



Arkbird V3.1028 Features:

ARKBIRD is a high-accuracy autopilot designed for fixed-wing. It can superimpose OSD(OnScreenDisplay) data on videos and at the same time control the balance, the return and many other maneuvers of your aircraft with high precision.

The perfect auto-stabilization system and a plug-and-play design free you from worries and inconveniences and enjoy the beauty of FPV in an instant.

1.Function all in one board, on board IMU (Inertial measurement unit), OSD (On Screen Display), barometer Attitude sensor, 12V-5V regulation chip, "ESC + voltage regulation" dual power supply. Industrial reliable designed.

- 2.Plug & Play design, no needed to weld any wire, Adjust parameters by OSD menu and radio stick.
- 3.Intelligent PID controller. Easy to adjust, support delta-wing, V-tail plane.
- 4.One button auto-leveling, one button RTH (return-to-home), lost radio signal return-home.
- 5.Cruise flight (Keep straight &constant-height flight).
- 6.Gyro normal balance and 3D balance. Hover mode.
- 7.Fence mode (Auto Switching to Return-to-Home Mode while flying out of the rectangle area specified.)
- 8.4 Way point flight, coordinate set by radio stick.
9. "Launch Assist" function which can help to control throttle and elevate angle when take-off.
- 10.RSSI port available, 10 channel PPM port supportable.
- 11.Compatible with Arkbird airspeed sensor.

One board OSD features:

1.Power & OSD Voltage display, 3D Go-home arrow, radar mark, flight time, horizon, total distance, and power consumption.

2.Customized interface: can set Fighter HUD interface, Simple interface, can choose the font size, the demands of latitude and longitude.

3."Flight Record" records the time, voyage, data of power consumption and various maximum records of the flights.

Reminding: For the first installation, please power up after a wire check. Forcible satellite search interface will be entered (incontrollable) every time you power up. You can pop-up manually and adjust rudder angle in Manual Mode and auxiliary control in Balance Mode. A Neutral Point Check for the sensor is necessary. Also, you need a fail-safe protection for the receiver in case your autopilot loses control when returning home. Adjust the OSD

voltage value before you can take off.

