



## **T-80RF**

### **4-channel microcomputer FM radio control transmitter User's guide**

**Note: Read this manual carefully before operating this product.**

FMA, Inc.  
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**FMA**  
**Direct**

## Introduction

Thank you for purchasing the FMA Direct T-80RF radio control transmitter. This unit provides narrowband FM output with PPM encoding for radio controlled aircraft and surface craft (boats, cars and hovercraft). The transmitter operates on any 72MHz RC aircraft channel (11 through 60) or 75MHz surface channel (61 through 90) when equipped with an appropriate crystal. It offers user-selectable positive or negative shift, enabling it to work with any 72MHz PPM receiver on the same channel. The T-80RF uses the latest microprocessor technology to control every function of the radio and provide such features as servo reversing on all channels, tri-rates and elevon/V-tail mixing.

This manual provides information for setting up and using the T-80RF transmitter. Please read it carefully before using the transmitter. The manual contains sections covering:

- Safety precautions
- Other radio components you'll need
- Identifying transmitter components
- Installing the antenna
- Powering the transmitter
- Setting up the radio system
- Conducting a radio system preflight check
- Troubleshooting

## T-80RF features

- **Frequency selection.** The T-80RF can transmit on any one of the fifty 72MHz or 75 MHz channels (11 through 90) allocated for radio controlled aircraft. One crystal is provided for the channel you selected when you purchased the transmitter. (According to F.C.C regulations, you cannot change the crystal in your transmitter unless you are a valid holder of an F.C.C. Second Class or First Class Operator's License.)
- **Mixing.** The T-80RF can be set to mix elevator and aileron controls for use with aircraft incorporating elevons (for example, flying wings) or V-tails. (For best results, center control surfaces mechanically after trimming in flight.)
- **Servo reversing.** Switches conveniently located on the front panel change the direction of servo rotation. This enables you to install servos and linkages in the best mechanical configuration, then simply change a switch to obtain the correct direction of motion.
- **Tri-rates.** Tri-rates, set by a switch on the front of the transmitter, desensitize controls while you are learning to fly (beginners tend to over-control). The T-80RF provides 50% and 75% throws (in addition to the full 100% throw) simultaneously on the aileron, elevator and rudder channels. The T80RF is particularly useful for reducing the throw on small aircraft using short control horns.
- **Trims.** Each of the four channels has a trim adjustment to compensate for variations in the model and local flying conditions.
- **Battery indicator.** Transmitter battery status is displayed when the transmitter is on, enabling you to check for safe battery power level at a glance.
- **Selectable frequency shift.** The T-80RF can be used with any narrowband FM PPM receiver you already own.
- **Ergonomic design.** Ribbed case and concave stick tips give you a solid grip on the transmitter and controls, allowing you focus on smooth and safe operation of your model. Recessed power switch helps prevent accidental shut-off.

## T-80RF specifications

Function	4-channel computer-controlled FM radio control transmitter
Size	6.75" wide x 2.6" deep x 6.25" high (including handle, not including antenna)
Weight	15.6 oz. (without batteries)
Frequencies	All U.S. 72 and 75 MHz radio controlled aircraft frequencies: Channel 11 through Channel 90
Power	8 AA alkaline batteries or optional 8-cell, 600 milliamp NiCad battery pack
Current drain	185 milliamps
RF output power	400 milliwatts
Encoding	PPM (universal, selectable positive or negative shift)
Operating pulse width	1.0 milliseconds to 2.0 milliseconds (1.5 milliseconds neutral) on each channel
F.C.C. ID	KH8-RFD1

## Safety precautions

Radio controlled models are not toys! Please observe these safety precautions:

