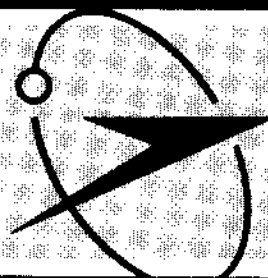


XL Series
Radio Control System



AIRTRONICS®

XL Series Radio Control System

THANK YOU FOR SELECTING AIRTRONICS!

All Airtronics radios are manufactured to exacting aerospace standards and then thoroughly tested and inspected before packaging. To fully enjoy and protect your RC equipment, please read this instruction manual carefully. You'll find it full of important instructions, safety guidelines, and installation tips. Take the time to read the entire manual before using your RC radio.



AIRTRONICS FEATURES

TRANSMITTER

- Advanced gimbal design with external control stick length adjustments and external tensioner adjustment capabilities
- Convenient servo reversing at the touch of a switch on all channels with every system
- The choice of either linear or exponential control for the elevator and ailerons
- Convenient servo travel adjustment on both elevator and ailerons
- Easy to read meter for checking of the transmitter and airborne battery pack
- Plug-in modules/crystals for easy frequency changing
- Both the transmitter and receiver utilize Signetics NE5044 and NE5045 encoder and decoder integrated circuits
- Attractive brushed aluminum Tx case for additional protection and sharp appearance
- Trainer system is standard for easy flight training

RECEIVER FEATURES

- Easy to change, plug-in frequency crystals
- Extremely small and light-weight, only 1.43 ounces
- Extremely rugged construction
- Subminiature connectors with gold plating, compatible with all Airtronics systems

SERVO FEATURES

- Extremely rugged and time proven
- Standard servos (94394) produce over 45 oz. in. torque
- Carbon potentiometer plus a carbon button wiper for extra long life and service
- Splined output shaft with 23 splines for easy servo neutral changing



SAFETY

RC modeling is one of the most enjoyable and rewarding hobbies available today. The rewards and satisfaction from RCing are only there if safety is on the RCers mind whenever he is operating his equipment. You must keep in mind at all times that you are responsible for the safety of not only yourself but those spectators or other flyers that are near you whenever you operate your RC model. This is not a responsibility that should be taken lightly.

The instructions and installation guidelines presented in this manual should be followed at all times. Deviating from the instructions could create an unsafe condition and cause your model to not respond properly to your commands. If you are new to the RC hobby, it is best to ask the advice of an experienced modeler who can check your radio installation.

Before flying your aircraft, you should also ask an experienced RCer to carefully inspect your entire model to help ensure that it will fly properly and respond to your radio commands. We also strongly recommend that you ask an expert RC flyer to test fly your aircraft on its maiden flight. He can help you trim the aircraft properly and advise you if the aircraft does not respond properly to the radio commands.

A.M.A. (Academy of Model Aeronautics)

The A.M.A. is the chief regulating body of the RC hobby. They

provide valuable services for RC clubs and for individual RC modelers. You should consider joining the A.M.A. to help further the sport of RC flying and to also be eligible for some important benefits and insurance protection offered by the A.M.A.

An important function of the A.M.A. has been the development of safety rules and regulations that most RC flying sites operate by. We urge you to seriously consider membership in the A.M.A. to benefit from their years of experience.

Membership in the A.M.A. includes subscription to an informative monthly magazine, liability insurance protection, special discount offers and other attractive benefits. For further information on the A.M.A. programs and how to join the organization, please write to the following address:



ACADEMY OF MODEL AERONAUTICS

~~815 Fifteenth Street, N.W.~~

~~Washington, D.C. 20005~~

F.C.C. LICENSING REQUIREMENT

Before operating your radio transmitter, it is necessary for you to obtain an operator's license from the Federal Communications Commission. The operator's license is issued at no charge to yourself after submitting form #505 to the F.C.C. If you are operating RC equipment on the 27 MHz or 72 MHz frequencies, no test is required. Many hobby shop dealers can supply you with the blank application form. If your local dealer does not have the forms please write to your nearest F.C.C. office. Check the white pages in your telephone book under U.S. Government for the one nearest you.



RADIO FREQUENCY CONTROL

A total of 17 different frequencies have been assigned for RC use by the F.C.C. Of the 17 frequencies available to RCers, five of those frequencies require than an amateur radio license be issued to the user. These are the frequencies located in the 53 MHz band. The commonly used RC frequencies range from 26.995 MHz to 75.640 MHz. Listed below are all of the frequencies and the identification flags which are used on your radio transmitter.

MHZ	Flag
26.995	Brown
27.045	Red
27.095	Orange

MHZ	Flag
27.145	Yellow
27.195	Green
72.080*	Brown/White
72.160	Blue/White
72.240*	Red/White
72.320	Violet/White
72.400*	Orange/White
72.960	Yellow/White
75.640*	Green/White
53.1	Brown/Black
53.2	Red/Black
53.3	Orange/Black
53.4	Yellow/Black
53.5	Green/Black

*Indicates aircraft frequencies only

For control at flying sites, each transmitter should be fitted with the appropriate color recognition flag so that other RCers can easily determine which frequencies are currently in use.

