MagTrack[R] Head Tracking System

Instruction Manual

ABSTRACT

MagTrack[R] is a magnetic Head Track system intended to be used for FPV flight.
The system measures the components of the magnetic earth field vector and calculates the relative position between the HT and the earth magnetic vector. Once the relative position is determined, the system sends a data stream of PPM signals through the trainer port of the RC transmitter, to move the pan&tilt camera servos in the airplane.

BEGINING WITH MAGTRACK

To begin using your MagTrack, first you have to configure your transmitter. MagTrack works using 2 channels of the FF9 transmitter trainer port; if you are not familiar with the use of the trainer port please see “FF9 Configuration” section on this manual.

Once configured the transmitter, connect the MagTrack to the FF9 transmitter trainer port. MagTrack takes energy from the FF9 transmitter trainer port, so when you don’t use the HT unplug it from the transmitter, or battery will be discharged.

One connected to the trainer port, MagTrack should be configured, please see “Configuration” section on this manual.

Once MagTrack has been configured, it should be calibrated, please see “Calibration” section on this manual.

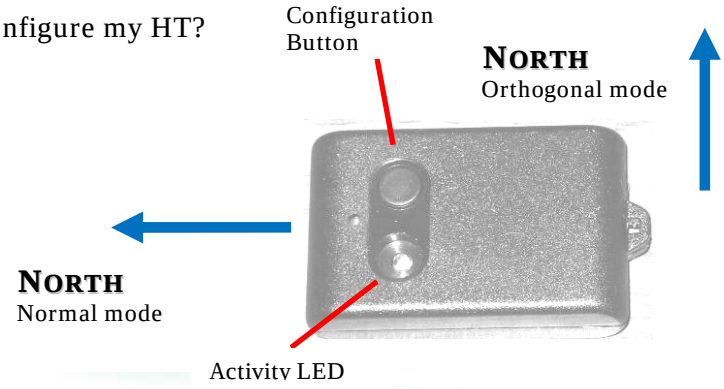
When you complete all these steps, MagTrack will be ready to be used, please, see “Using MagTrack” section on this manual.

CONFIGURATION

MagTrack[R] is configurable to work with different transmitters. The configurable options are the following:

- PPM Modulation: +PPM/-PPM => Futaba Transmitters use -PPM modulation.
- Number of PPM channels (from 1 to 8) Futaba FF9 admits 8 channel PPM signals.
- Channel assigned to HT Vertical signal (from 1 to 8).
- Channel assigned to HT Horizontal signal (from 1 to 8).
- HT orientation: Normal/Orthogonal.

How do I configure my HT?



To enter to the configuration mode you have to press the config button during at least ½ second and no more than 2 seconds.

After that you will hear a set of long and short "beeps" of different tones (low and high tones) that will indicate the options and their values as explained below.

A sort of low beep sound indicate the menu option, if the button is not pressed, after 1 second, the default option will sound with a high sound beep. If after a menu-option-low-beep, you push the config button, a sort of sub-menu options will sound, and pushing the config button, you select the option. After pushing the button, option selected sounds and the menu goes to the next option.

MENU EXPLAINED

1.- Enter configuration mode.

- ⇨ Press the config button (0.5s < t < 2s); a short pressing has not effect.

2.- Select Programmable items.

You will hear a sequence of low tones, by pushing config button, the menu item is selected. If item is not selected, a sequence of high beep tones indicate the default or preselected option.

"beep"	PPM mode
"beep beep"	Number of channels
"beep beep beep"	Horizontal movement Channel
"beep beep beep beep"	Vertical movement Channel
"beep beep beep beep ...."	Normal/Orthogonal
"beep beep beep beep ...."	Enable/Disable Sleep mode
"beep beep beep beep ...."	Horizontal Sensitivity
"beep beep beep beep ...."	Vertical Sensitivity

3.- Select item values.

	1 beep	2 beeps	3beeps	4beeps	5beeps	6beeps	7beeps	8beeps
PPM	PPM-	PPM+						
N of Channels	1	2	3	4	5	6	7	8
Vertical mov. Channel	1	2	3	4	5	6	7	8
Horizontal mov. Channel	1	2	3	4	5	6	7	8
HT Mode	Normal	Orthogonal						
Sleep Mode	Disable	Enable						
Horiz. Sensitivity	1	2	3	4	5			
Vert. Sensitivity	1	2	3	4	5			

After item is selected, a sequence of high beep tones indicates the selected option.

4.- Automatic Exit.

CALIBRATION

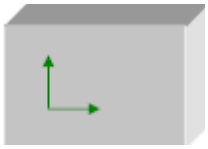
Press continuously the configuration button during at least 3 seconds; after that you will hear a beep.