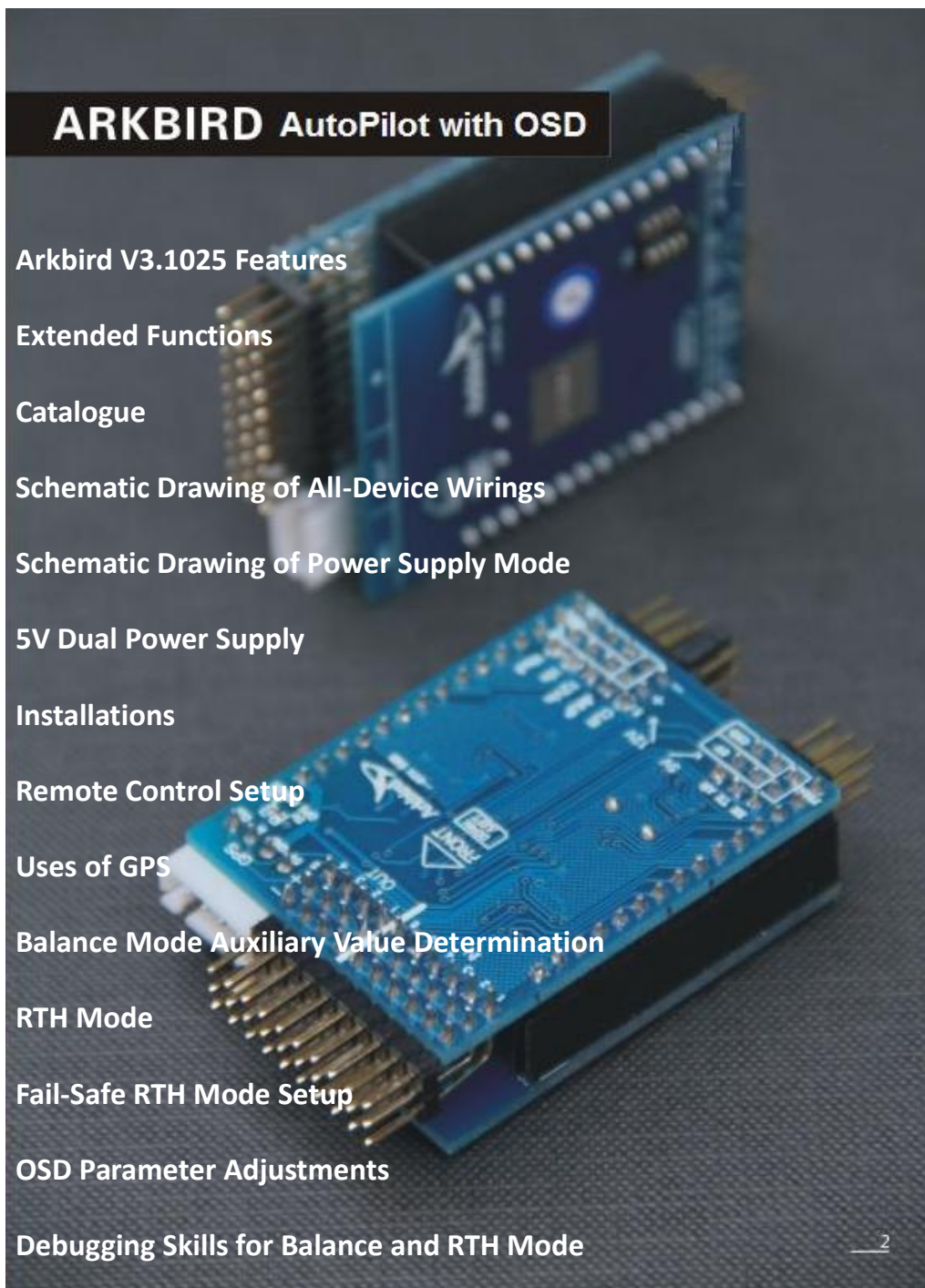
For the first flight, we suggest take off with "Manual Mode". Check if the aircraft flies normally after switching to "Balance Mode" in a level flight. Then switch to "RTH Mode" and check the autopilot by using OSD parameter (see the last chapter in the instructions: Notes for Balance and RTH). Please keep an eye on the important parameters during the flight (Vibration value, Satellite number, Speed and Altitude).

When the maiden flight test is done, Balance Mode can be used freely for taking off the autopilot, or you can use extended functions such as waypoints, cruise flight or fence mode.

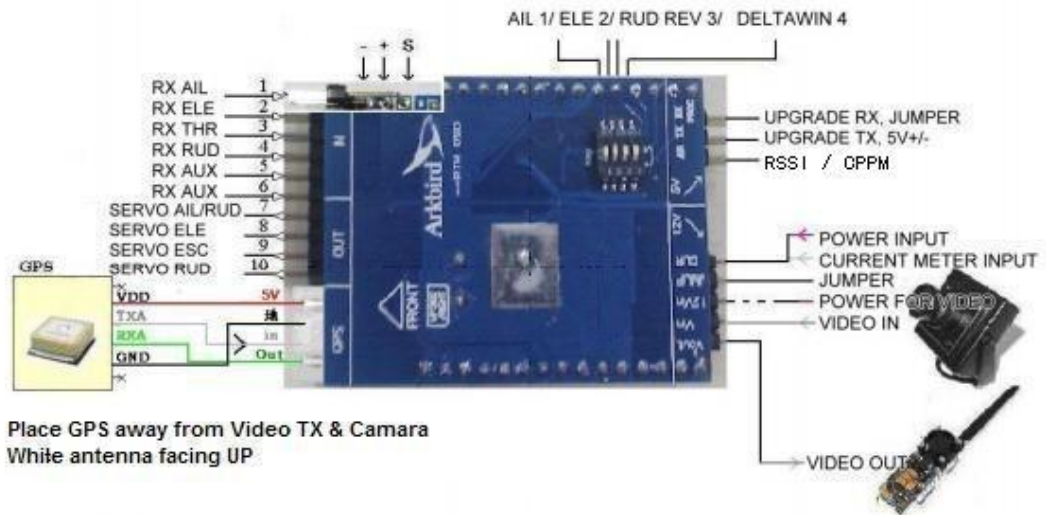
Enjoy the flight.

