EzAntennaTracker v2

Instruction manual - International edition

ImmersionRC
Real Virtuality

Overview

The EzAntennaTracker v2 system is the successor to ImmersionRC's EzAntennaTracker Lite, the first commercially available antenna tracker designed for FPV/UAV flight.

It operates by using the digital telemetry stream from the EzOSD module, the XuGong v2 Pro or the TinyTelemetry module and sends it down one of the audio channels of an A/V link, via the transmitter. This telemetry stream contains information on the plane's GPS location, and other information available to the telemetry module, such as battery level and UHF link quality.

This telemetry stream then exits from the audio jack of the ground-based A/V receiver, and can be used for various purposes.

1. It can be simply recorded to the audio/video recorder, and 're-played' through Google Earth(™) to show the path that the model took during the flight/drive/sail. This case requires no additional hardware.
2. It can be recorded, as above, but used to find a lost plane in the event of a distant crash. The gps coordinates of the last packet sent should indicate roughly (or best case, exactly) where the plane crashed. Again, no additional hardware required.
3. It can be fed to an antenna tracker, which is driving a pan/tilt mount. This can aim a directional antenna at the plane during the entire flight, greatly reducing dropouts (and with the added bonus that the antenna points to where the plane landed/crashed in the event of a 'problem').

This manual is dedicated to the third purpose, the use of the telemetry stream to drive an antenna tracker.

The EzAntennaTracker v2 functions include:

- Single-wire connection to ImmersionRC Uno/Duo receivers with the GS-Link connection (power, A/V, and control). This includes all GS-Link equipped Uno/Duo products shipped to date!
- Control of Rx frequency and band, with direct readout in MHz on the LCD
- 3A 'quiet' switching regulator to power connected servos
- Three buffered A/V outputs to drive Goggles, DVRs, LCDs, etc
- USB port for setup and firmware upgrades
- Alarms for loss of tracking, and low battery
- 100% compatible with telemetry from the EzOSD, TinyTelemetry, XuGong v2 Pro and all upcoming ImmersionRC multicopter products.
- No more heat-shrink, no more messy cabling, no more external BEC
- Professional aluminium enclosure with our signature 'bumpers'

Package contents

1 pcs - EzAntennaTracker v2
1 pcs - 3.5mm Male to 3x Phono cable
1 pcs - male to male mini-DIN6 cable

Electronics Setup

Airborne Electronics

Please refer to the manual of your ImmersionRC telemetry gear (TinyTelemetry, EzOSD or XuGong v2 Pro) for installation. The telemetry is transmitted through the right audio channel.

Ensure that the cable running between the telemetry module and the transmitter is cabled correctly for video and stereo audio (e.g. for LawMate systems, take the right channel of the stereo pair from the EzOSD, and route that to the mono audio input of the Lawmate transmitter, see later for more details).

Ground Station Electronics

The EzAntennaTracker v2 has the following connections:

Left plate

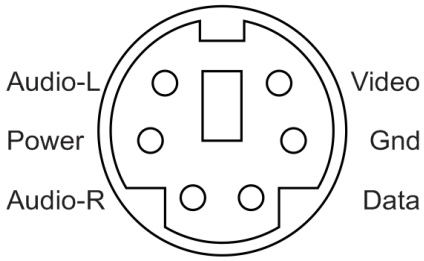
1. USB connector: used for upgrading flash firmware, may be left disconnected in normal use.
2. A/V outputs: 3 audio and video outputs to connect goggles, DVR, screens, tracking applications and any other means to enjoy the signal from your model for you and your friends. This has the same pinout as FatShark goggles.
3. Pan servos connector: connect the servos of your tracking antenna mount here, from left to right: PWM signal, +5 / 6 V and Ground.
4. Tilt servos connector: connect the servos of your tracking antenna mount here, from left to right: PWM signal, +5 / 6 V and Ground.
5. DC power input: Connect any DC power supply here, from 6V to 16V. Ensure that the supply used is capable of driving the pan/tilt servos for a long period of time, with the load of the antenna on them.

Right plate

1. GS-Link: connects to your receiver.
2. Menu navigation buttons: From left to right: Down, Enter, Up

Groundstation Link Connection

The Ground Station link is a standard 6-pin mini-DIN, as used for many years by PS/2 mice and keyboards. Here is the pinout of the female connector:



This connector may be used to:

- power the receiver
- control IRC receiver's Channel and Band
- get Receiver quality information
- interface to the Video, and Audio output lines

Cabling, Getting the Correct Audio Channel

There are two fundamental types of A/V Tx/Rx equipment being used for FPV, those with a mono audio link, and those with a stereo link.

The 'Lawmate' equipment, and clones, used primarily for law-enforcement, transmits only (relatively low bandwidth) mono audio (one channel). This equipment will function correctly with the ImmersionRC telemetry link, but note that the only audio channel will be dedicated to telemetry, and therefore it cannot be used for an onboard microphone.

The 'Airwave'/'NexWave' equipment, and clones, provides a high-bandwidth stereo audio link. One of the two channels may be used for telemetry (generally, the Right-Channel), while the other (Left) may be used for an onboard microphone.
One of the most common problems experienced when setting up an antenna tracking system is to ensure the audio is correctly cabled both in the plane (Tx-end), and on the ground (Rx-end).
Additional care must be taken if Lawmate transmitters are used with Airwave/NexWave receivers (or vice-versa). These cases will be covered below.