REMEMBER

The operation of any additional transmitters will "jam" the signal and will cause the model being operated to lose radio control.

FREQUENCY FLAGS

Appropriate colored flags have been included with your Airtronics radio set. Be sure to attach these flags properly to your radio transmitter antenna and to always have the flags displayed when using your transmitter. As the flags become aged and the colors begin to fade, replace them with new, easy to identify, flags.

RF MODULE

On the side of your radio transmitter is a small access plate to the RF module. The frequency number assigned to your radio is included on this plate for your convenience. Try to familiarize yourself with the number and color codes before flying.

Your radio frequency transmission can carry for several miles under ideal atmospheric conditions. If flying at a new site, take the time to carefully check the surrounding area and determine whether or not your signal could disrupt any other RC modeler's signal. Also, you will want to check with your F.C.C. office and determine whether or not any industrial users in your area are on the same frequency as you intend to fly your model on. This is a common occurrence and something which should be checked before flying at any new site.

FREQUENCY CHANGE 72 MHz

To change transmitter frequency, remove the transmitter back, carefully pull out the RF module, and replace with module of desired frequency. Change frequency identification plate and replace antenna flag.

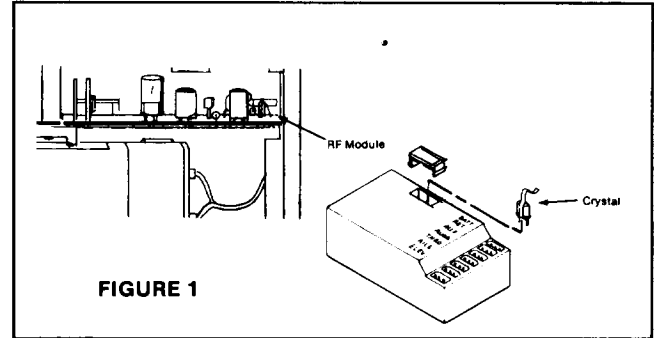


FIGURE 1

To change the receiver frequency, remove the crystal cover, and gently pull out the crystal. Install the crystal matching the transmitter frequency, and replace the crystal cover. Refer to Fig. 1.

Frequency changes on the lower portion of the 72 MHz band, 72.080 to 72.960 MHz do not require retuning of the receiver. A frequency change from the lower portion of the band to 75.640 or from 75.640 to the lower portion of the band will require retuning of the receiver.

If a frequency change requiring retuning is desired, please return the transmitter and receiver to the factory for retuning.

FREQUENCY CHANGE 53 MHz AND 27 MHz

To change the frequency of systems on 53 MHz or 27 MHz, only the crystals need to be changed.

CRYSTAL EXCHANGE

The crystals used in Airtronics systems are close tolerance, and under no circumstances should other brands of crystals be used in Airtronics radios as the performance will be sub-standard.

SYSTEM BAND CHANGES

Band changes will require a transmitter RF module, receiver, crystals, and frequency flags for the desired band and frequency.

The Academy of Model Aeronautics has been working with the Federal Communications Commission for many years in order to obtain new additional frequencies for radio control use.

Your Airtronics radio will be adaptable to these new frequencies by one of the frequency change methods described above.



PACKAGING

Your Airtronics radio system has been packaged in a specially designed styrofoam storage container. We recommend that you keep the container and do not discard it. The use of the container is the best possible way to store your radio system and also it is the safest method to ship the radio back to Airtronics if it should ever require repairs.



SYSTEM FAMILIARIZATION

Before installing your Airtronics radio in your model, we recommend that the entire system be assembled and operated on your workbench so that you can become familiar with all the control functions and features of your Airtronics radio. In order for the system to operate, the nicad batteries will, of course, have to be charged. The next section of this manual deals with proper battery charging.



BATTERY CHARGING

Proper radio control requires that the batteries be in a high state of charge. Once the batteries have dropped below a specific voltage level, then loss of radio control will result. While the nicad batteries in your Airtronics radio may last for many years, they do require special care and charging procedures.

INITIAL BATTERY CHARGING

The nicad batteries in the transmitter and airborne battery pack must be charged **for at least 24 hours** on their initial charge. Both the transmitter and receiver battery packs should be connected to the charger as shown in Fig. 2.