Attention

All the details can be found in our instructions. Please read carefully before operating and pay close attention to the details and important parameters, in case you miss any important information which may leave hazards or cause damage.



1 Wirings



Use 3P wires “black (ground), red (power), white (data)”

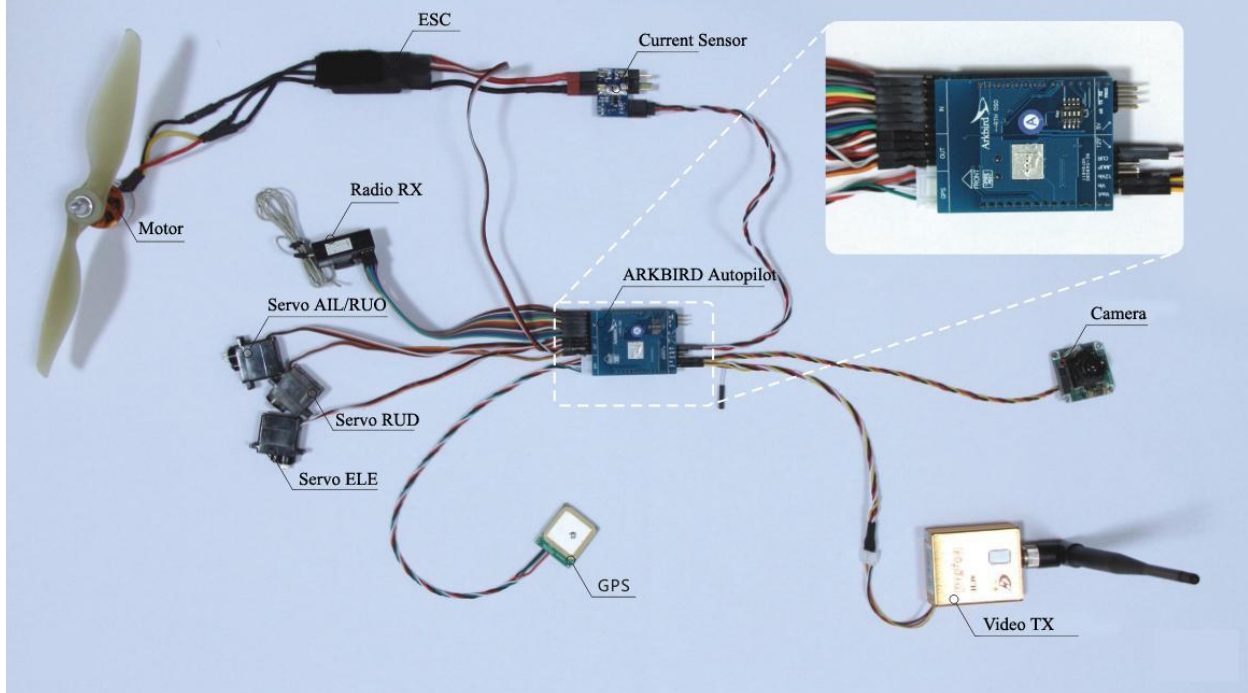
(Note the polar of camera wire, DO NOT POWER ON before carefully check.

Especially 12V, incorrect wiring will damage the autopilot permanently!)