- Follow all instructions in this manual to assure safe operation.
- If you have not assembled and operated a radio controlled model before, obtain help from an experienced modeler. You will need guidance to successfully assemble, test and operate radio controlled models. One of the best ways to obtain help is to join your local radio control club.
- Never fly radio controlled airplanes near people, buildings, telephone or power lines, cars, trees or other objects on the ground or in the air.
- Keep your radio controlled models and equipment away from children. Do not allow unauthorized people of any age to operate radio controlled models without proper supervision from an experienced modeler.
- In some areas of the country, you cannot legally operate radio controlled models except at approved fields. Check with local authorities first.
- Observe frequency control. If someone else is operating a radio controlled model on the same channel as your transmitter, **do not turn on your transmitter—even for a short time.** Your transmitter's channel number is marked on the crystal cover (see next page). When a model receives signals from two transmitters on the same channel at the same time, it cannot be controlled and will crash—possibly causing personal injury or property damage. **For safety, most RC flying fields have formal frequency control rules. Follow them carefully.**
- Do not operate your radio control transmitter within 3 miles of a flying field. Even at a distance, your transmitter can cause interference.
- Do not operate radio controlled models and equipment in the rain, or at night.
- Protect all electronic equipment from exposure to rain, water, high humidity and high temperatures.
- Discard batteries in accordance with local waste disposal and recycling regulations.
- FMA Direct recommends that you join the AMA. They can help you find a club in your area.

Academy of Model Aeronautics  
5161 East Memorial Drive  
Muncie, Indiana 47302

Phone: (800) 435-9262  
Web: [www.modelaircraft.org](http://www.modelaircraft.org)

## Other radio components you'll need

Besides the T-80RF transmitter, you'll need:

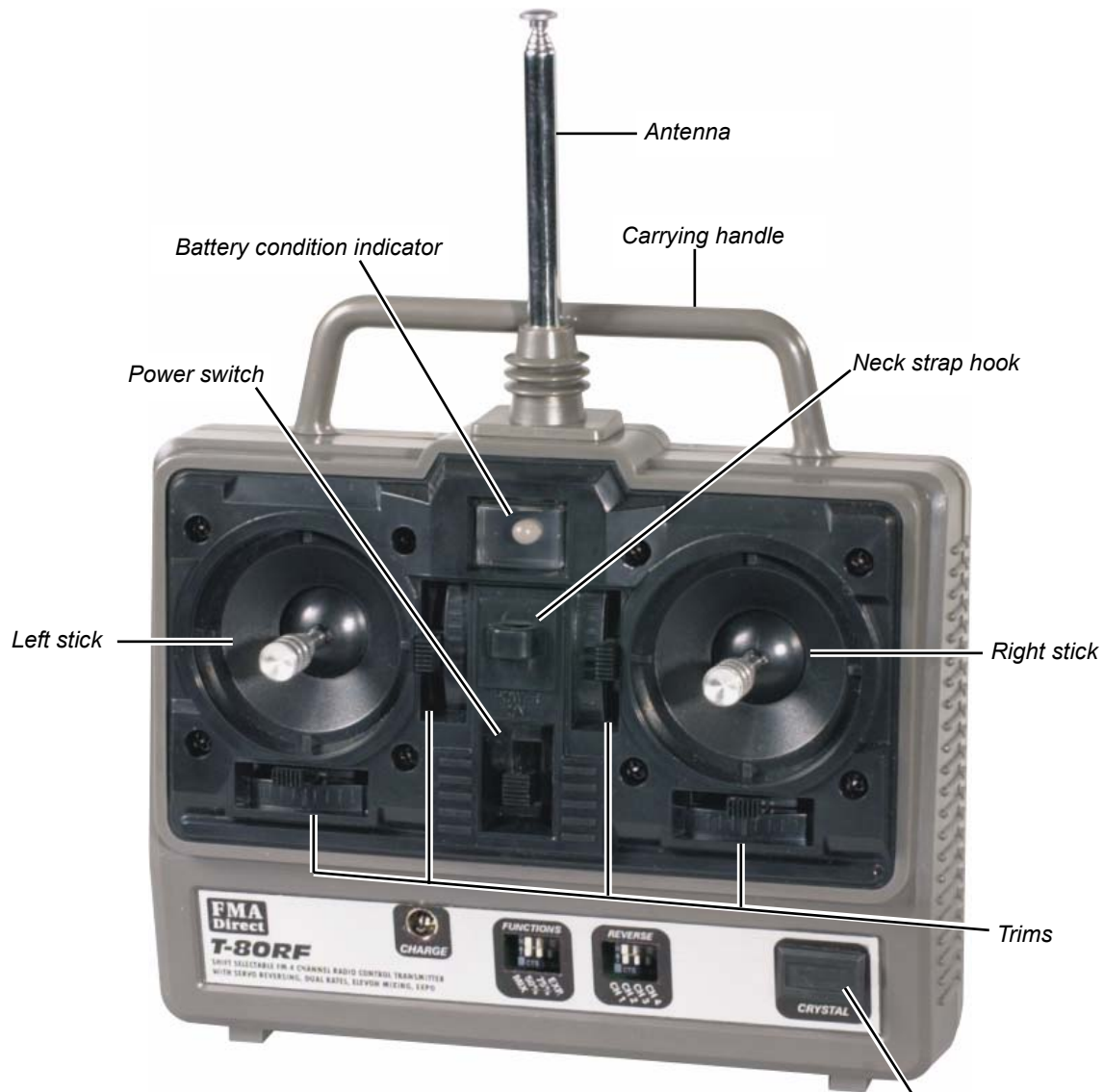
- Receiver, operating on the same radio control channel as the transmitter.
- Switch harness.
- Servos for moving aircraft control surfaces.
- Optional extension cable for connecting aileron servo to receiver.
- For an engine-powered aircraft: additional servo (for controlling engine speed), and battery pack to supply power to receiver and servos.
- For an electric motor-powered aircraft: electronic speed control (for controlling electric motor speed and supplying power to receiver and servos).

