



# HFX900 R/C System

HFX900 manual v0.8 Draft

*Congratulations on your purchase of the HFX900 R/C System. These instructions cover the use of the HFX900 transmitter; Micro900 (Micro9) series receivers, and LP90 Bahoma cell and charger.*

*There are several types of 900Mhz receivers available for the HFX900 Transmitter. For this version of the instructions manual, we have 2 types of receivers, a 0.9 gram Micro900 (also known as Micro9 receiver) receiver and a 0.38 gram Micro900 receiver.*

*The 0.9 gram receiver is the heavier receiver model and it is the easiest to set up. It has microconnectors for connecting motor, and 2 actuators, and magnetic "Bahoma" battery terminals.*

*The lower weight models save weight by elimination of these microconnector parts. To use the 0.38 gram receiver soldering fine wires to small PCB pads is required. If you have no experience in Micro R/C or soldering, the Micro900 0.9 gram receiver - will make it easy for you to build up an airplane without any need to do small surface mount soldering.*

*The HFX900 transmitter has a few extra features built-in - you can use your transmitter with the included Freeware FMS flight simulator and learn to fly on your PC! Lithium Polymer airplane cells can be charged and stored right on the transmitter with*

*Plantraco's patent pending Bahoma magnetic battery connector. State-of-the-Art Pure Digital 900Mhz RF link means solid radio control, no more long antennas, and you'll have plenty of radio range for indoor and outdoor Micro R/C flying.*

## FINE PRINT

Battery discharging, charging, electric motors, spinning propellers, and flying models all have the potential for serious injury to persons and damage to property. In purchasing these products, the user agrees to accept responsibility for all such risks, and not to hold the manufacturer, distributors, or retailers responsible for any accident, injury to persons, or damage to property.

## PRODUCTS COVERED IN THIS INSTRUCTION MANUAL

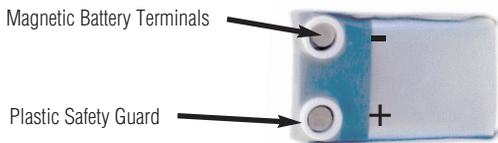
- HFX900 (HFX868 in Europe) Proportional R/C Transmitter/Charger "R/C Air Model 1" - Centering Throttle or Non Centering Throttle (900Mhz-USA, 868Mhz-Europe)
- Micro900 0.9 Gram Receiver
- Micro900 0.38 Gram Receiver
- FMS Flight Simulator Interface Cable and FMS Software CDR0M with Computer Models of the Plantraco MicroScout and (soon) Butterfly (FMS is a freeware R/C Flight Simulator - bundled with permission from the author - you can also download it and all the Plantraco FMS flight sim model files from links at: <http://www.plantraco.com/FMS.html>)
- LP90 - 90mAh Lithium Polymer Bahoma Cell

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**Fig. 1.** Bahoma Battery Connector (patent pending)

## GETTING STARTED

### Add Batteries to Transmitter (See Fig. 2.5)

Remove the rectangular battery cover from the back of the Transmitter. Insert 4 "AA" Alkaline batteries taking note of proper polarity of positive and negative contacts (Negative end of the battery should make contact with the "spring").

### Charge Lithium Polymer Rechargeable "Bahoma" Cell

The included lithium polymer cell features Plantraco's Bahoma (**BA**ttery **H**older using **MA**gnets) connector (patent pending). The Bahoma connector system uses strong plated magnets to hold the battery onto the charger and onto the Micro900 receiver. These magnets are also used as electrical conductors. The terminals of the Bahoma cell are protected from shorting to each other by a plastic safety guard. (See Fig. 1)

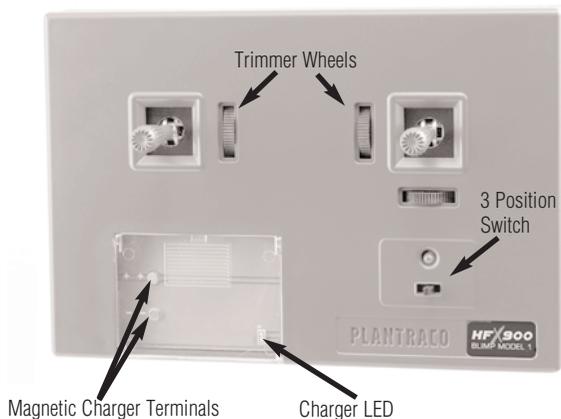
On the front of the transmitter, slide the 3 position switch to the middle position to put the transmitter into its "Charge" mode. The LED inside the charger door will be blinking rapidly. Slide the hinged clear polycarbonate plastic charger door downwards to unlock it, and then lift it open. Attach the Bahoma cell to the corresponding magnetic terminals. The Bahoma cell will "click" into place on the charger by magnetic attraction and with good electrical contact. The LED inside the charger will now glow brightly. Close the clear charger door, and slide it up to shut it with a small click. Your cell is now charging, and when the bright LED goes out, the cell is fully charged and ready for use. Charge time is about 60 minutes typically. The charger is set to charge at 78mA. (See Fig. 2)