Transmitter Audio Connection

ImmersionRC/FatShark Transmitter

If ImmersionRC/FatShark transmitters are used, there are two A/V connectors supplied on the transmitter board.
One is the 5-pin Molex-SL connector, which is used to interconnect ImmersionRC/FatShark cameras, Transmitters, and OSDs. This will be the standard method for connecting the audio channels, and requires no additional effort (assuming standard cables are used, with all 5 pins connected).

An additional connector is supplied on ImmersionRC/FatShark transmitters, for future expansion. This is a 5-pin JST (small white connector), with the same pinout as the larger 5-pin Molex. The TinyTelemetry connects directly to this connector.

Lawmate Transmitter

For Lawmate transmitters, a 4-pin connector is supplied, with the following pinout. The telemetry signal from the ImmersionRC telemetry must be routed to the white cable (Audio).

Yellow	Composite Video
White	Audio (Mono)
Black	Ground

Red	+5v/+12v

Receiver Audio Connection

All the inputs to the EzAntennaTracker go through the 6 pin mini-DIN connector. Telemetry is read on the right audio channel to calculate how to move the tracker. Audio and video are read on that connector and then output again on the EzAntennaTracker on the 3 A/V outputs.

ImmersionRC receivers have a Ground Station Link connector, so this connection from the receiver is all you need. With other receivers, it is fairly simple to build your own cable using the A/V output from the receiver to get the audio and video data to a mini-DIN6 connector.

When using a non-ImmersionRC receiver, you will not be able to change channel using the feature built into the antenna tracker, but all other functions will operate correctly.

ImmersionRC/FatShark receivers

ImmersionRC receivers, including the Unos, Duos and the Fat Shark LCD glasses, all use a standard 4-pole 3.5mm jack. For reasons which are not immediately obvious, manufacturers of equipment using these connectors do not always follow the same pinout. The 4 most common are shown below:

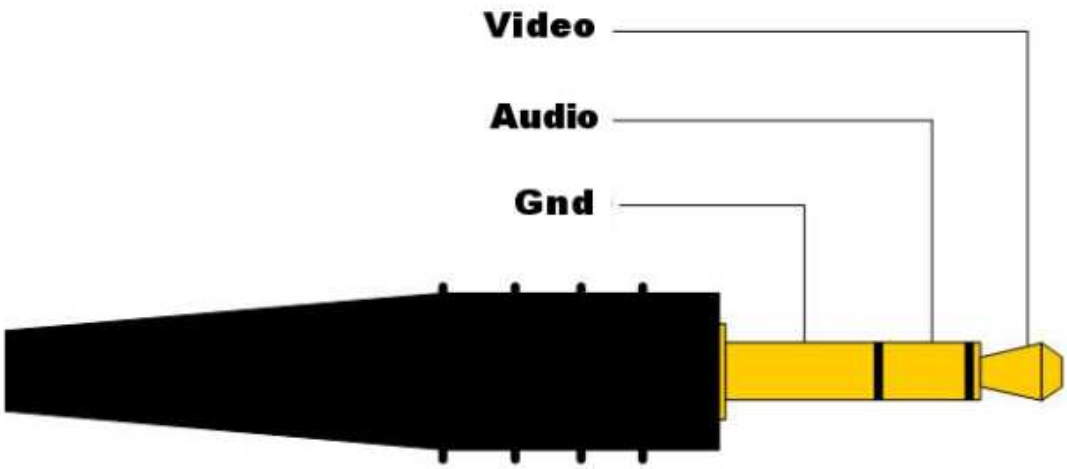
	1	2	3	4
Fat Shark, Archos, Gigabeat, Creative Zen Vision Series, Cown iAudio, Apple iBook	Ground	Video	Right	Left
Standard Camcorder Cable	Right	Ground	Video	Left
iPod Video	Video	Ground	Left	Right
Zune	Video	Ground	Right	Left

The pinout used by the ImmersionRC/FatShark equipment is shown, and is shared with other common consumer equipment (Archos, Creative Labs, Apple, etc.)
When ImmersionRC/FatShark gear is used, the telemetry signal will appear on the Right audio channel, pin 3.

Typically, when a 4-pole 3.5mm cable is terminated with Phono/Cinch/RCA connectors on the other end, the colors are Yellow for video, Red for Audio-Right, and White for Audio-Left. (Note: This is typical, but cannot be guaranteed).

Lawmate Receivers

Lawmate receivers use a stereo 3.5mm jack. With the following pinout:



Cables commonly used to interface to Lawmate receivers have a 3.5mm stereo jack on one end, and two Phono/Cinch/RCA connectors on the other. These connectors are typically Red & White, with audio emitted on the red connector, and video on the white.

Mixed Equipment

Lawmate Transmitter, Airwave/NexWave Receiver

In the case where a lawmate transmitter is coupled to an airwave receiver, for example, the ImmersionRC Duo 2400, the mono audio from the lawmate transmitter will be emitted on both audio outputs. Note however that the Right channel (Red connector usually) is generally 'cleaner', and contains less interference from the video channel.

Recording telemetry

Not much to do here either, just ensure that the output from the audio/video receiver is correctly cabled to the recording device (avoiding swapping the left and right audio channels if possible).