**Tip:** FMA Direct carries a full line of compatible receivers, servos, electronic speed controls, battery packs, chargers and related flight equipment.

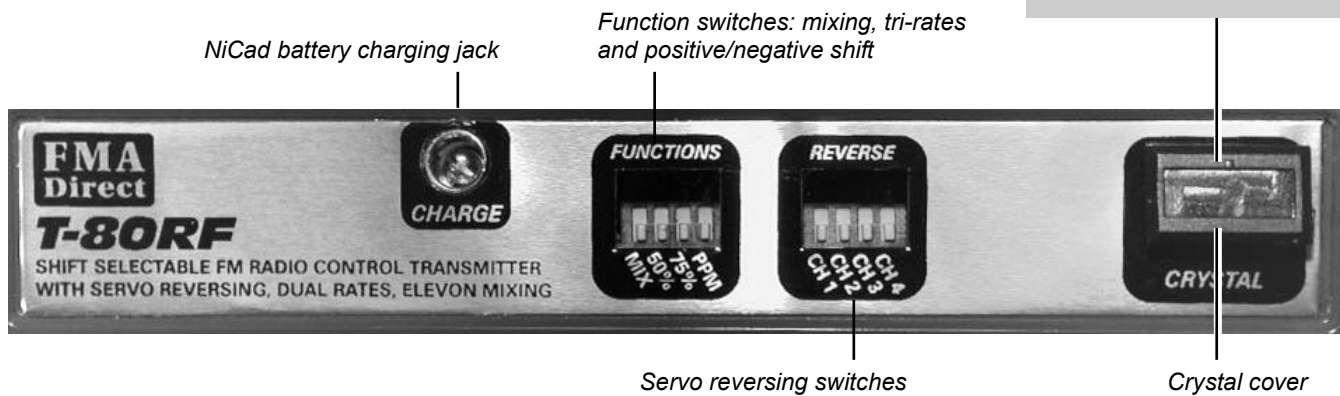
## Installing the antenna

1. Locate the end of the antenna having the threaded hole.
2. Gently slide that end of the antenna into the antenna hole in the top of the transmitter, until the antenna can't be slid in any farther (don't force it).
3. Gently rotate the antenna clockwise (as seen from the top). Stop rotating when the antenna is secure.

# Identifying transmitter components



**Note:** Look here for your transmitter's channel number



## Powering the transmitter

The T-80RF can be powered either by alkaline batteries or by an optional rechargeable NiCad battery pack. You selected the type of power when you purchased the transmitter. Follow the instructions on this page for your power system.