### Important Notes about Lithium Polymer Batteries

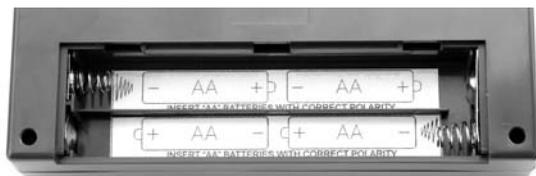
The lithium polymer rechargeable battery should not be used if it has become swollen or has been physically damaged, crumpled, or cut. Always use the supplied charger built into the transmitter. Always charge the LP90 cell with the clear charger door closed. The supplied lithium polymer cell can provide you with many discharge cycles when used properly, but eventually it will require replacement. Replacement cells are available from your dealer or from Plantraco directly at [www.plantraco.com](http://www.plantraco.com). Always dispose of used or damaged batteries appropriately.

If you need to dispose of a damaged Lithium Polymer cell, you can make a solution of about 2 cups of water and 1 cup of table salt in a disposable container outdoors. Put the damaged cell in this concentrated salt water solution and leave it outside overnight. The damaged cell may then be disposed of in the garbage safely.

Replacement cells are always available from your dealer or from the plantraco website [www.plantraco.com](http://www.plantraco.com)



**Fig. 2.** HFX900 Transmitter with Built-In Charger.



**Fig. 2.5.** Insert "AA" Batteries with Correct Polarity

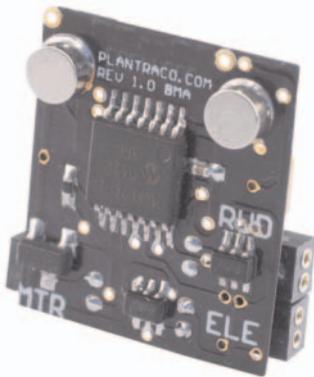
# RECEIVERS

This version of the instruction manual only covers the 0.38 gram and 0.9 gram 3 channel Micro900 Receivers. The 0.9 gram receiver is intended to be easy to use, and the 0.38 gram model has been produced on thinner PCB material and without magnets and microconnectors - resulting in a good weight savings. Most of this manual will apply to both of these receivers, but there are always a few exceptions. Lower weight receivers and other receiver variations are in the works.

Note that **all** Plantraco Micro900 receivers can sync to the HFX900 (American model) **AND** HFX868 (European) transmitters.

## Micro900 0.9 Gram Receiver

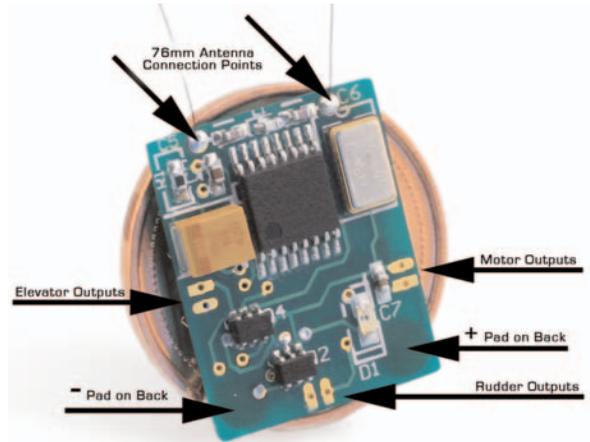
This small circuit board receiver has microconnector outputs for 1 motor and 2 magnet actuators. 2 magnetic battery terminals (Bahoma -spaced 10mm apart). 2 short wire on the top side of the receiver are the dipole antenna. The receiver can report status to the user by use of an LED indicator light, and also by making high frequency tones emitted through the magnetic actuator itself. You will find these audible tones useful - they can tell you if you have successfully started your receiver, synced to your transmitter, and what frequency you have synced to.