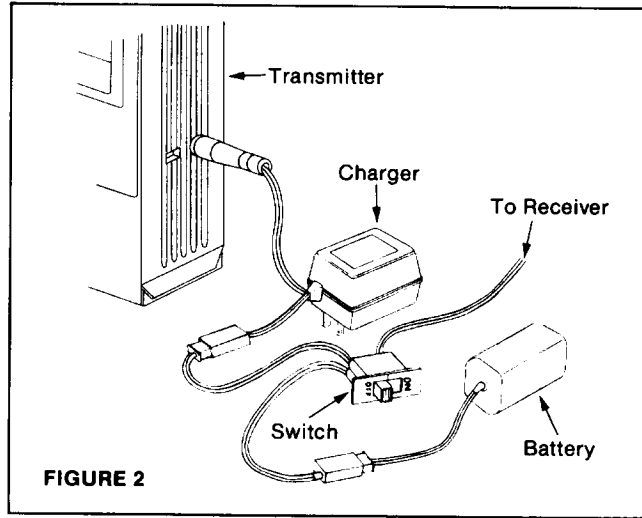


FIGURE 2

Be sure that the transmitter is in the **off** position and that the receiver harness is also in the **off** position, if it is connected, during this initial charging operation. The battery charger should be plugged into a regular 110 volt alternating current wall outlet. If you have connected the harnesses and batteries properly, two red indicator lights on the battery charger housing will glow, indicating proper charging is taking place. If one or the other of the lights is not operating, check to make sure that the connections are clean and tight and that all switches are in the **off** position.

225 MAH BATTERY PACK (P/N 95002)

If you are using an optional 225 milliamp hour battery pack, a lower rate of battery charging is required. Included with each battery pack set is a resistor charging harness which should always be used. This battery pack should also be charged for 14-16 hours.

SUBSEQUENT BATTERY CHARGING

After the initial battery charging procedure is completed, the batteries will not require such a long charging time. The batteries should be charged for approximately 14 to 16 hours before flying the aircraft. The charging is best done on the day prior to your actual flying time. If you have charged the batteries in your radio and aircraft and several days have passed, it is strongly recommended that the batteries be recharged before use.

EXTERNAL BATTERY CHARGER CONNECTION

For your convenience, an external battery charger connection is provided in your set. When mounting the external battery charger in your aircraft, be sure to mount it on the side of the aircraft opposite the exhaust outlet.

BATTERY OPERATIONAL CAPACITY

The length of time which you may operate your transmitter is approximately 2 hours before recharging is required. The airborne battery pack will operate for approximately 2 hours if power draw is normal. This is provided only as a general

guideline as each installation will have a different current drain.



SYSTEM CHECKOUT

CONTROL FUNCTIONS

Connect all of the system components and the fully charged nicad battery as shown in Figure 5. Turn the transmitter switch to the ON position and then turn the receiver switch to the ON position. Gently move each control stick through its full range of motion and note whether or not the servos operate smoothly and responsively. Both the tension and the length on the control sticks can be easily altered to suit your own personal preferences. After you have adjusted the control sticks to suit yourself, you should also move the trim levers through their full range of motion. The trim levers are used to make small adjustments to your aircraft so that it can be flown "hands off" without constant pressure having to be applied to either of the control sticks.

The control functions described are for a four channel radio. The six channel XL radio also has separate control functions for landing gear operation and for flap operation. The landing gear is normally operated by the toggle switch located on the top left of the transmitter. The flaps may be operated by the positionable control switch on the right side of the transmitter housing. At this time, you can move the servo leads

around and determine whether or not these functions are also working smoothly and properly. See Fig. 3.