### Installing alkaline batteries

1. Remove the battery cover: push inward on the cover where it is marked “Push,” then slide the cover toward the bottom of the transmitter.
2. Install 8 fresh AA alkaline cells according to the polarity markings in the battery compartment.
3. Replace the battery cover: position the cover over the battery chamber, insert the cover tabs into the slots in the transmitter body, then slide the cover toward the top of the transmitter.

**Tip:** Alkaline batteries should last for about 10 hours of operation. Take an extra set to the flying field, in case the set in the transmitter becomes unusable.

### Determining battery condition

**CAUTION:** If you are at or near a flying field, observe frequency control rules and comply with local procedures before turning on your transmitter. When the transmitter is on—even for a few seconds, it is radiating radio frequencies which may interfere with a radio system already operating on the same frequency.

1. Turn the T-80RF on by sliding the power switch to the up position.
2. Observe the battery condition indicator light (just above the power switch):

Green	Transmitter is ready for use.
Yellow	Batteries are approaching a depleted state. Avoid using the transmitter until batteries have been replaced or recharged.
Red	Batteries are depleted, and must be replaced or recharged before you can use the transmitter.
No color	Batteries are dead, and must be replaced or recharged before you can use the transmitter.

3. Turn the T-80RF off by sliding the power switch to the down position.

**Note:** Check the battery indicator periodically during each session. If you are flying an airplane and the battery indicator turns red, land the plane immediately.

### Using the optional NiCad batteries

If you ordered the NiCad battery option, the battery pack was installed at the factory and you do not need to install it. However, you must charge the battery pack for 24 hours before using the transmitter for the first time. Charge the battery pack using the included charger.

#### Charging the NiCad batteries

1. Turn off the T-80RF by sliding its power switch to the down position.

**Note:** You cannot charge the T-80RF NiCad battery pack if the transmitter is on.

2. Connect the charger’s transmitter connector to the **Charge** jack on the front of the T-80RF.
3. If you also need to charge a receiver battery pack, connect the charger’s receiver connector to the pack.
4. Plug the charger into a standard 120VAC wall outlet. If the batteries are properly connected and charging, the charger’s corresponding indicator light will glow.
5. Before first use, charge the batteries for 24 hours. Then, before each flying session, charge the batteries for 10 to 12 hours.

**Tip:** After initial battery charging, a field charger can recharge transmitter, receiver and/or flight pack NiCad batteries in as little as 20 minutes from a 12 volt storage or automobile battery. This is convenient when you need to charge batteries and there isn’t a 120VAC outlet nearby to supply power for a wall plug-in type charger. The FMA Direct catalog lists several peak-detecting field chargers (or visit [www.fmadirect.com](http://www.fmadirect.com) on the Web). Please read and follow the instructions that come with your field charger before fast-charging any battery pack.

#### Caring for NiCad batteries

NiCad batteries, if properly maintained, will provide long life. About once per month, you should fully discharge NiCad batteries, then fully charge them. This helps prevent NiCad “memory” effects, which can lead to lower capacity and false indications of proper charge level.

**Tip:** FMA Direct offers battery management systems that help keep batteries in top condition.

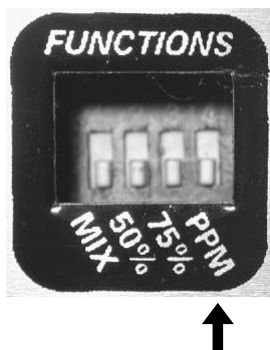
**Note:** The NiCad battery pack is permanently installed in the T-80RF. If it needs to be replaced, please return the T-80RF to an FMA service center.

# Setting up the radio system

## A. Set transmitter frequency shift.

The T-80RF works with any narrowband FM receiver with PPM decoding. You must, however, set the transmitter's frequency shift to match the receiver you will be using. Check the receiver's specifications to determine whether it uses positive or negative shift. Universal receivers can be set to either positive or negative shift, so check the receiver to determine its configuration.