Try to use a fairly high bitrate for recording the audio (DV Camcorder users don't need to worry, its plenty high enough).

ImmersionRC telemetry gear usually provides a mode setting for telemetry transmission (*high*, *normal*, *slow*), that changes the baud rate of transmission. *High*/*slow* mode isn't really used and it's now recommended to keep that setting on *normal*.

Mechanical Setup

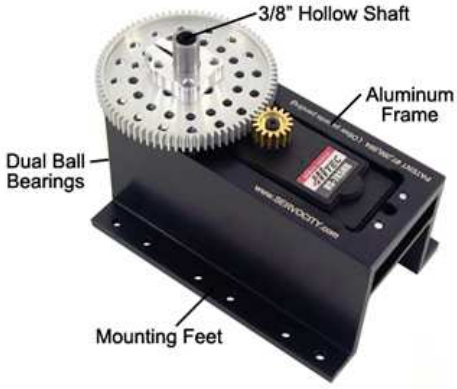
Suitable Pan/Tilt mounts

Some antenna pan/tilt mounts that have been used successfully with the EzAntennaTracker system are listed below. The SPG785/DDT500H combination has been used by the designers of the EzAntennaTracker for several months, and has proven to be a reliable, robust solution.

ServoCity Medium-Duty
SPG785 Pan, 2:1 ratio option (630 degrees)
http://www.servocity.com/html/spg785a-bm_bottom_mount.html#.VGByrvnF-JF
DDT500H Tilt

This combination works well, and gives a full 360 degree pan rotation with plenty of torque (especially on the Pan axis) for larger patch antennas.

The DDT500H Tilt mount



The SPG785 Pan mount

The SPG785 includes the highly recommended HS-785 HB sail winch servo. The specifications for this servo may be found here:
http://hitecrcd.com/products/servos/boat-servos/hs-785hb-3.5-turn-winch-servo/product
This is a high-torque servo, which provides 1260 degrees of rotation, straight out of the box.

Low cost alternatives
Small winch servos like the *GWS 125* 360° servo and it's successors can be used as a reasonable low-cost alternative for the pan servo, at least for light-weight antennas.

They can be bought from various online retailers, including www.servocity.com in the USA, and http://www.activerobots.co.uk, or http://www.servoshop.co.uk in the UK.
Note that with any of these 360° servos it is highly advisable to support a heavy antenna with an external bearing, and not rely only on the servo's output shaft.

Do I really need a Tilt axis?

Not in all cases. For example, when using the pan/tilt mount for long distance flight, at safe altitudes, the tilt angle is generally only a few degrees from horizontal, pointing just above the horizon. In this case, a patch, or yagi antenna, on a pan-only mount, should suffice.
To improve this solution further, use a diversity receiver, with a second omnidirectional antenna, or low-gain patch (with the patch facing straight up). When flying closer to the antenna, the diversity will prefer the omni, or low-gain patch. When flying long-range the pan-mounted antenna, with its narrower radiation pattern, will be preferred.

Servo Splines

One last point on pan servos: there appear to be two common spline sizes used for the output shafts of standard-size servos:. the Futaba, and the Hitec standard. The GWS/SuperTec servo uses a Futaba standard spline.

Hitec standard-sized servos use a 24-tooth spline, and Futaba, a 25-tooth spline. ServoCity offers a wide variety of adapters for these standard splines, which are interesting for use in building an antenna pan/tilt mount.

Operation

User Interface

The display has two modes:

- *Status mode:* showing information on telemetry during flight, discussed later on
- *Menu mode*: allowing to interact with the tracker and set parameters, described below.

On startup, the display is in *Status mode*, by pressing the center button (*Menu*), you enter in the menu. The menu has two levels, a menu list grouping controls by items, and the controls themselves.

Navigation

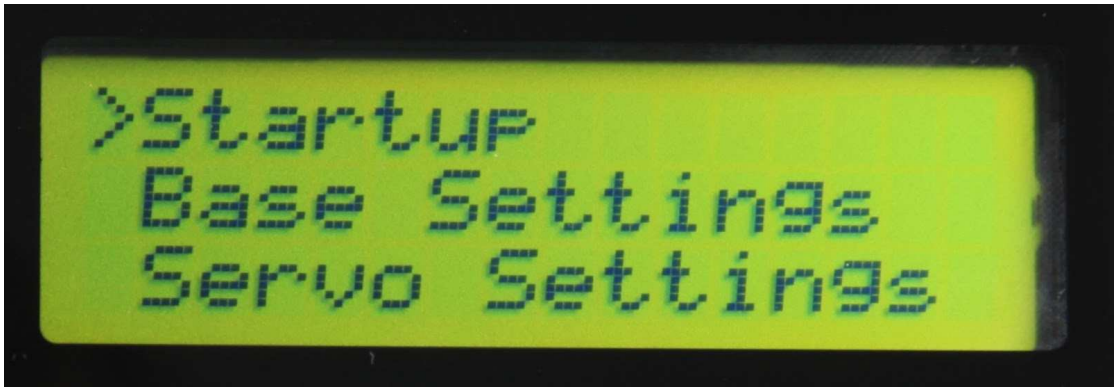
In *Status mode*, Up and Down show you the next and previous status page.