Calibration procedure

1. Connect the system to the transmitter.
2. Place the system as far as possible from big metallic things or magnets.
3. Place the HTS parallel to the earth surface.
4. Push the calibration button with a thin stick during at least 3 seconds.
5. Rotate the HTS 360° around it; you will hear a weak "beep" when the system finds a value of magnetic field greater than the value stored.
6. Rotate the HTS in all possible axes.
7. The calibration process will end when the "beep" stops.
8. Once the "beep" stops, you have to press the calibration button to indicate to the system that calibration process has finished.
9. If the calibration is well performed, the system will work perfectly; if the system doesn't work fine, check the calibration conditions and re-calibrate.

More about Calibration

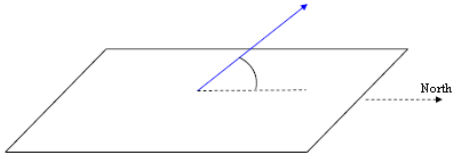
- HT is equipped with 2 orthogonal magnetic sensors.



- During calibration process, the controller measures both sensors to determine the maximum value of magnetic field in each one.

- To obtain a good system performance is very important to obtain a good reading of max magnetic field in each axis.

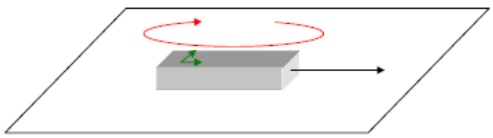
- Magnetic field on the earth is not parallel to the earth surface:

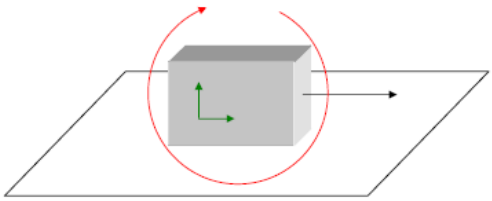


Magnetic sensors are polarized, so it is very important to obtain a good reading in both directions of each sensor.

At the end, there are 4 significant readings in such a way that if these 4 readings are not taken correctly, the system will not work properly.

To obtain the max readings it should be necessary to align both sensors in both orientations with the magnetic earth vector. In practice is difficult to align exactly the HT with the earth magnetic vector to obtain max readings, so to calibrate the sensor is convenient to move both sensors in the vicinity of the max value of earth magnetic vector: first one of them and after the other one. For this reason a good approach to calibrate the system is moving the HT 360º in all directions in order to obtain maximum readings, but if during the process the sensors are not aligned at least one time with the earth magnetic sensor, the calibration would be incorrect, what means that the system would work, but not properly.





The calibration process suggested is a good approach but keep in mind that the most important thing is to align both sensors with the earth magnetic vector.

FF9 CONFIGURATION

1. Press MODE button until the main menu appears on the FF9 display.

2. Move through the menu with the FF9 round button, to the TRAINER option (turning the FF9 round button) and select it by pressing the FF9 round button.

3. Turn the FF9 round button until the first option (Marked normally as INH) appears as OFF. At this moment, if you pull the "H" button, the "OFF" will turn in "ON" and when you leave the "H" button, the "ON" will turn in "OFF" as in TRAINER conditions. The HT works with the "H" button in pull position (you can employ a rubber to maintain the "H" button pulled).

4. With the buttons of the FF9 located close to the display (left side), move through all the TRAINER functions and set all to OFF except channels 7 and 8 that will be set to FUNC. Once you have finished, press the FF9 "End" button.

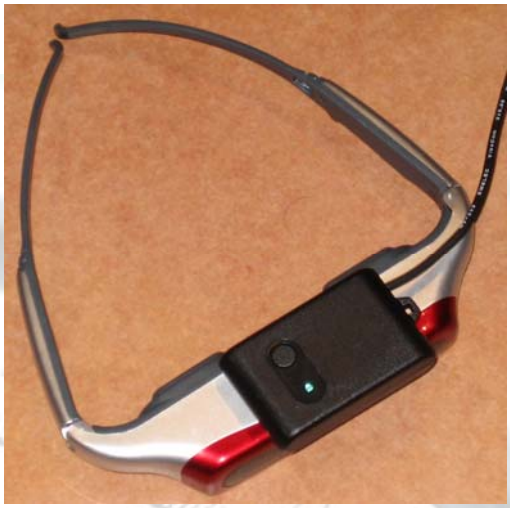
5. Move through the menu with the FF9 round button, to the SERVO option (turning the FF9 round button) and select it by pressing the FF9 round button. Now, with the “H” button Pulled you should see activity on channels 7 and 8 when moving the HT. To exit push the END button in the FF9 Transmitter.

6. It is convenient to set the “END POINTS” of the channels 7 and 8 to the maximum travel; to do that, go to the option “END POINT” of the FF9 main menu turning the FF9 round button conveniently. Go to the channel 7 and 8 and set the servo end points to 140%.

USING MAGTRACK

Once everything has been configured and calibrated, you will be ready to use the MagTrack; next step will be to install the HeadTrack on the head (on a cap or on the top of your glasses with a Velcro tape).

- ⇨ Note: If you test the system with your hands, you will obtain a fast movement on your pan&tilt servo mount due to the sensibility of the Head Tracker, this is normal. A smooth movement will be obtained only when installed properly on your head.