1. Locate the **PPM** switch in the **Functions** section on the T-80RF front panel.



2. Set the switch as follows:

For a...	such as...	move switch...
Negative shift receiver	FMA, Futaba, Hitec and most others	Down (off)
Positive shift receiver	JR, Airtronics/Sanwa	Up (on)

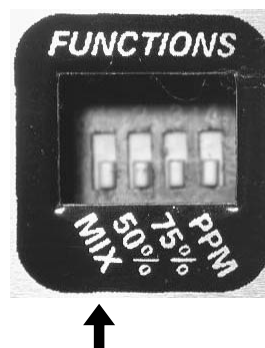
**CAUTION:** Be sure to check and, if necessary, change the **PPM** frequency shift setting when using a different receiver.

## B. Set mixing.

If your airplane is equipped with elevons or a V-tail, you'll need to activate mixing. If your plane has conventional controls (ailerons, elevator, rudder), mixing must be off.

**Note:** If your flying wing or V-tail aircraft is equipped with an electronic mixer, set T-80RF mixing to off.

1. Locate the **Mix** switch in the **Functions** section on the T-80RF front panel.



2. Using a very small flat-blade screwdriver, set the **Mix** switch as follows:

For...	set Mix switch...
Conventional controls (ailerons, elevator, rudder) or electronic mixer in aircraft	Down (off)
Elevons or V-tail	Up (on)

**CAUTION:** Be sure to check and, if necessary, change the **Mix** switch when you use the transmitter with a aircraft having a different control configuration.

## About mixing

The T-80RF has 50-50 bi-directional mixing between the elevator and aileron channels. For each degree of elevator motion, the aileron channel moves an equal amount. And for each degree of aileron motion, the elevator moves an equal amount. In the model, two servos move the elevons or V-tail surfaces. With this kind of control configuration, the servos are called the right servo and left servo (instead of aileron servo and elevator servo).

With mixing, when you move the transmitter's elevator stick, the control surfaces move to make the airplane go up or down. When you move the transmitter's aileron stick, the control surfaces move to make the airplane yaw/roll left or right.

**Tip:** Mixing frees the rudder channel for another function. You could, for example, use the rudder channel for flaps, retracts, to drop a parachute or push the shutter button of an on-board camera.

**C. Set the control throws.**

*Control throw* refers to how far an airplane’s control surfaces move in response to the maximum movement of the corresponding control stick on the transmitter. You must set control throws with the T-80RF’s tri-rate at 100%.

**CAUTION:** If you are at or near a flying field, observe frequency control rules and comply with local procedures before turning on your transmitter. When the transmitter is on—even for a few seconds, it is radiating radio frequencies which may interfere with a radio system already operating on the same frequency.

1. Install the servos, linkages, receiver, switch harness and receiver battery in the aircraft according to instructions supplied with those items. (If you purchased an FMA flight pack, refer to the manual supplied with it.)
2. Be sure the servos are connected to the receiver as follows:

Connect this servo...	to this FMA receiver* channel...
Elevator	1
Aileron	2
Throttle or speed control	3
Rudder	4

\*If used with receivers from other manufacturers, channel order may be different. Check your receiver’s manual for channel assignments. If you aren’t sure about channel assignments: a) plug one servo into one receiver channel, and move the transmitter sticks to determine which stick is associated with that channel, then b) move the servo to other channels and repeat.

3. Locate the **50%** and **75%** switches in the **Functions** section on the T-80RF front panel.
4. Using a very small flat-blade screwdriver, move the **50%** and **75%** switches to the down (off) position. This sets the tri-rate feature to **100%** so you can initially set up the control surfaces.
5. Set all four transmitter trims to their centered positions.

6. Turn on the transmitter, then turn on the receiver.
7. With the transmitter control sticks centered, make sure that the control surfaces are in their neutral positions. If a control is offset from neutral, adjust the appropriate linkage.

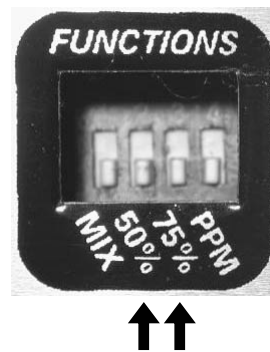
**Note:** At this point, don’t use the transmitter trims to set control surfaces to their neutral positions—make only mechanical adjustments in the linkages. This assures that the servos and their corresponding control surfaces are in their neutral positions at the same time.