RF METER

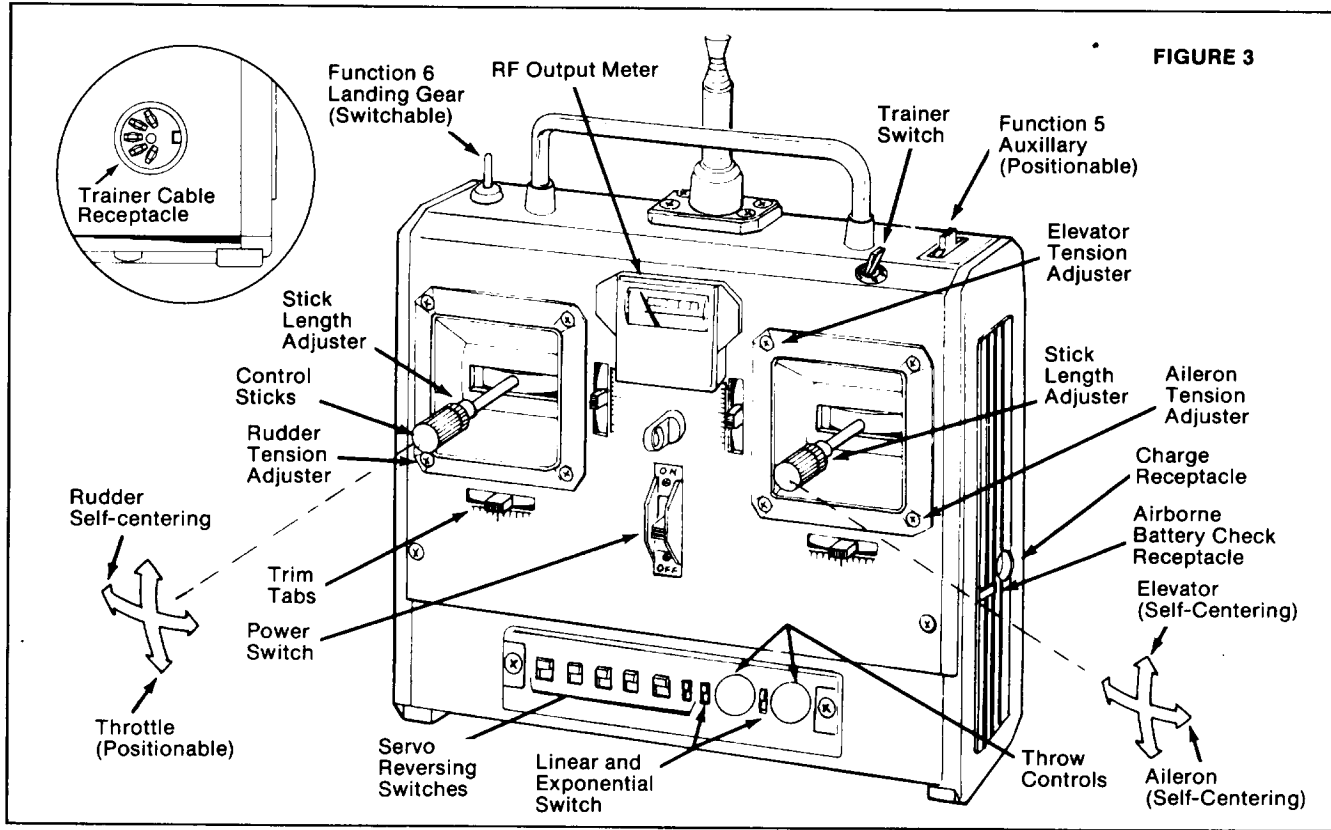
XL transmitters are also equipped with a RF output meter. The RF meter will indicate the strength of the radio frequency being transmitted. When the output needle is in the silver area of the meter, this indicates that the RF signal being produced is strong and clear. If the needle drops into the orange, middle zone, or red zone, this indicates a very marginal signal output and the aircraft should not be operated until the transmitter batteries have been recharged. The airborne battery pack can also be plugged into the transmitter and the strength of its battery charge measured on the same meter. The readings obtained are the same as for the transmitter batteries. Use the long cable provided.

Located beneath the Airtronics XL series name plate are the servo reversing switches, servo travel limiter controls, and the exponential and linear selection switches. To remove the name plate, gently slide to the left and lift.

CONTROL RATES

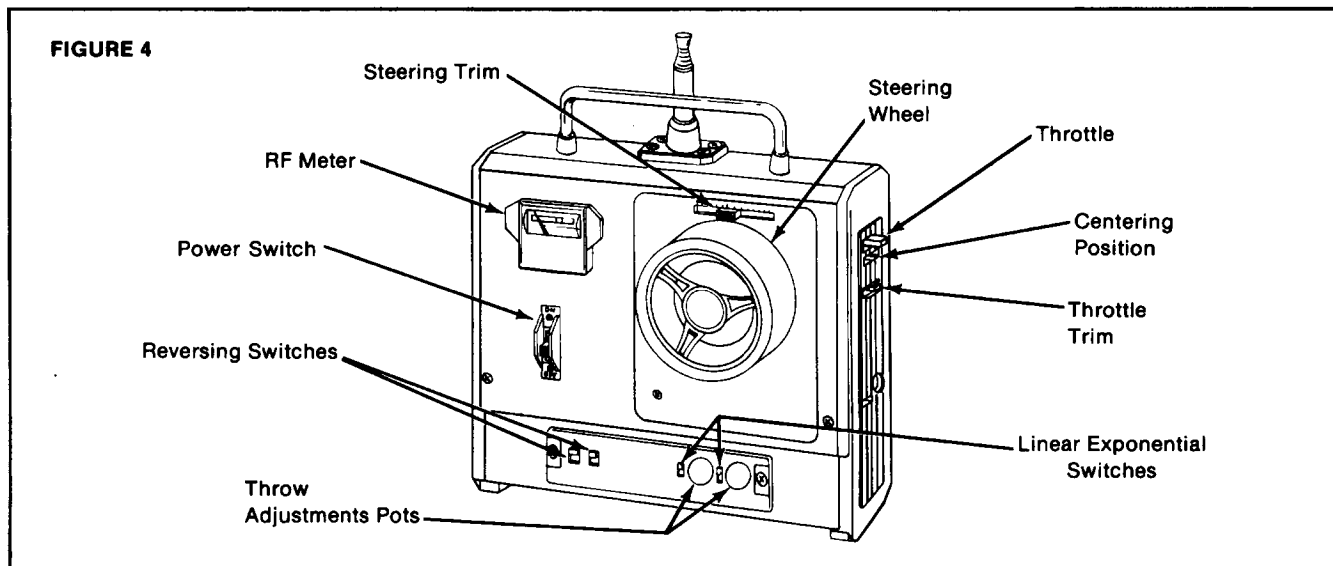
An important feature of your XL radio is the ability to select either linear or exponential control rates for both the ailerons and elevator. In the linear position, for example, a 1/8th movement of the control stick will move the aircraft control surface a corresponding proportional amount. The next additional 1/8th movement of the control stick will move the