Pressing *Enter* gets you into *Menu mode*, up and down buttons select the item above or below, shown by a caret. It cycles through all items, displaying 3 items per page. The last page always contains an *Exit* item, to quit the menu or submenu.

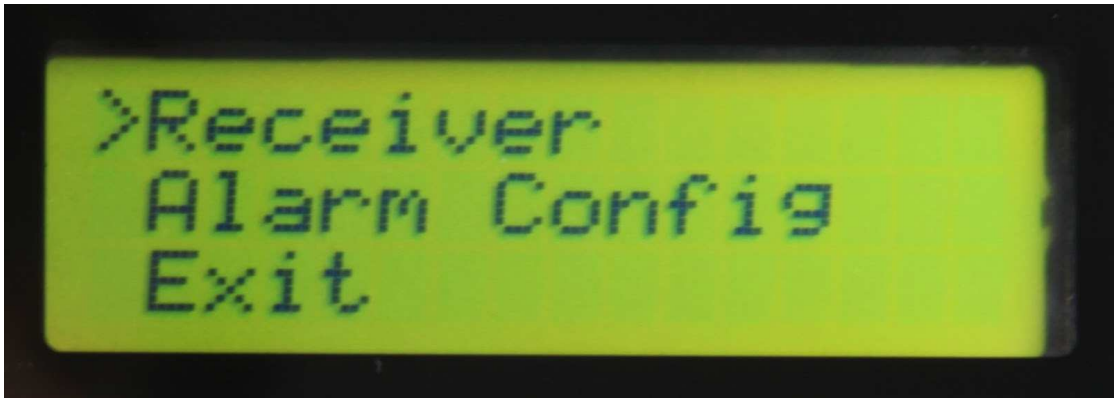
In the menu list, *Enter* button enters the submenu.

In the control sub-menus, *Enter* button toggles the item if it's a "yes/no" control, executes the action for the item, or shows a second caret to change the value with *Up* and *Down* buttons, *Enter* button validates the value.

Menu Items



Startup: controls to setup EzAntennaTracker v2 in preparation of a flight.
Base Settings: configuration options for the EzAntennaTracker v2 behaviour
Servo Settings: controls to setup servo movement and limits for your antenna tracker



Receiver: controls for receiver channel and band, showing connection status and receiver selected frequency
Alarm Config: controls for battery and telemetry alarms

One time setup

Once you've set up your mechanical mount for the antenna, you need to set up the base so that it moves the servos with the correct zero and amplitude.

This is done in using the *Servo Settings* menu.

Menu items

Servo Set(up): Enable the servo setup control in order to take manual control of the pan and tilt servos. This is useful during initial setup of the pan/tilt mount, and also when using the same antenna mount (un-guided) to fly with a plane not equipped with an ImmersionRC telemetry system.
Pan Deg, Tilt Deg: Once servo setup mode is enabled, these controls define the pan and tilt servo angle respectively.

Pan us/360, Til(t) us/360: These are essentially the relationship between angle, and the width of the servo pulse required to move the servo to that angle. These controls only need to be setup once, during the construction of the antenna pan/tilt mount. See the 'Setting Up The Servos' section of this manual for an explanation of how to set these up, along with example settings for common pan/tilt mounts.

Tilt max, Tilt min, Pan max, Pan min: Use to limit servo movement to avoid mechanical constraints .

Pan offset, Til(t) offset: Use to correct for mechanical offsets. For example, the tilt offset is used to define the offset in degrees between 'zero tilt' (looking at the horizon), and the servo neutral position.

Pan Rev(erse), Tilt Rev(erse): Allows the pan/tilt axes to be reversed, to adapt to different servo, and mechanical linkage requirements.
Servo T(e)st: Start a servo test, this will walk the mount around its extremes, in both axes.
Servo Spd: Servo speed, 1 = fastest, 10 = slowest. Normally, the default setting of 1 is appropriate. Use higher settings only with large, heavy antennas.

Exit: Exit the setup menu, and return to the previously displayed status menu.

Setting up the servos

The antenna tracker firmware has several parameters, which are stored in non-volatile memory (i.e. preserved when not powered up). These parameters allow the characteristics of the servos, and mount, to be defined, and include:

Pan Reverse	no/yes
Tilt Reverse	no/yes
Pan us/360	150-2000us in 10us steps
Tilt us/360	200-4000us in 20us steps
Tilt min	-90 to +90 degrees in 1 degree steps
Tilt max	-90 to +90 degrees in 1 degree steps
Pan min	-180 to +180 degrees in 2 degree steps
Pan max	-180 to +180 degrees in 2 degree steps

To help with the configuration of the mount, a servo setup mode is provided. Once enabled, using the **Servo Setup** entry in the menu, the **Pan Deg**, and **Tilt Deg**, options may be used to manually move the servos.

Servo Setup Step #1: Defining the zero position
Use the **Servo Setup** mode to set both servos to zero degrees (centered). When in this mode, mechanically adjust the pan/tilt mount configuration until the antenna is pointing 'straight ahead', with zero tilt (pointing at the horizon).
This generally involves simply removing the screw from each servo's horn, and rotating the horn until the antenna is in its zero-pan, zero-tilt position;

Servo Setup Step #2: Setting up servo reverses
Once zero has been defined, set each axis value to a setting of +20°, and ensure that the servos move in the correct direction. For Pan, +20 degrees = 20° right of center. For Tilt, +20 degrees = 20° up from level.
If either servo is backwards, change its reverse setting to compensate.