8. Set each control surface to the amount of travel recommended by the airplane’s manufacturer. Do this by changing the location of the clevis in the servo arm and/or control horn holes.

*Example:* If the manufacturer specifies a 1/2" control throw for the elevator, then the elevator trailing edge should move 1/2" up or down from its neutral position when you move the transmitter’s elevator stick all the way up or all the way down.

9. Using the table below, set the tri-rate to match your skill level. If you are a beginner, ask your instructor for advice (the instructor may want to test the aircraft at 100%, then select a different setting before letting you control the

For this skill level...	set 50% switch...	and set 75% switch...
Beginner (50% rate)	Up (on)	Down (off)
Intermediate (75% rate)	Down (off)	Up (on)
Advanced (100% rate)	Down (off)	Down (off)



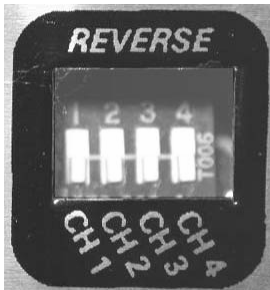
**Note:** The 50% and 75% tri-rates simultaneously desensitize the aileron, elevator and rudder controls.

### D. Set control throw directions (servo reversing).

You must assure that the aircraft's control surfaces and throttle move in the correct directions. If they move in the incorrect directions, you will not be able to control your airplane.

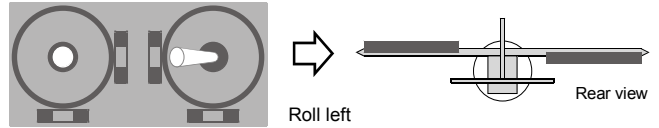
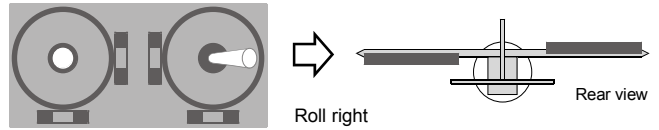
**CAUTION:** If you are at or near a flying field, observe frequency control rules and comply with local procedures before turning on your transmitter. When the transmitter is on—even for a few seconds, it is radiating radio frequencies which may interfere with a radio system already operating on the same frequency.

1. Turn on the transmitter, then turn on the receiver.
2. Move each control stick on the transmitter, and compare the airplane's control surfaces and throttle with the pictures on this page and the next page (depending on your airplane's configuration).
3. If a surface or the throttle moves in the wrong direction, use a small flat-blade screwdriver to change the position of the corresponding channel switch in the **Reverse** section of the transmitter's front panel. Check control movement again.

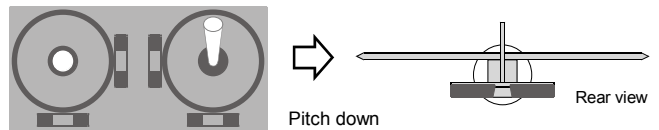
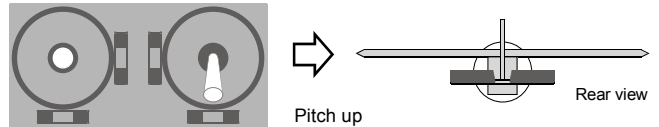


### Conventional controls

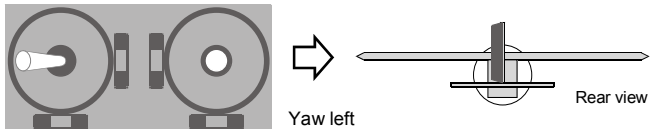
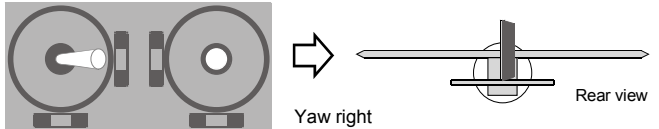
#### Roll control (aileron, channel 2\*)