FIGURE 3



aircraft control surfaces the exact same amount. No matter where the stick is positioned in its total range of movement, the aircraft control surface will move an identical, proportional amount. Selecting the exponential control functions will provide a continually changing ratio of stick to servo to aircraft control surface movement. As the control stick is moved farther from center in the exponential mode, the control surface will begin to move farther and farther, increasing

proportionally to the amount of control stick movement. This provides less sensitivity near the center point of the control stick movement and greater sensitivity or control surface movement as the control stick moves farther and farther from the center or neutral position. This helps the aircraft to be flown in a smoother manner and lessens the skill required to perform certain maneuvers by either novice or expert modelers.



SERVO TRAVEL ADJUSTMENT

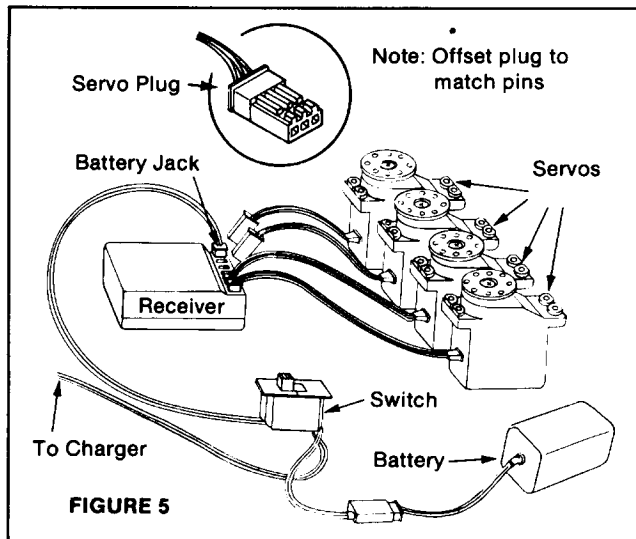
The two servo adjustment potentiometers are used to control the amount of either elevator or aileron movement. The throw adjustment can be turned so as to select anywhere from 20% to 100% of the normal servo movement. Turning the throw adjustments counterclockwise decreases the amount of control surface movement, when the linear/expo switches are in the expo position only.

TRAINER CABLE CONNECTION

The XL series also has the capability of being connected to another XL radio or Championship series radio by the use of the flight trainer connecting harness. This allows the expert-level modeler to assist the beginner in learning how to fly. After connecting the two radios together, the system is energized by the switch located near the top right of the transmitter housing. See instructions on page 16.

RECEIVER

After becoming completely familiar with all of the controls of the transmitter, inspect the airborne receiver. Note that the XL receivers incorporate plug-in crystals which allow convenient frequency changes. All the connections of the receiver are clearly labeled for your convenience. Use extreme care when making these connections as they are polarized and should be installed in one direction only. Never force the connectors in the reverse direction as the connector will be permanently damaged.



SERVOS

The servos supplied with your XL radio set have 23 fine splines on their output shaft, which allows easy and convenient placement of the control wheel or arm. This helps ease installation in your aircraft. Each servo also features rubber vibration isolation mounts at each mounting point.

WIRING HARNESS

An ON/OFF switch wiring harness is included, along with an external battery charging lead plus an extension cable for use

on the ailerons. You will find that the cables provided in this set and the length of each will be more than adequate for the majority of models available.

MOUNTING HARDWARE

An assortment of mounting hardware has been included along with a servo tray. Mounting screws, washers, and other necessary pieces are all provided. You should utilize these components to install your Airtronics radio as they have been designed to ensure the most reliable installation possible.



INSTALLATION INSTRUCTIONS

The following installation guidelines have been carefully developed through years of experience. We recommend that you follow them closely to avoid any problems with your radio installation.

The mounting techniques developed by Airtronics have been designed to not only secure the components in place inside the aircraft but more importantly to isolate them from the vibrations of the engine. Every effort should be taken by yourself to isolate the components from the vibration in the fuselage. You should ensure that the engine is smooth running and that the propeller is properly balanced.

You will also want to protect your radio equipment from the oil residue from the exhaust pipe of the engine. Both the

battery pack and the receiver should be carefully wrapped in a plastic bag or covering so as to moisture-proof it from the oil residue. The battery compartment and receiver compartment of your aircraft should be sealed as oil tight as possible.