Servo Setup Step #3: Setting up servo gains
Next step is to teach the antenna tracker how many microseconds of servo drive pulse width are required to rotate through 360 degrees. To do this, remain in servo setup mode, and set the pan servo value manually to a setting of +90 degrees.
Adjust the **Pan us/360** control until the pan axis is physically rotated 90° to the right of center.
Repeat this for the tilt axis.

Note: if your mechanical setup does not permit 90° rotation, try another rotation angle that is easy for you to check alignment for, e.g. using a set square.

Servo Setup Step #4: Setting up tilt servo limits
Again, using the Servo Setup mode, manually change the tilt angle to each of its mechanical limits in turn, then back off by one 'click'. Note down these values, and enter them into the **Tilt min**/**Tilt max** controls.

That's it, the mount should now be setup correctly.

Example settings

ServoCity pan/tilt mount , SPG785 Pan (2:1, 630 degree option), DDT500H Tilt

Pan Reverse	Yes
Tilt Reverse	No
Pan us/360	450us
Tilt us/360	4000us
Tilt min	10 degrees (or zero if possible without the tilt servo binding at 0°)
Tilt max	90 degrees

GWS/SuperTec S125 (for pan axis only)

Pan Reverse	Yes
Tilt Reverse	- - -
Pan us/360	990us
Tilt us/360	- - -
Tilt min	- - -
Tilt max	- - -

Pre Flight Setup

Flight with telemetry

Before a flight in a new environment, you need to set up the antenna tracker alignment so that it knows it's position. Set up the receiving frequency of the antenna with the **Receiver** menu, and then use the **Startup** menu to set up your antenna at the beginning of a flight. Two steps are necessary:

1. setting the home GPS position
2. setting the bearing of the base

Set Home: Press when the GPS-equipped plane is located beside the antenna. This will use the plane position to give the antenna tracker the home reference it needs before flight.
Note that this occurs automatically the first time that the antenna tracker 'sees' 6 satellites or greater reported by the plane's GPS. For a more precise fix, wait until the GPS lock is better (9 satellites or more), and press 'Set Home' again.

Calibrate, Bear(ing) Cal(ibration): Press the Calibrate button to teach the antenna tracker the second reference that it requires, the direction in which the antenna mount is pointing.

Base setup procedure

Antenna physical setup

The antenna tracker should be installed level and oriented so that most flying will take place in the direction that it faces in neutral position (Pan = 0 degrees), to avoid crossing the -180/+180 degree boundary, and therefore avoiding 360 degree complete rotations as the antenna crosses that boundary.

Home position

The Antenna Tracker has no GPS itself, so it needs some help during setup time to let it know where it is. In order to teach it its GPS position, power up the plane with onboard telemetry and wait for it to get a good satellite fix. Keep the plane close to the antenna and check on the Position **Status Page** what position is reported. Check the number of satellites reported, the more satellites, the better the fix. Fix starts being OK at around 6 satellites, precise fix with 9 or more.

After waiting a couple of minutes for a very precise fix, enter the antenna tracker's menu, and select **Set Home.**

Direction alignment

The antenna doesn't know what direction is north. To teach it to the antenna, there are a couple of possibilities:

Manually, using a compass.

If a compass is available, then the direction in which the antenna tracking is facing may be directly entered into the menu, into the **Bearing Cal** menu item.
As an example, if the zero-position of the antenna tracker points North-West, enter -45 (degrees) into the **Bearing Cal** menu.
Note that the range of this menu item is -180° through +180°. Many compasses are marked from 0° through 360° degrees, so for values between 180° and 360°, just subtract the value from 360°. E.g. compass reads 320 degrees, 360 – 320 = 40 degrees. Enter this into the menu.

Manually, using your model.

Get your model far away from the antenna and set it at a stationary point. The antenna will start trying to track the model. Use the **Bearing Cal** menu item to correct the direction the antenna is pointing to, so that it points directly to your model. With a model that can stay stationary like a quadcopter and an aid, this can be done in flight: fly your model a bit further away while piloting it visually and keep it at one point while your aid changes the **Bearing Cal** value to point the antenna straight towards it.

Automatically, using the GPS in the plane

Once the GPS *home position* has been learned, enter the antenna tracker's menu, and select **Calibrate.** The text *CAL* will appear on the display (blinking), and the antenna will move to point to the center position in both axes (pan = 0 degrees, tilt = 0 degrees).
Walk the plane out 20 or 30 paces (the further the better), directly in the axis of the antenna (antenna is pointing directly at the plane).
Walk back to the antenna tracker (leaving the plane where it is), and press the center menu button. The pan (heading) zero position will be stored, and flight can commence!

> Explanation: Why 'the further the better'?
>
> When a GPS is powered up, especially in the presence of a high-power video transmitter, the positional errors can be significant until a large number of satellites have been acquired.
> For long distance flight, the antenna positioning accuracy is fairly critical, so the calibration of the antenna tracker is also just as critical. If the home location of the antenna tracker is stored when the GPS error is large, and then if the bearing (pan) calibration is performed with the plane close to the antenna tracker, also with its own GPS error, the bearing calibration error can be quite large.
> The further the plane is positioned from the antenna tracker when the bearing calibration is performed, the less significant this error will be.