#### Pitch control (elevator, channel 1\*)



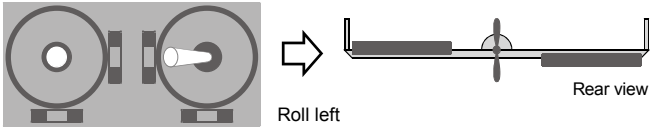
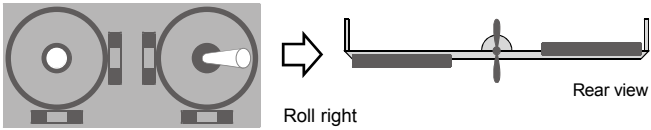
#### Yaw control (rudder, channel 4\*)



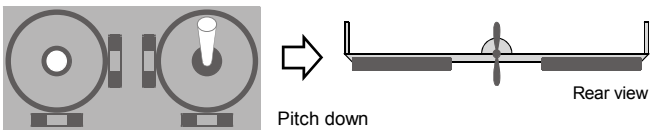
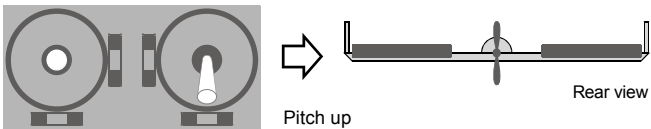


### Elevon controls

#### Roll control (channel 2\*)

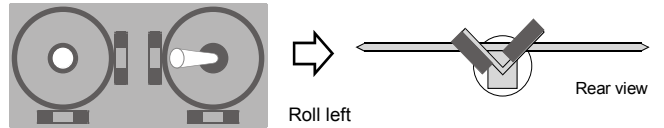
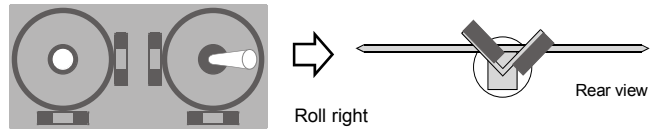


#### Pitch control (channel 1\*)

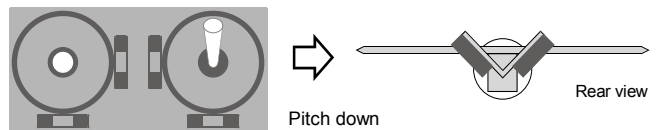
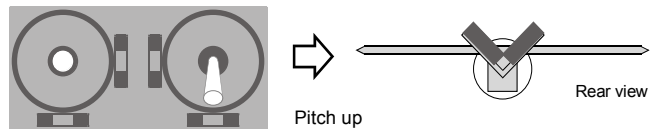


### V-tail controls

#### Roll control (channel 2\*)



#### Pitch control (channel 1\*)

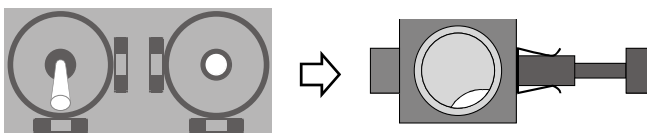


**\*Note:** Channels assignments are for the T-80RF and correspond to the servo reversing switches.

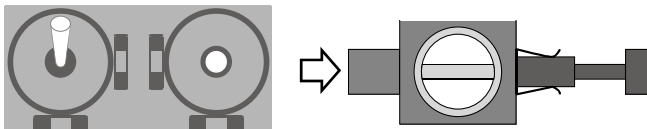
**Note:** Stick movements and control throws shown on these pages are exaggerated for clarity. Normal flying requires only small stick movements.

### Throttle control (channel 3\*)

#### Idle



#### Full speed



## Conducting a radio system preflight check

Before starting and flying any aircraft, you should perform a thorough preflight check of the propeller, engine/motor, airframe, control surfaces, linkages and many other parts. Details are beyond the scope of this manual, but the steps below cover typical radio system check-out.

1. Check receiver battery voltage with an extended range voltmeter. (A standard voltmeter isn't effective for checking receiver batteries. An extended range voltmeter applies a load, which simulates typical use conditions for more accurate measurement of battery voltage.)
2. Assure servos, switch harness and receiver battery are securely connected.
3. Assure receiver antenna is deployed.
4. Assure transmitter antenna is secure. Tighten if necessary.
5. Extend transmitter antenna to its full length.
6. Check transmitter battery condition: turn on the transmitter and observe the battery indicator above the power switch. If it is green, the transmitter is ready to use.