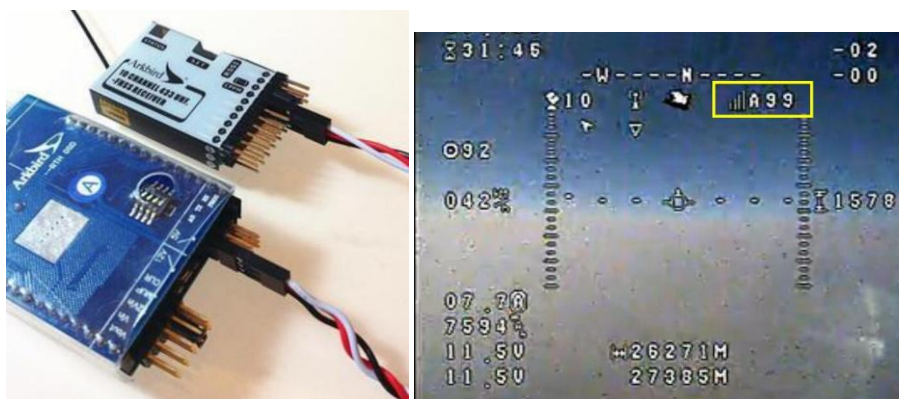
(If The camera needs a 5V supply, please connect a BEC from 12V or main power, Do not connect CPU 5V for a 5V camera in case of the power supply shortage)

Arkbird System's Assemble Map

ARKBIRD Autopilot



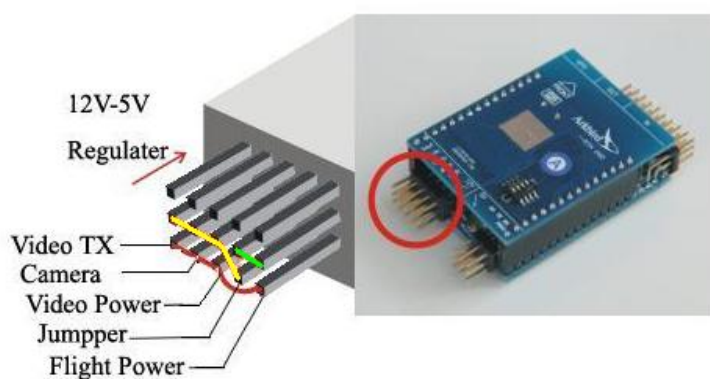
The AR port in the bottom right corner can be used as PPM output interface, which supports Arkbird 433 receiver to achieve single-wire 10 Channel transmission and signal strength RSSI (automatically identified when plugged in).



2 Power Supply Mode

Recommend using one single 3S (12V) battery to supply **motor power** and **Arkbird OSD12V**, Video TX & camera (Shared supply),

Otherwise, use one battery (2S-6S) to supply motor power, another 3S battery to supply OSD 12V&Video (Separated supply).



3S Battery Shared Power Supply (Factory Default)



Arkbird sensor's 3P wire can wire in the **motor power**.

1. If 3S battery, plug in the jumper (Default), it will supply power to **12V Video system** (Arkbird OSD 12V, Video TX & camera).

OSD12V - 5V regulator provides additional 5V power for OSD & CPU.

If not using OSD, we also strongly suggest plug in OSD 12V to provide dual power to prevent any issue caused by ESC 5V power insufficiency.