**Fig. 3** Micro900 0.9 gram receiver with Bahoma and microconnectors - easy to configure!

## Micro900 0.38 Gram Receiver

This older, but lower weight receiver version has outputs for 1 motor and 2 magnet actuators. The software on this receiver uses PFM instead of PWM for control of actuators. This should result in the same power to the actuator, but is easier on small batteries, and has the unusual side effect of making unusual robot sounds from the actuators.



**Fig. 4** Micro900 0.38 gram receiver. This one has no Bahoma Magnets, or connectors.

## Low Battery Protection - built in failsafe.

The Lithium Polymer Bahoma battery should not be discharged lower than about 2.7 Volts. The low battery failsafe function of the Micro900 receiver will ensure that you do not over discharge your lithium polymer battery. It will warn you when your battery is low and needs to be recharged by cutting the throttle to 60% when cell voltage is getting low. You can continue to fly if you wish - the attenuated throttle usually allows the lithium cell voltage to rise, so maybe you can still fly for a little bit longer. When the cell voltage drops even lower, the throttle will then be cut to 30% and you will most certainly have to land your model.

The receiver measures cell voltage while you are flying, and the LED will blink a series of flashes to indicate the general state of the battery voltage. You won't notice this when you are flying, but this functionality is built in if you want to do some bench testing etc. If you leave the battery on the receiver for too long (like overnight) you may over discharge and damage the cell - so be sure to disconnect it and recharge when you are done

## Multi-Frequency Operation

This 900MHz R/C System (868MHz in EU), can be configured for use on one of 3 radio frequencies “channels”. You select your channel when you switch on your transmitter. The position of the Left joystick at startup controls what channel you will use. When you startup the Transmitter, you can hold the Left stick to the Left, leave it in the middle (default), or hold it to the Right, to configure operation on Channels 1, 2 and 3 respectively. Default is Channel 2 (left stick is in the middle position). (The European frequencies are designated as numbers 4, 5 and 6 respectively, and are accessed in exactly the same way) The American version of the HFX900 transmitter is capable of transmitting on CH 1, 2 and 3 ONLY. The HFX868 transmitter is capable of transmitting on CH 4, 5 and 6 ONLY. **(See Fig.5)**

When selecting a Channel on startup, you can hold the Left joystick in a position for about 2 seconds and let it spring back to center when you are ready to transmit. Channel 2 is the default channel because the Left joystick is a self centering joystick, so this channel is always selected by default if you switch on the transmitter without holding the Left joystick in any particular position. If you are flying alone, you will probably be transmitting on channel 2 (CH 2) most of the time.

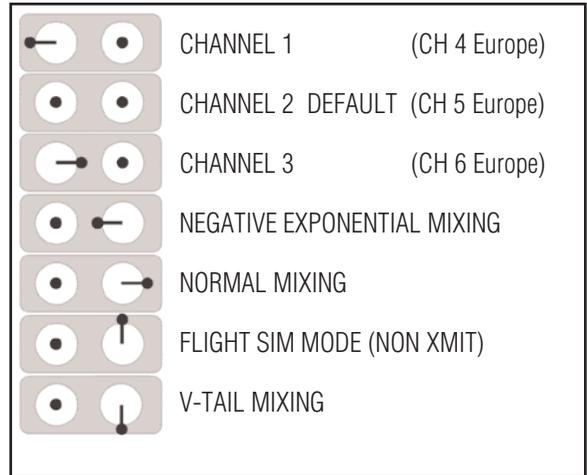
The receiver will look for the lowest channel number first and will lock-on (sync) to the transmitter that is broadcasting on the lowest channel number. It also will compare received signal strength, but for practical purposes, the lowest channel number is the most important factor for the receiver.

When you are flying in the same room as others, The first user to start up his airplane should use channel 2 or 3, and the second user can use channel 1. Therefore up to three people can fly in the same room simultaneously. The first person should use CH 3, the second should use CH2 and the third person should use CH1. All three channels can be used together without risk of interference from the others. If the 3 people flying in the same room are aware of what channel they are using, they will be able to allow a new flyer to join in, so long as the new user can select a lower channel number than what is currently being used. If you are flying with your friends, put the longest flying airplane on CH 3, and then let the other airplanes use the lower channels.

For example, if the first user will want to have a long 20 minute flight, he should use CH 3. Then if other users want to start up their planes too, they can use CH 2, and the last guy gets to use CH 1.