SERVO MOUNTING

Whenever possible, use the servo mounting tray included in your Airtronics set to securely mount the servos in your aircraft. They are easy and convenient to use and provide the best protection for your servos.

The tray should be mounted on sturdy hardwood rails that are securely mounted to the airframe. As servo reversing is available on each control function, it does not matter which servo is selected for any of the functions. Each servo is held in place by four mounting screws. At each mounting point, rubber vibration isolators are used with a brass insert in them to prevent the rubber from being overly compressed. Be sure to use a washer under the head of each screw when fastening the servos to the tray.

If there is not room for the servo tray in the aircraft or the instructions call for a different servo mounting, then hardwood rails can be used in place of the servo tray. The servos should be fastened to the hardwood rails with the same rubber grommet brass insert, screw and washer. The screws require that a pilot hole of 1/16th of an inch be drilled so that the hardwood will not be split.

Servos should be positioned so they have at least a 1/16th inch clearance all the way around the servo so that it will not pick up vibrations from the airframe. After the servos are

securely in position, install either the arm or wheel to the servo output shaft. Be sure to tighten the retaining screw securely.

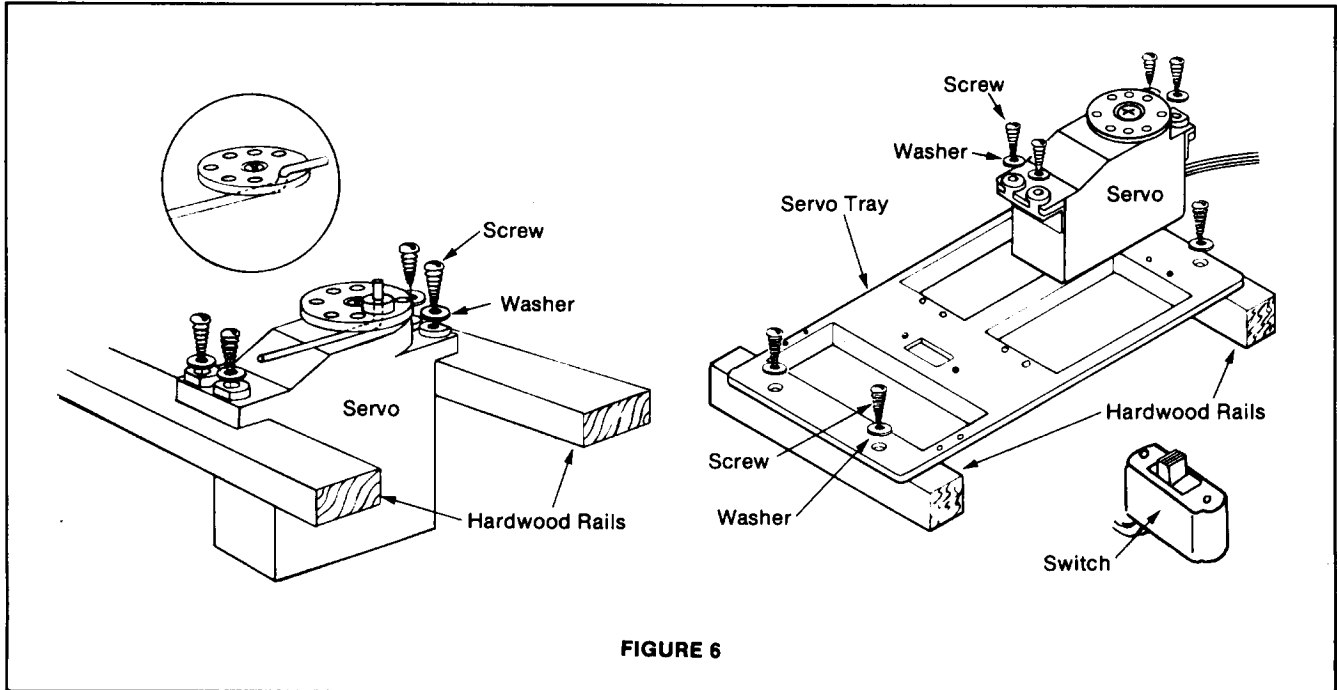
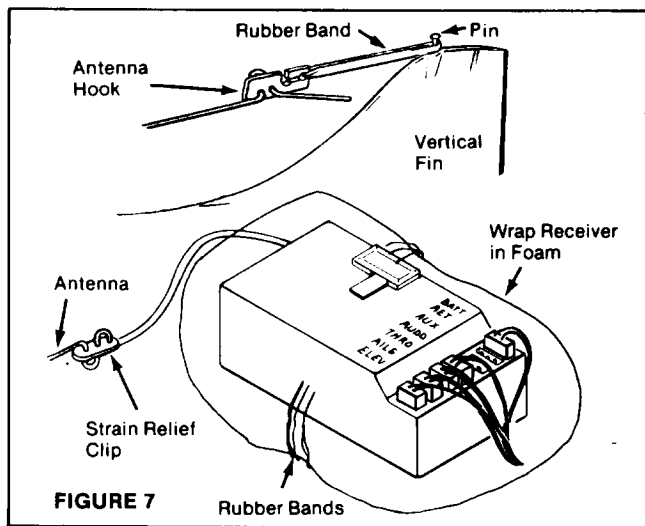