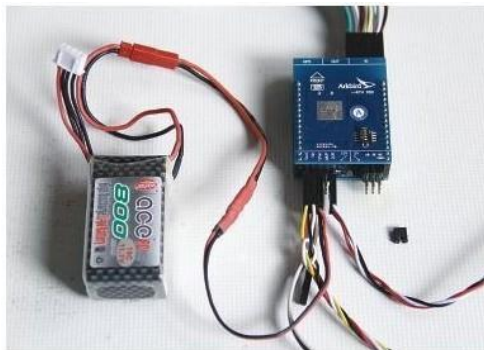
Independent Power Supply



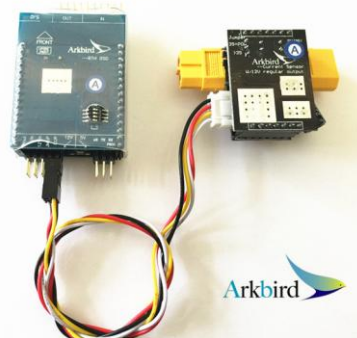
2. If separated supply, remove the jumper, connect another 3S battery (800mah-1000mah) to the Video Power Port (12Vin) on the third row.

If separated supply, the **sequence to power on** is OSD 12V first, and then **motor power**. Otherwise, the OSD cannot initialize and display.

Schematic drawing of Independent Power Supply Wiring



(You can also choose the new Arkbird current sensor with 12V regulated output (accessories) which shares one battery with motor and the video sector. Please see as below:)



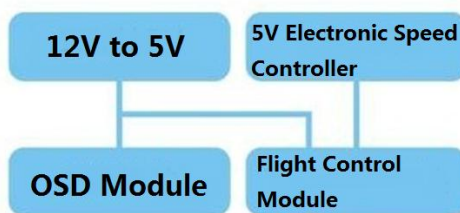
Note:

When using 4S-6S battery, connect jumper cap to ">3S"(Default connection, Direction connection),the output voltage of white line is 12v at the moment.

When using 3S battery, connect jumper cap to "3s=POW", regulator module will not work at this time, the output voltage is Power voltage of your 3S battery.

3 5V Dual Power Supply

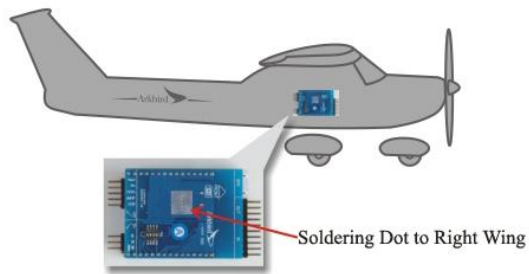
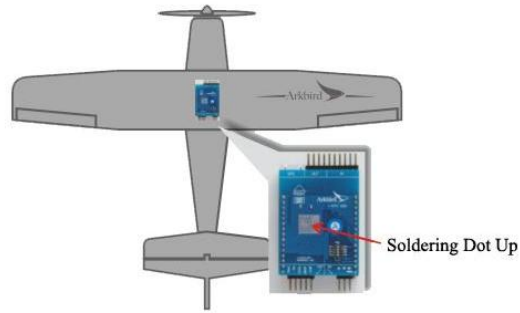
On board OSD 12V to 5V regulator , with 5V BEC(form ESC) supplies power to the CPU module at the same time.



If OSD function is not used, please plug in OSD 12V power as well to prevent a lack of power supply for 5V electronic speed controller.

4 Installation:

1. The pins of Servo & Radio RX shall stay forward (toward flying direction), the side with soldering dot shall be upward or Vertical toward right wing. (Default is level installation)
2. Keep GPS antenna upward placed and away from interference sources such as image transmission and camera.
3. Put on heat-shrink tubing, fix by sponge and cable tie. Please keep away from motor to avoid vibration which will reduce the accuracy of sensor.
4. While using on flying wing, connect channel 1 output to right servo and connect channel 2 output to left servo. DISABLE the mix function from transmitter, switch Dip switch 4 to "0" to enable flying wing mix.
5. When using on V-wing, connect Channel 2 output to the right V-wing; attach Channel 4 to the left V-wing. DISABLE the mix function from transmitter, enable V-wing mix in the OSD menu(Flight Parameters).
6. While using on 3-channel plane, connect Channel 1 output to rudder to steering.
7. When setting return-to-home, please take off propellers for safety concern.