If there is going to be a lot of people coming and going, or one user is using CH 1 and wants to fly for a long time, the other flyers would obviously not be able to select a channel lower than CH 1. They can wait for the CH 1 airplane to finish his flight, or they can take their model into a different room, or move about 100 feet away and try to sync their receiver to CH 2 or CH 3 - in this way, they are using the received signal strength to force the receiver to sync to CH 2 or CH 3, even though a transmitter maybe be transmitting on CH 1

Future models of the HFX900 may have more channels (frequencies) in the 900MHz ISM band, or may use a frequency hopping technique. This is not available on the first version of our HFX900 transmitters and receivers, but we are working on it. For now the 3 channels will allow most Micro R/C flyers to fly with friends interference free



**Fig. 5 - Configure Transmitter functions by holding stick positions while switching transmitter ON**

## Transmitter Mixing Modes

There are 4 user-selectable “Mixing Modes” available on the transmitter. **(See Fig.5)** You select your “mixing mode” when you switch on your transmitter. The mixing mode you choose will be saved in memory until you make another selection - even if you switch it off. The position of the Right joystick at startup controls what mixing mode will be selected. The factory default mixing mode is “Normal” rudder and elevator mixing, this can also be selected at startup by holding the Right joystick to the right for about 2 seconds. When you startup the Transmitter, you can hold the Right joystick to the left to select “Negative Exponential” mixing that might be useful to dampen your joystick controls for squirrely models. When you startup the Transmitter, you can hold the Right joystick down to select “V-Tail” mixing for elevon style planes. “Flight Simulator” mixing mode is accessed by pushing the Right stick up at startup - which will put the transmitter in to a non transmitting state that is used only when we want to connect the transmitter to a personal computer for using the freeware FMS flight simulator software. Note that the selected mixing function will remain in memory, even if the transmitter is switched OFF - This can be convenient, but it can also cause confusion if you forget what mixing mode you are in. So if you use the non-transmitting FMS function, you’ll have to remember to select another mixing mode when you want to fly your real airplane - if you forget to do this, it might seem like your transmitter is not working - you have to remember what mixing mode you left your transmitter in.

### Normal Mixing (Right Stick to Right)

This style of mixing is for 3 channel rudder and elevator. The Left stick controls the motor throttle. The Right stick controls rudder and elevator.

### Negative Exponential Rate - (Right Stick to Left)

This makes the control response milder around the joystick center point, but it becomes increasingly stronger as the input approaches 100%. This can help for taming squirrely models.

### V-Tail Mixing - (Right Stick Down)

For models that combine elevator and aileron function on two control surfaces, like flying wings and V-tail planes.

### FMS Mode - Selected at startup (Right Stick Up)

The FMS mode shuts down the radio functions of the transmitter and instead sends signals through the monophonic audio jack on the left side of the transmitter box. A special cable connects the transmitter to a personal computer with the freeware FMS software installed, and you can use the HFX900 transmitter as an R/C Flight Sim input device.

### Establishing Transmitter-Receiver R/C Link

Turn on your transmitter by pushing the 3 position switch all the way to the far right. The main transmitter LED will glow. It is always best to turn the transmitter on first.

The receiver should have 2 actuators and one motor connected.

The receiver can communicate to the user with audible tones and LED blinking sequence.

Attach the LP90 cell to the receiver, you will notice a distinctive audible musical arpeggio tone sequence (musical notes C-E-G-C-G-E-C) that indicates successful microprocessor startup. This arpeggio is followed by a two-tone repetitive sequence (C-E,,C-E,,C-E -- and so on). This repeating two-tone sequence indicates that the receiver is scanning for a transmitter signal - it will continue to repeat until a valid transmitter signal is received. Once a valid transmitter has been found, the Channel number will be indicated by a series of tones (G note). The default transmitter channel is Channel 2, so you should hear two "G" notes to indicate that the receiver is operating on Channel 2. (European HFX868 default is CH 5, so in Europe, you get to hear 5 "G" notes indicating the receiver is operating on Channel 5. Once you hear the final count of "G" notes, you will know that your HFX900 system is ready for action. The actuators may start moving and buzzing, and if your throttle stick or throttle trim is not adjusted the propeller may be spinning, so be mindful of this. You will be able to control the actuators by using the Transmitter Joysticks, (See **Fig.6** )but first you will need to adjust the trim by moving the small trimmer wheels located near the transmitter joysticks