FIGURE 6

AIRBORNE RECEIVER INSTALLATION

The receiver should be located in the aircraft in as safe a position as possible. It should be sealed in a plastic bag for protection against oil residue and then wrapped lightly with at least 1/4 inch of soft foam rubber. The foam rubber should be held in place by small rubber bands. If space allows, an additional layer of dense, shock absorbant foam rubber can be placed loosely around the soft rubber. This will help protect the receiver in the case of a hard impact.



RECEIVER ANTENNA INSTALLATION

An antenna strain relief and antenna hook are provided. The strain relief should be installed on the antenna before the exit hole to maintain a small amount of slack between the receiver and antenna exit. The antenna hook is then used to fasten the end of the antenna to an attachment point, which is usually the vertical fin of the airplane.

REMEMBER

NEVER FOLD THE ANTENNA BACK UPON ITSELF AND ALSO NEVER CUT OR CHANGE THE ANTENNA LENGTH.

Either of these two conditions can cause loss of radio control. The antenna itself should be placed so that it is as far away from servo and power leads as possible. This helps to ensure that the best possible radio reception is achieved.

BATTERY PACK INSTALLATION

The battery pack must be protected against vibration the same as the radio receiver. First, seal the battery pack in a plastic bag and then wrap it with at least 1/4 inch of soft foam. If space permits, shock absorbant foam can also be wrapped around the battery pack for further protection. The battery pack should be placed in front of the receiver pack near the forward portion of the aircraft whenever possible. This will help prevent the battery pack from damaging the receiver in the event of a hard landing.

WIRING HARNESS INSTALLATION

The on/off switch should be mounted on the side of the aircraft away from the engine exhaust. Use the switch on/off plate as a guide for drilling the holes. Whenever possible, pick a location where the switch is convenient to get to but does not detract from the appearance of your aircraft. For convenience, the external battery charging connection can be located next to the on/off switch.



PRE-FLIGHT SYSTEM CHECK OUT

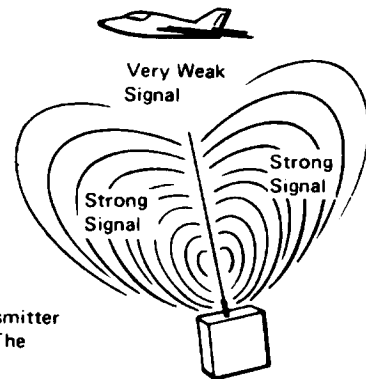
With all components properly installed in the airplane, turn the transmitter to the ON position and then the receiver to the ON position. Move the control sticks through the full range of their movement. Be sure that all the control surfaces move smoothly and do not bind. Also note that each control surface moves in the proper direction.

FIELD CHECK

At your flying site, the range of your radio must be checked to see how well it works in that vicinity. Position yourself directly behind the aircraft and then REMOVE THE ANTENNA COMPLETELY FROM YOUR RADIO TRANSMITTER. Turn the transmitter to the ON position and the receiver in your aircraft to the ON position. Move the rubber control from left to right in a continuous manner. Note whether or not the airplane responds promptly and smoothly. Slowly back away from the

aircraft until the rudder does not respond properly to the control movements of your transmitter stick. This is the limit of the radio range. If you are from 30 to 50 feet away from the aircraft, then the signal to your receiver is adequate. The second step is to start the engine of your plane and operate it at full throttle while a helper holds the plane on the ground. Repeat the same test and notice if the control surfaces operate at the same distance. If the distance has changes by more than 10 to 12 feet, then the vibration of the engine is effecting the reception of the radio. This problem should be corrected before you attempt to fly your airplane. If both checks prove satisfactory, you are now ready for your first flight. Reinstall your antenna.

FIGURE 8



Never Point The Transmitter
Antenna Directly At The
Model During Flight

REMEMBER

WHEN FLYING NEVER POINT THE ANTENNA DIRECTLY AT THE MODEL. THE SIGNAL IS TRANSMITTED FROM THE ANTENNA LENGTH NOT THE TIP. SEE FIGURE 8

FLYING SAFETY REVIEW

Remember that the transmitted radio frequency of your radio can "jam" the signal of any other model operating on that same frequency. Jamming of the radio signal will cause the other modeler's aircraft to go out of control, creating an unsafe situation for all spectators in the area.

Before flying your aircraft, carefully inspect the flying area for any possible hazards that could cause a loss of control. Make sure that spectators or other flyers in the area are well away from the normal flying and traffic patterns. If the flying area that you wish to use does not appear to provide the proper safety, then do not attempt to fly your model at that site. Seek out another area where the proper flying conditions exist.