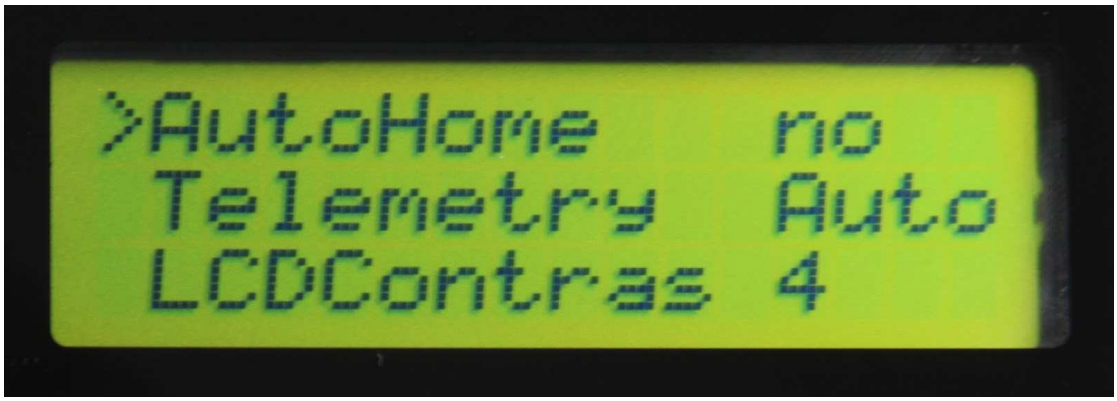
Tip: If flying often at the same location, mark the position of the antenna mount legs on the ground. The position of the antenna, and the heading calibration, are stored in non-volatile memory, and will be restored when power is next applied. This will avoid the need for any 'home position', or heading calibrations each time you fly.

Flight without Telemetry

You might want to fly a model without Immersion RC telemetry gear mounted. In that case, you can't use the tracking feature of the antenna tracker, but you might still want to use your antenna for reception. In this case, you can set the antenna to stay fixed in one position, using the **Servo Settings** menu. Use **Set Servo: yes** to stop the antenna from trying to move. Align it in the general direction you will be flying in with **Pan Deg**/**Tilt Deg** settings.

Base Configuration

Base Settings menu



AutoHome enables automatic setting of the home position of the base as soon as received telemetry shows more than 6 satellites used to get a GPS fix.
Telemetry sets the speed used for telemetry transmission, and should match the speed of the telemetry encoding on the model. Choices are *Auto, Fast, Normal, Slow*. It's recommended to use *Normal* or *Auto*
LCDContras(t) is the contrast used for the LCD display.

Alarm Config menu

The alarm configuration helps to set-up signalisation in case of faults: **Batt Alarm** sets the voltage level of the battery below which an alarm sounds. **Trk Alarm** enables or disables an alarm when the tracker lost telemetry from the model.

Receiver menu

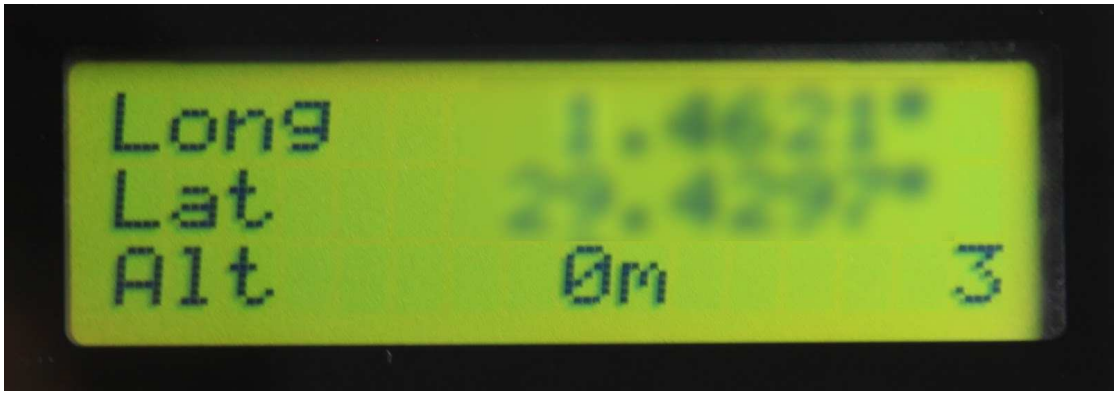
The tracker can control the receiver through the GS-Link cable. The **Receiver** menu checks all the channels and bands available on the receiver. In the menu, you can setup the **Channel** and **Band** of the receiver and check the **Frequency** it's set on.

If **Band** shows **no**, your receiver does not support band selection. If **Channel** shows **no**, there might be an issue with the connection to the receiver. Check your cables and power. Exiting the submenu and entering it again reconnects to the receiver and checks all the available bands.

One word of caution: The tracker loops through all bands and channels when entering that menu to know what channels the receiver supports. Avoid entering that menu when in flight, as it change your channels. If you want to check what channel is used, please look at the status pages.