**CAUTION:** If you are at or near a flying field, observe frequency control rules and comply with local procedures before turning on your transmitter. When the transmitter is on—even for a few seconds, it is radiating radio frequencies which may interfere with a radio system already operating on the same frequency.

Many "shootdowns" occur during pre-flight checks. You must coordinate with other flyers so that two transmitters are *never* transmitting on the same channel at the same time.

7. Check tri-rate switches to assure they are set to match your skill level.
8. Turn on receiver.
9. Check for proper control directions: move all four transmitter sticks—one at a time—and observe the corresponding control surfaces and throttle. Change servo reversing and/or mixing settings as needed.
10. Assure control linkages move freely. Correct any linkage binding. (Binding linkages can rapidly deplete the receiver battery.)
11. Perform a range check to assure the airplane can be safely controlled by the transmitter at a distance. (If you don't know how to perform a range check, ask your instructor or get help from an experienced modeler. FMA flight pack manuals contain range check distances.)

After starting the engine *and before taking off*, check the controls again. Engine vibration may reveal loose connections or other radio system problems. If the radio system doesn't perform perfectly, stop the engine and correct any problems.

## About FMA

FMA, Inc. has been designing innovative radio control electronics for more than 30 years. FMA designs are known for their high quality and reliable performance. Since 1994, FMA Direct has assembled an impressive line of more than 300 radio control products available through dealers and directly from the company, backed up by solid customer support. Please visit the FMA Web site ([www.fmadirect.com](http://www.fmadirect.com)) for the latest information about our products.

Products available from FMA Direct include:

- Dual conversion receivers: 4, 5, 6 and 8 channels; sub-micro, micro and standard sizes; 72MHz, 75MHz and 6 meters.
- Servos: micro, mini, standard and high torque.
- Flight packs: including receiver, servos and battery pack or speed control.
- Electronic speed controls: for RC cars, airplanes and boats.
- Electric motors and propulsion systems.
- Field chargers and battery management systems.
- Electric airplanes: including the Razor flying wing.
- Battery packs: for receivers, transmitters and electric flight.
- And many other radio control components and accessories.

## Transmitter troubleshooting

Symptom	Possible cause
Battery indicator doesn't light up.	Batteries are dead.
Controls chatter during range check.	Transmitter antenna is loose. Transmitter battery doesn't have enough power. Receiver battery doesn't have enough power. Servo or battery connectors not securely connected to receiver.
Control operates wrong direction.	Servo reversing switch is set incorrectly.
Aileron control moves both ailerons and elevator. Elevator control moves both elevator and ailerons.	Mixing for elevon/V-tail is activated, but model has conventional controls.
Unexpected or uncommanded control excursions.	Someone else is transmitting on the same frequency. <b>Do not fly until the frequency is clear.</b>
Battery charger connected and plugged in, but not charging.	Transmitter is on.

## FMA limited warranty on transmitter products

### Warranty

FMA, Inc. warrants this product to be free of manufacturing defects for the term of one year from the date of purchase. Should any defects covered by this warranty occur, the transmitter shall be repaired or replaced with a unit of equal performance by FMA, Inc. or an authorized FMA service station.

### Limits and exclusions

This warranty may be enforced only by the original purchaser, who uses this product in its original condition as purchased, in strict accordance with the product's instructions. Units returned for warranty service to an FMA service center will be accepted for service when shipped postpaid, with a copy of the original sales receipt or warranty registration form, to the service station designated by FMA, Inc.

This warranty does not apply to:

- Consequential or incidental losses resulting from the use of this product.
- Damage resulting from accident, crashes, misuse, abuse, neglect, electrical surges, reversed polarity on connectors, lightning or other acts of God.
- Damage from failure to follow instructions supplied with the product.
- Damage occurring during shipment of the product either to the customer or from the customer for service (claims must be presented to the carrier).
- Damage resulting from repair, adjustment, or any alteration of the product by anyone other than an authorized FMA technician.
- Installation or removal charges, or damage caused by improper installation or removal.

Call (301) 668-7614 for more information about service and warranty repairs.