2 ways of installation


5 Switch Modes through CH5 and CH6:

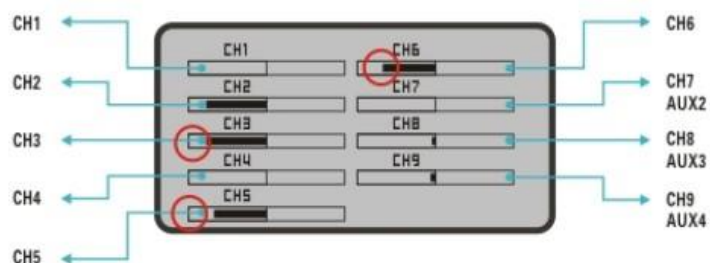
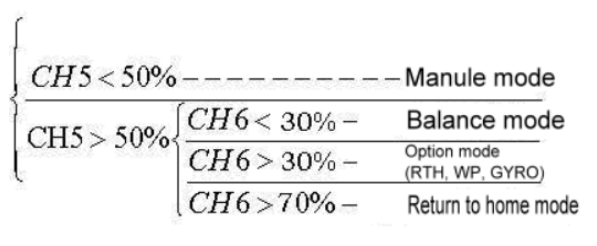
1. After installation, test OSD and the radio control. Use CH5 and CH6 (0% to 100%) to switch flight mode.

2. While CH5 < 50%, it switches to Manual Mode (OSD shows ) , Autopilot is not involved in the control.

3. While CH5 > 50% and CH6 < 30%, it switches to Balance Mode (shows ) ;

While CH5 > 50% and 30% < CH6 < 70%, it switches to Custom Mode (Waypoint Mode  ,Hover Mode, Fence Mode, RTH mode) , Default is RTH mode.


While CH5 > 50% and CH6 > 70%, it switches to Return-to-home(RTH) Mode. (shows ) .



6 GPS & Save Home Position

After power on, Arkbird will start to search GPS satellite and save the first valid position as Home.

During searching, the elevator will be up and any manipulation of radio stick is invalid. If need to skip the searching, please push CH6 more than 75% and push CH1 to left or right side for 1 second.

Once skipped the searching, it **CANNOT** switch to RTH mode, **RTH logo**  will flash but it is balance mode.



The plane cannot be manipulated when GPS is in the standby interface for a forcible satellite search

Flight OSD Interface

<p>Flight Interface :</p> <p>Flight Time</p> <p>Acceleration Health Value</p> <p>Speed</p> <p>Current Value</p> <p>Power Consumption</p> <p>Image Transmission Voltage</p> <p>Dynamic Voltage</p>	<p>Compass</p> <p>Satellite Numbers Current Mode RTH Direction</p> <p>GPS INFO ← GPS Coordinates</p> <p>E - - - S - - - W</p> <p>I P</p> <p>Radar Display</p> <p>Distance from Home (m)</p> <p>Total Distance (m)</p>	<p>Roll Angle</p> <p>Pitch Angle</p> <p>Waypoint</p> <p>Altitude</p> <p>Roll Control Value</p> <p>Pitch Control Value</p> <p>Throttle Control Value</p>
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1. When Arkbird is auto piloting the plane(RTH mode、Cruise flight), the lower right will display Roll, Pitch control Angle Value and Throttle Value, Adjust Autopilot if these angles not appropriate.
2. The idle current is 0.8A while turning off the throttle, if the readout is wrong, please enter the OSD menu and exit to reset the current value.
3. Please reduce the motor vibration to keep the “vibration value” more than 65 (99 is the most ideal situation).
4. Pay attention to GPS satellite quantity, less than 7 will result mistake positioning.

7 Manual Mode

Radio Stick and SUB-TRIM back to center, set radio travel range as 100%.