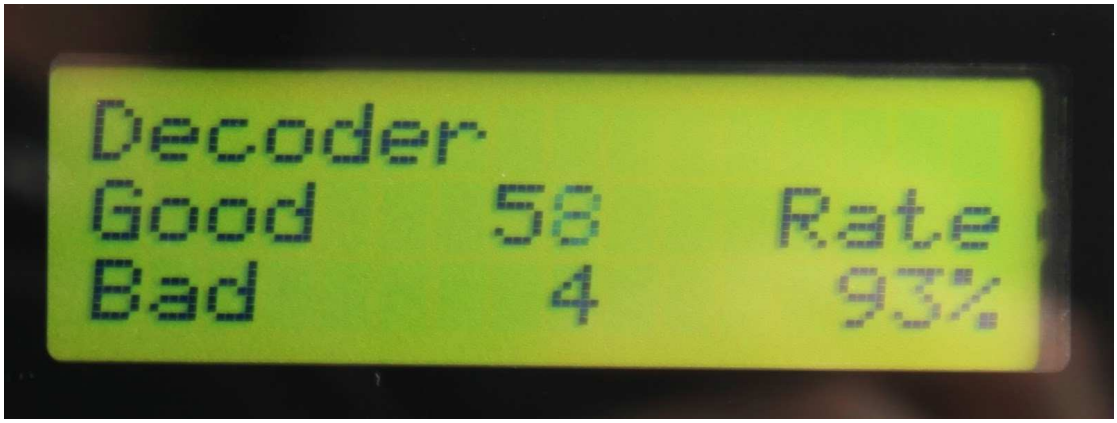
Flight Status pages

Eight status pages are available, and may be accessed using the up/down buttons while not in the setup menu.

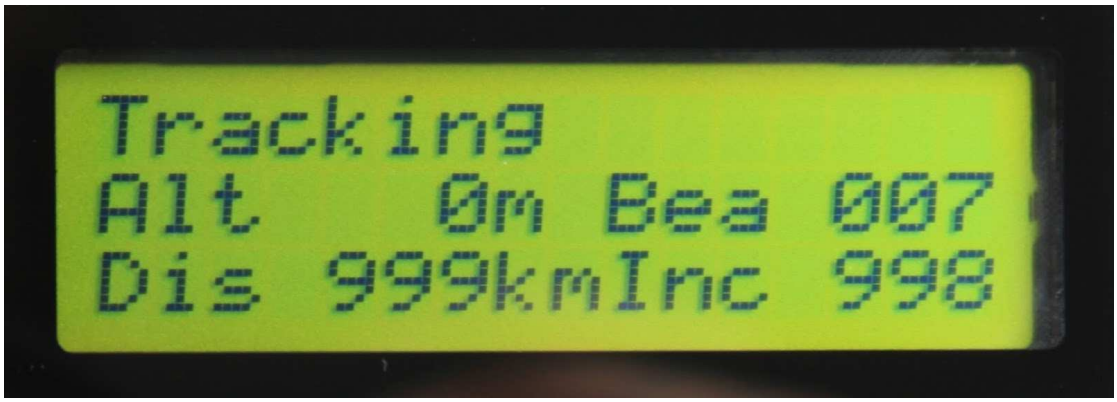


The **default page** shows the plane's current (or last-known) GPS coordinates. This includes Longitude, Latitude, and Altitude (Above Launch Point). The number of satellites currently locked is also shown, in the lower right corner.

The second page shows the **audio levels** currently being received, along with an indicator showing 'Low', OK', or 'High'.



The **Decoder Page** shows the number telemetry packets decoded, along with the error rate. This shows the number of Good versus Bad packets: good packets are packets received that have been decoded correctly. This is no indication of the quality of the telemetry, only of the transmission link.



The **Tracking Page** shows the plane's relative position to the base: current altitude (above launch point), distance from the launch point, bearing and inclination of the antenna required to point to the plane.

The **Voltage Page** shows the voltage of the model's battery, the current that is being drawn from it and the number of mAh that have been drawn from the battery. This is shown if the model is equipped with a battery sensor.

The **EzUHF Link Page** shows the quality of the link, if the model is equipped with an EzUHF and wired to transmit the quality of signal alongside the telemetry data. It shows RSSI values and quality of signal.

The **Groundstation Page** shows the voltage of the power source connected to the base.

The **Receiver Page** shows the information on the AV link. It shows the used Band, Channel and Frequency the receiver is setup on and the RSSI of the received AV signal.

Replaying recorded telemetry data

Once a flight has been recorded, it may be replayed in order to test the antenna mount (or just to impress your friends with your NASA-class technology).
When choosing the recording/playback device, and its settings, it is important to remember that the audio channel which contains the telemetry stream must be recorded at a fairly high bitrate, and sample rate, in order for reliable decoding to take place.
Audio compression techniques, such as MP3, distort the audio waveform in ways that the human ear does not detect, but the antenna tracker will be adversely affected.
Some examples of recording/playback devices, and 'decodability' are shown below:

Recorder	Playback	Success
DV Camcorder, 25mbps bitrate, for audio + video	Apple iPhone video, Audio encoded to 128kbps, 48kHz sample rate	Approx. 50% lost packets, quite usable none the less.
DV Camcorder, 25mbps bitrate, for audio + video	Audio: 256 Kbps, 44100 Hz, 16 Bit, Stereo.	Very good, > 95% good packet rate.