NOVICE FLYERS

This manual explains in detail exactly how to operate your RC radio equipment. Even though you have read and understood these instructions fully, you should not attempt to fly your aircraft by yourself if you have not had some training in RC

flying. Learning to fly safely and proficiently requires several hours of training and practice.

USE OF TRAINER CABLE

To use the trainer function there are a few items that must be carefully checked.

First, plug the trainer cable into both transmitters. Remember the master transmitter must match the receiver in use. In the following instructions the master transmitter will be referred to as #1 and the student transmitter will be referred to as #2. Turn on #1 and note the position of the control surfaces. Push the trainer switch on #1. Transmitter #2 now has control. Check to be sure that the control surfaces move the same direction as #1. **NOTE THAT #2 POWER SWITCH IS ALWAYS OFF.**

Now that you have determined that all the controls move the same direction we can check the neutrals on #2. Turn the trainer switch on #1, on and off, and observe the neutral position on the airplane. Adjust the neutrals on the #2 transmitter until the controls do not move while turning the #1 trainer switch on and off.

You are now ready for flight. Again, remember that #2 power switch must remain in the **OFF** position.

Your instructor will be familiar with the above instructions so be sure to check with him when in doubt.



SOME OF THE IMPORTANT SAFETY RULES OF RC FLYING ARE AS FOLLOWS:

1. Do not operate your transmitter until you are quite certain that your frequency is not in use and is "clear."
2. Always fly at designated flying sites whenever possible.
3. Never fly directly over the heads of any spectators or other flyers at your flying area.
4. Always rely on an experienced flyer as a "back up" during your training period.
5. Inspect your radio equipment to make sure that it is operating properly before attempting any flights.
6. Do not attempt to fly in poor weather conditions. Strong winds are a prime cause of loss of control and damage to your aircraft.



F.A.A. (FEDERAL AVIATION ADMINISTRATION)

The F.A.A. recognizes that RC modelers are generally very concerned about flying safety and use good judgment whenever flying their model aircraft. They have issued safety standards of their own for the benefit of the novice flyer. The following F.A.A. safety standards should be followed whenever operating your RC aircraft:

1. Exercise vigilance for full scale aircraft (have other people help whenever possible) so as not to create a collision hazard.
2. Select an operating site a sufficient distance from populated areas to avoid creating a noise problem or a potential hazard.
3. Do not fly higher than 400 feet above the surface.
4. Do not operate closer than three miles from the boundary of an airport unless permitted to do so 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.
5. 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 the proposed operations.



EQUIPMENT MAINTENANCE

Very little maintenance is required of your Airtronics radio. To ensure the most reliable operation possible from your equipment, you will want to keep it clean and stored in a protected area when not in use.

We recommend that you store the transmitter in a plastic bag when not in use so as to avoid dust contamination problems. Always place your transmitter back in its protective bag.

especially at the field where it can be subjected to prop wash from other aircraft.

After each day of flying, you should carefully check all the connections and mounting screws of your radio equipment. No matter how securely you installed those items, eventually they may work loose. Periodic inspection by yourself can eliminate the possibility of aircraft damage.

CLEANING

To clean your RC equipment, use a soft cloth dampened slightly with a cleaning solution. Do not allow any excess moisture to remain in the cloth before using it on the components.

LONG-TERM STORAGE

If you wish to store your equipment for longer periods of time, such as over the winter, then the equipment should be removed from the aircraft and stored in the original factory package. You should charge the nicad batteries fully before storing the equipment. The batteries should be recharged at least every six months to protect them. All of your equipment should be stored within your home so that it is not subjected to freezing temperatures and moisture contamination.

FACTORY REPAIR SERVICE

Should you need repair service for your Airtronics radio system, we strongly urge you to return your system directly to us. We have an expert staff of trained technicians that can professionally and quickly return your radio to service.

To return your equipment for service, please carefully follow these instructions.

1. Return the entire system to Airtronics unless the problem is limited to individual servos. Whenever possible, use the original factory shipping carton to protect your radio set.
2. Do not return any portions of your model with your radio equipment. Remove the radio equipment from your model completely.
3. Make sure that your nicad batteries in both the transmitter and the airborne pack are fully charged before you package your equipment. By returning the set to us with fully recharged batteries, it will minimize the time it takes to repair your set.
4. Make sure that all ON/OFF switches are in the OFF position. Be sure to disconnect the receiver battery pack as an extra precaution.
5. Please include a complete description of the problems that you have encountered. Be sure to include the following information on your written set of instructions.
 - a. The serial number on the bottom of the transmitter
 - b. A packing list of all items that you have returned to us.
 - c. Your explanation of the problem
 - d. Your full name, mailing address (including your zip code)
6. Please date your letter and mark or package your letter attention:

Global Services
18480 Bandilier Circle
Fountain Valley, CA 92708