### Adjusting the Trimmers

Rotate the trimmer wheels with your thumb until you have successfully stopped any buzzing of the actuators. Most experienced R/C pilots will have no problems with this, but if you are a beginner, it might seem strange for now. Basically you will want the trimmer wheels to be positioned near the middle of their full range of motion. Make sure you know what mixing mode your transmitter is configured to. If you are confused, remove the Bahoma cell from the receiver, and review the transmitter mixing functions and start again

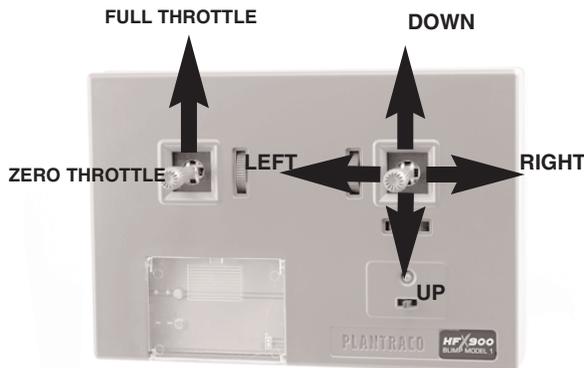


Fig 6 . Basic R/C Aircraft Control

### HFX900 (Americas) Frequencies

CHANNEL 1	904.4775
CHANNEL 2	915.9975
CHANNEL 3	927.5175

### HFX868 (Europe)Frequencies.

CHANNEL 4	868.105 Mhz
CHANNEL 5	868.385 Mhz
CHANNEL 6	869.910 Mhz

# FMS FLIGHT SIM

## Using the HFX900 Transmitter for the FMS R/C Flight Simulator

To use our transmitter in the FMS joystick mode, connect the supplied serial cable to your Windows PC and insert the mono plug into the jack on the left side of the transmitter.

We have included a CDROM that has the FMS Flight simulator, and also has the Plantraco MicroScout FMS model. Soon we will be adding the Butterfly FMS model and other items to the CDROM.

If you lose the CDROM that was included with your system, you can download the freeware Flight Simulator "FMS"

The Windows Installer can be downloaded here:

<http://www.n.ethz.ch/student/mmoeller/fms/beta/fmsdisk01.exe>

The official website for FMS can be found here:

[http://n.ethz.ch/student/mmoeller/fms/index\\_e.html](http://n.ethz.ch/student/mmoeller/fms/index_e.html)

Once downloaded launch the installer and choose your installation directory (Normally "C:\Program Files" ) This should already be the default, and you can just press next.

You can choose to put an Icon on the desktop for easy launch of the application. The program should be installed.

You can Launch the program from the icon located on the desktop or from the start menu.

With the Serial Cable attached to the computer, and the mono plug inserted into the jack on the side of the transmitter, hold the Right stick Up - while simultaneously switching the transmitter from off to ON

The transmitter will now be in the NON TRANSMITTING mode and can be used as an input device for the flight simulator.

In the FMS program click the menu "Controls" then click on " Analog controls... " .

Select "Serial PIC Interface" and then click the button marked "Resources". Then you will need to select the com port which the cable is connected to. (Probably COM1)

For the Baud Rate Choose "19200" . Then Press OK

Then Click "Mapping/Calibration" then click "Calibrate" you should now move both sticks in all directions to allow the software to adjust to the range of motion available.

You can see the blue bars moving up and down to confirm full range of motion.

Two or three big circles with both sticks should be fine.

Click Ok.

And then click ok again.

The aircraft on screen should now start rolling ahead - You should now be able to affect the aircraft by moving the control sticks.

To switch back to a transmitting mode hold the right stick to the right and simultaneously switching the transmitter from off to ON.



# TROUBLESHOOTING

We hope that you won't have any problems with your HFX900 system, but if you do, check this Troubleshooting list first.

## 1. My Receiver played the startup tones through my actuator at startup, but then it just plays the C-E tones over and over - it keeps beeping.

- Check transmitter - Make sure the switch is all the way to the right and the transmitter LED is glowing
- Is the transmitter in FMS mode? Switch the Tx off for a few seconds and then startup with the Right joystick held to the right for 2 seconds - Let the stick go and you should be in normal rudder elevator R/C mode again. Now remove the battery from the receiver and start it up again. You should hear the arpeggio tones, and then the C-E tones and then a few G tones to tell you what channel you have just locked-on (synced) to.
- Change your Transmitter batteries for fresh ones and try again
- Check if your receiver still has it's antennas - have they been broken off or cut? replace and try again or contact Plantraco

## 2. When I charge my LP90 cell on the built-in charger of the transmitter, the LED goes out right away, but the cell doesn't seem to have much power anymore.- Or - It seems to be taking forever to charge my LP90 cell.