Firmware update

The Antenna Tracker stores its firmware in flash memory, which may be upgraded easily using a standard Type A->Mini-A USB cable (commonly used to download pictures from digital cameras).
Firmware upgrades are available from the ImmersionRC website, and may be installed using the EzOSD firmware update tools, by following the same procedure.

Troubleshooting

Here are various steps to find out issues with the tracking.

Listen to the audio
The first step if it doesn't work right is to check that a signal is received:
plug some earphones to the audio output of your receiver. You should hear some pretty characteristic rhythmic beeping on the right audio channel.

Verify Quality of transmission with a phone with iTelemetry Dongle
You could try to check the quality of this signal with your cellphone using the iTelemetry app on iPhone and DroidTelemetry on Android, if you own the appropriate iTelemetry Dongle. The app shows a display of the signal, which helps to determine if there is any signal and if there is some noise on it.

Ratio of good vs. bad packets
This shows the amount of correctly received packets versus badly garbled packets. If you have a lot of bad packets, check your antennas and cables. This is only an indication that packets are received correctly and do not indicate anything about the content of the packet and the quality of the transmitted telemetry.

Quality of GPS signal
Put your model down a bit further away from the antenna and look at the telemetry status page. The amount of change in position and the number of satellites are paramount here. Try moving the GPS antenna up and as far away as possible from other emitting antennas.

Checking, and Debugging Telemetry Audio Issues

There are two useful tools in the EzAntennaTracker v2 for debugging audio issues.

Audio level tool

This is accessed by cycling through the status screens using the up/down buttons. The indicator shows the 'volume' detected on the audio right-channel input. The status in the lower-left corner will show 'Low', 'OK', or 'High', depending upon the suitability of the audio signal for telemetry use.

Decoder status screen

This is also found in the status screens and shows the number of packets successfully decoded, along with the bad packet count, and the ratio between good/bad packets.

Note: In most cases, there is no cause for alarm if the bad packet rate is relatively high. The telemetry protocol used by the EzTelemetry system sends several updates per second, and the antenna tracker (especially when the plane is a long distance out) requires very few for a successful track. If the bad packet count is high when the plane is close to the Rx then it may indicate a problem.

Setting the Audio Gain control

Due to the huge variation in audio voltage levels which are emitted from common FPV receivers, it may be necessary to adjust the audio gain control on the AntennaTracker to increase packet reception reliability.
For most Airwave-based equipment, the levels are close to industry standard line-levels and are adjusted in the factory.

For Lawmate, and Chinese clones (generally 900MHz equipment), the levels have been observed to be > 10x the industry standard.
For reliable packet reception with this equipment it might be necessary to adjust the audio gain. For this, open the EzAntennaTracker by unscrewing one of the side plates and slide the board out of the box. Then use a small eye-glass-style screwdriver to rotate the control anti-clockwise. While doing this, watch the audio level page to see that high and low are well spread, usually with about a difference of 40 between them. Then check the packet reception page, and adjust until only 'good' packets are being received.

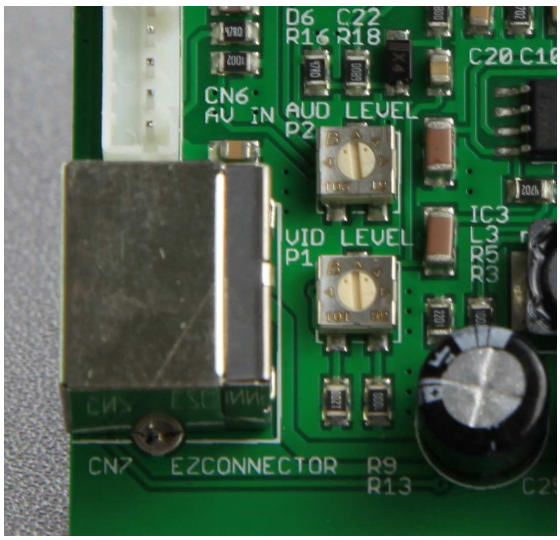


Figure 6: Audio Gain Trimmer

It is important to note that for most equipment sold and used in Europe (2.4GHz, 5.8GHz) this procedure is not required. The default audio level is ok.

Support

First line of support is done by the reseller. If you encounter any problems with your ImmersionRC product contact them first.

For support on issues involving equipment from other brands and also general support for ImmersionRC products, the best place to go is the ImmersionRC section of FPVlab.com.
We actively monitor this forum and provide support here.

Regulatory notice

The use of this product may be prohibited in your country/region/state, please verify that the RF output power and frequencies of components used with this receiver comply with local rules and regulations. This product may require a license to operate.

Directions on safety

ImmersionRC advocates the safe use of their products, always make sure you equipment is in proper working order, is checked prior to every flight and that your are familiar with and respect the equipment's capabilities and limitations. Do NOT fly recklessly, do NOT fly near airports, freeways, towns, people, etc, basically anywhere where an equipment failure or pilot error can result in injury or damage to people and/or property.

Warranty

For warranty claims or repair requests please consult the retailer that you purchased this product from, they will be able to help you with your warranty claim or repair request.

Like Us

We would like thank you for purchasing this ImmersionRC product.

Like ImmersionRC's Facebook page and be kept up-to-date with news, product releases, firmware updates, tips and tricks, and other information relevant to the FPV hobbyist.

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You can also follow us on Google Plus
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We have even been known to Tweet on occasion
https://twitter.com/@immersionrc