period, Horizon Service Center will repair or replace, at our discretion, any component that is found to be factory defective at no cost to the purchaser. This warranty is limited to the original purchaser of the unit and is not transferable.

This warranty does not apply to any unit that has been improperly installed, mishandled, abused or damaged in a crash, or to any unit that has been repaired or altered by any unauthorized agencies. Under no circumstances will the buyer be entitled to consequential or incidental damages. This limited warranty gives you specific legal rights; you also have other rights, which may vary from state to state. As with all fine electronic equipment, do not subject your radio system to extreme temperatures, humidity or moisture. Do not leave it in direct sunlight for long periods of time.

### Repair Service Directions

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In the event that your JR radio needs service, please follow the instructions listed below.

1. Check all on/off switches to be sure they are off. This will speed the repair process of checking battery condition.
2. Return your system components only (transmitter, receiver, servos, etc.). Do not return your system installed in a model aircraft, car, boat, etc.
3. Preferably, use the original carton/packaging (molded foam container), or equivalent, to ship your system. Do not use the system carton itself as a shipping carton, you should package the system carton within a sturdy shipping container using additional packing material to safeguard against damage during transit. Include complete name and address information inside the carton, as well as clearly writing it on the outer label/return address area.
4. Include detailed information explaining your operation of the system and problem(s) encountered. Provide an itemized list of equipment enclosed and identify any particular area/function, which may better assist our technicians in addressing your concerns. Within your letter, advise us of the payment method you prefer to use. Horizon Service Center accepts VISA or MasterCard. Please include your card number and expiration date. Date your correspondence, and be sure your complete name and address appear on this enclosure.
5. Include your name, mailing address, and a phone number where you can be reached during the business day.

### Warranty Repairs

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To receive warranty service, you must include a copy of your original dated sales receipt to verify your proof-of-purchase date. Providing that warranty conditions have been met, your radio will be repaired without charge.

### Normal Non-Warranty Repairs

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Should your repair cost exceed 50% of the retail purchase cost, you will be provided with an estimate advising you of your options.

Mail your system to:

Horizon Service Center  
4105 Fieldstone Road  
Champaign, IL 61822  
Phone: (217) 355-9511



# Setup Sheet (Aircraft)

MODEL NO \_\_\_\_\_

MODEL NAME \_\_\_\_\_

	SPOI	AIL1	ELEV	RUDD	AIL2	FLAP	AUX2	AUX3
REVERSE SW	NORM REV	NORM REV	NORM REV	NORM REV	NORM REV	NORM REV	NORM REV	NORM REV
SUB TRIM								
TRAVEL ADJUST	+ % - %	L % R %	U % D %	L % R %	L % R %	U % D %	+ % - %	+ % - %
FAIL SAFE (SPCM)								

			AIL	ELEV	RUDD
DUAL RATE/EXP	0	D/R	%	%	%
		EXP	%	%	%
	1	D/R	%	%	%
		EXP	%	%	%
SNAP ROLL	ACT	R-D	%	%	%
		R-U	%	%	%
	INH	L-D	%	%	%
		L-U	%	%	%
TRIM OFFSET					

AUTO RUDD D/R	ACT INH
---------------	---------

ELEV → FLAP MIX	DOWN	%
	UP	%

AIL → RUDD MIX	RATE	%
	SW	

LANDING	ELEV	
	FLAP	
	SPOI	
	AUTO	ACT INH
THRO		%

DIFFERENTIAL	%
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ADDITIONAL NOTES	
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WING TYPE	NORMAL FLAPERON DELTA
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PROGRAMMABLE MIX		CHANNEL	SW	EXP	0	1	2	3	4	5	6
	MIX1	→		ON/OFF							
	MIX1	→		ON/OFF							
						+POS		-POS		OFFSET	
	MIX1	→									
	MIX1	→									
	MIX1	→									



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