- Replace the AA batteries in the transmitter- they are probably low and we have to have greater than 4.4 Volts left in the 4 AA cells in order to charge up the LP90 cell. A normal Charge will take about 60 minutes With fresh AA cells in the transmitter, you should be able to get about 10 charges of your LP90 cell - you may get more, depending on how you use your cells, but eventually, the AA cells of the transmitter will become depleted, so be mindful of the charger LED. It can be a good idea to use a digital volt meter (these are often available for less than \$15.00 these days) to check your cell voltage once in a while.

## 3. I sync up fine, but the controls seem to be reversed or something - when I give it elevator, I get rudder - it's all messed up

- You are in V-Tail mixing mode. Power off the transmitter for 5 seconds and restart the transmitter while holding the Right joystick to the right for about 2 seconds and when you release it, you should have normal control again.

## 4. I sync up fine, when the models is throttled up or is shaken, the battery seems to lose it's connection, and the receiver starts up again, I can hear the tones.

- Try squeezing the Bahoma battery magnet terminals of the cell and slide the battery around on the receivers magnets when you make a connection - this will help to clear any debris that might be preventing the Bahoma magnets from getting a good electrical con-

tact. If the magnets are well apposed to each other, they should stick fine and you won't shake them loose anymore

- You can also try using a small piece of tape to securely affix the battery to the receiver if your airplane is a bit shaky in the air. If your gearbox and prop are well balanced, you will have less shaking of your model in the air - you can check that too to reduce vibration.

## 5. I crashed my plane, and now when I start up the receiver, I don't hear any tones at all and I can't seem to sync anymore

- Check your magnetic actuator wiring - broken wire?
- Check the LED on the receiver - does it blink when the receiver is powered up with the cell? It should
- Does the LED blink in an S-O-S pattern for about 10 seconds and then it does play some tones? If it does, this means your cell needs to be recharged
- Check magnets on your cell and on the receiver - are they all still attached and intact? If they have broken off of the cell, you'll need to replace or repair it - If a magnet has broken off of the receiver, contact Plantraco
- Check the magnet terminals to see if there is any magnetic debris coating the cells, preventing a good electrical connection. If there is, clean them off with a Q-tip, toothpick, small flathead screwdriver etc Dip your Q-tip in rubbing alcohol, this can clean the crud off your magnet terminals
- Check the bahoma cell - measure volts with voltmeter. You should be above 4 Volts for a fully charged cell
- Perhaps in the crash, you broke a solder joint on the PCB - if you know how to solder, you can try to reheat the solder joints of all components until you fix the problem, or you can contact Plantraco for more advice or repair services.

## 6. I can't get FMS to work properly

- Make sure you put your transmitter in FMS mode. Do this by holding the Right Stick in the up position at startup of the transmitter. You can check that the transmitter is in FMS mode by starting up your receiver - it should keep beeping without syncing to the transmitter since the transmitter should be in the non-transmitting FMS mode now. If your receiver can still sync to your transmitter, you are not in FMS mode.
- Follow the directions on the CDROM carefully. Re-install FMS, or call your local computer guru to help you. It's easy, but maybe your system is messed up. We'll have more tips on FMS mode on our website, just go to <http://www.plantraco.com/hobbies/help.html>

# Ready To Fly Models from Plantraco Coming Soon!



4 Gram R/C Butterfly

## Special Thanks

We are very grateful for the advice and support we received from experts in the hobby community. Especially the people below who graciously offered their expertise to us, spent lots of time talking and corresponding with us - all for the love and advancement of this wonderful hobby!

Each of you has contributed to this project in one way or another, and by giving us your good advice over the last year. So we are indebted to you.

Ramon Crichlow  
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Fritz Mueller  
Jean-Daniel Nicoud  
Henry Pasquet  
John Piri  
Petr Saroch  
Bob Selman  
Jason Toews  
Brian Wolfe  
John Worth

Any changes or modifications (including the antennas) made to this device that are not expressly approved by the manufacturer may void the user's authority to operate the equipment.

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300MHz  
**MicroScout**



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