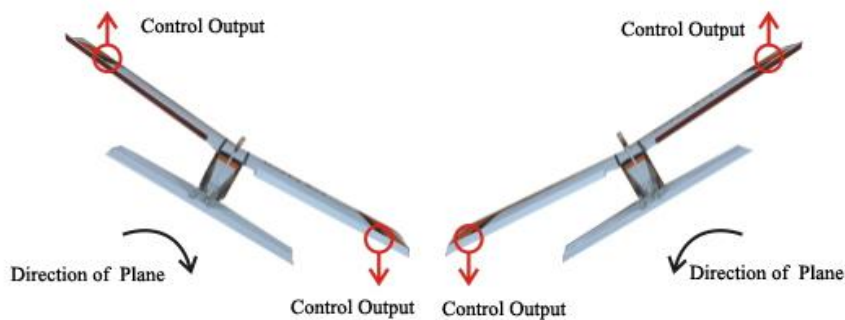
Switching to Manual Mode, Arkbird will not participate control, set **manual control's reverse** through radio, adjust plane's CG and travel angle, make sure plane can fly stably in horizontal without Autopilot.

Reverse Balance Mode assistant Control



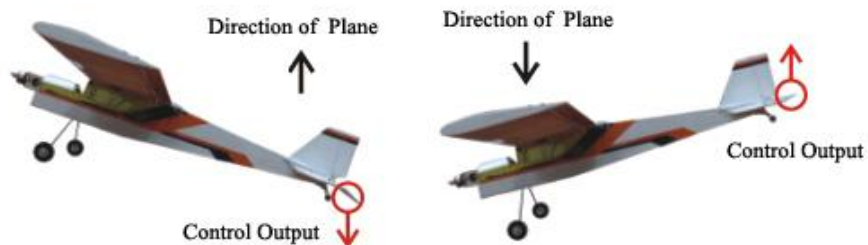
Switching to Balance Mode by pushing CH5 to 100% and CH6 to 0%, if the neutral point is correct, rudder, aileron and elevator shall be at the neutral position, otherwise, please check the neutral point again.(see OSD menu -> CTL parameters)

1. **Aileron:** When rolling the plane to right, aileron shall produce a left compensation automatically, make plane go back horizontal. On the contrary, when rolling to left, aileron will produce a right compensation. Please see as below:



If the compensation direction is not correct, please move the Dip switch 1 to the other side.

2. **Elevator:** When pitching up the plane, elevator shall produce a down compensation automatically. On the contrary, when pitching down, elevator will produce an up compensation. Please see as below:




If the compensation direction is not correct, please move the Dip switch 2 to the other side.

3. **Rudder:** When yawing the plane to right, rudder shall produce a left compensation automatically. On the contrary, when yawing to left, rudder will produce a right compensation.



If the compensation direction is not correct, please move the Dip switch 3 to the other side.

7 GPS and Return to Home Instruction

While switching to **RTH Mode**  (CH5 to 100% and CH6 to 100%), it will adjust the flying height to safe height to go home.

If the **throttle safe** is open and **when height and distance is within 30m**, ESC will alert by a sound of "didi", but no any throttle output, to avoid any hacking while adjusting. (Refer to OSD menu)

During RTH mode throttle will increase if altitude is low, or speed is slow, decrease if altitude is high, or speed is faster than set safe speed.

Once lost GPS satellite, switching to RTH, the plane will **go home automatically based on the home angle of last position before out of signal**. Within radio range, please switch to Balance Mode and land.

Please keep an eye on the quantity of GPS signal and voltage value, fly carefully. Please note if the quantity of satellite is less than 7, the positioning might not be correct.

8 Fail-Safe to RTH mode

Fail-Safe is a **receiver's function** to preset position when receiver is out of signal. Some receivers can set in the radio menu, and some save the current position through receiver (probably through a button).