Place the Head Tracker completely horizontal on your cap/glasses and be sure it will not be moved by the cables action.

Don't pull strongly the HT cable, otherwise you may damage the unit and in an extreme case the transmitter.

Depending on how you mounted the HT in your head you should point to the north or to the south to make it work properly. When the system finds the north or the south it generates a weak "beep". If you are pointing to the wrong cardinal point, the horizontal movement will be very fast and it will be impossible to center the HT, in this case, turn your head 180° and point to the opposite cardinal point.

To fine tune the HT vertical movement, may be you will need to tilt a little bit the HT upwards or downwards => this is not mandatory for a correct use of the HT. Instead to do that, you may adjust the vertical servo travel and center.

With the system pointing to the right cardinal point, you will listen a weak "beep", and when moving the system to the East or to the West, the horizontal servo will have a

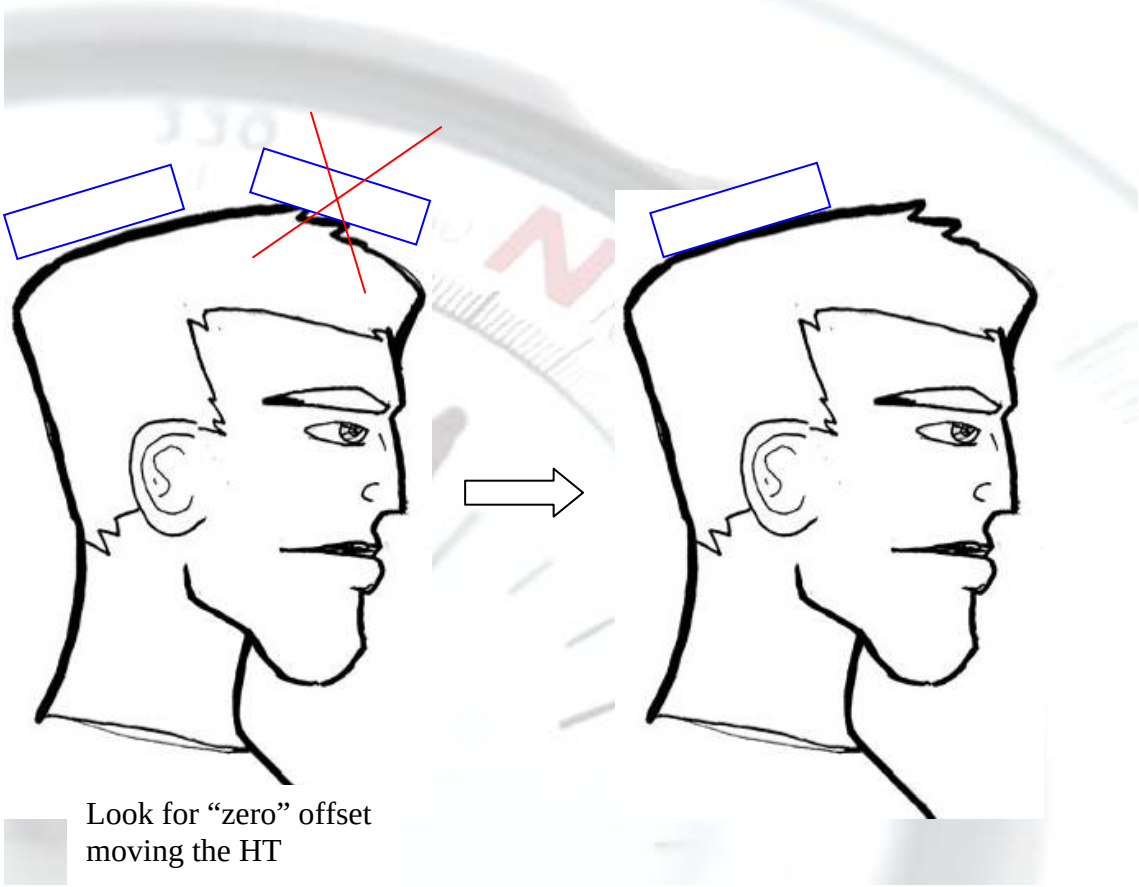
smooth movement to the right or to the left. The travel angles are 45º (approx) to the East and (45º approx) to the West. These are the operating angles. Inside this range if you move the HT upwards or downwards, maintaining the horizontal angle, vertical servo, will move smoothly upwards or downwards.

If the servos doesn't move smoothly, check the position of the HT (change 180º its orientation and try again) or recalibrate the system.

Reference Angles

The reference angle (zero) for the **horizontal movement** is the BEEP sound sent by the HT. From this point you will have a movement of 45º + 45º.

The reference angle (zero) for the **vertical movement,** may be fine tuned by tilting a little bit the HT slightly upwards or downwards as indicated in the figure, although this is not mandatory => you may adjust the zero servos position from the transmitter.



Look for “zero” offset moving the HT

Important Note: Don’t try to open the unit; doing that, you may damage the unit and the transmitter trainer port.