Please refer to the manual of receiver. Set the fail-safe position the same as Return-to-Home Mode through CH5 and CH6 (CH5>50%,CH6 > 70%). And then turn off the radio to check if it switches to Return-to-Home Mode



(Note: No need to set fail-safe from channel 1 to channel 4 as these four channels are controlled by autopilot under Return-to-Home Mode, which is not relevant to receiver.)

9 OSD and Menu

CH5 switches to Manual Mode(<50%), throttle to 0%, and push CH1 to left or right side for 6 seconds, it will enter into main menu. Exit the main menu if CH5 switches to auto mode(>50%).

Moving stick up and down to change the value, pushing to right side to select, and pushing to left side to exit and save parameters.



Main Menu:

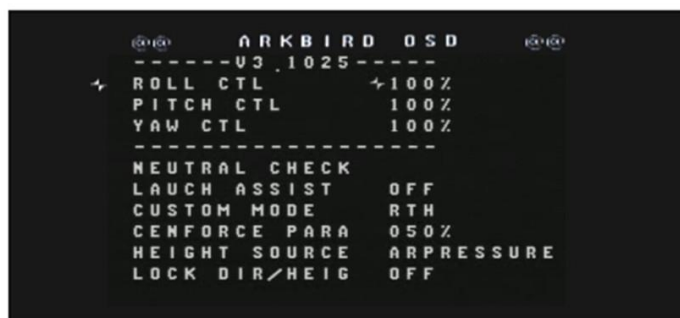
Set HOME	Save home position
Set CTL Parameters	Set CTL Parameters
Set RTH Parameters	Set RTH (Return to Home) Parameters
Set OSD Parameters	Set OSD Interface

Flight Parameters	Reverse and delta-wing mixing
Fence Area Set	Set Fence Mode Area
Way Point Set1	Set Way Point Mode1
Way Point Set2	Set Way Point Mode2
-Flight Record-	Records of flight time, curding range, power consumption and every highest record. "RECENT" refers to the recent flight record: "RECORD" refers to the total record.
Reset All to Default	Move stick to right side for 2 seconds to reset to default



Flight Data Logging Function

Set CTL Parameters



- Roll Ctl Roll Control (%) (equivalent to travel range on radio, **Please adjust the travel range on OSD, do not adjust through radio**)
- Pitch Ctl Pitch Control (%)
- Yaw Ctl Yaw Control (%)

Neutral Check Neutral Point Check:

Neutral point alignment needed under first installation, not used for weeks, or temperature variation is more than 10 degrees.

Aileron **all the way to the right** means it is waiting autopilot be put down, OSD shows "Waiting Neutral Point Check."

Put the autopilot paralleled to the ground (Please prop up if there is a landing gear), and **move CH1 left and right** to do 3-seconds neutral point check. Aileron will be back to center once finished.

Note: **Pushing CH5 and CH6 to minus (0%) and moving CH1 stick to left or right side** within 3 seconds after power on can also enter neutral point check.

Launch Assist

After turning the function on (ON), "Launch Assist" function which can help to control throttle and reduce the difficulty of take-off in manual throwing process.

Switch to balance mode, and the throttle will not be started, OSD displays "T throttle's volume" and "Launch" tip (as is shown below), which means launch assist will occur.

Run up with aircraft in hands, when the speed is higher than 5kmph, the throttle will start output and automatically control the take-off.

Note: This function can only be started when more than 6 GPS satellites are available. In order to ensure safety, in run-up process, lower the throttle stick, lower the aircraft head down 35° or stop the run-up, throttle will be disabled. When the aircraft flies above 15m high, or more than 100 m away, launch assist will be disabled and throttle will under normal control.



Custom Mode Custom Mode (CH5 > 50% and 30% < CH6 < 70%) :

RTH : Return to Home (Default)

Way Point : Way Point Mode, it is able to trace the Way Point Set by WayPoint menu.

HOVER : Hover mode, regard the hover position as balance position

Gyro : Gyro Mode, it will do compensation for unintentional attitude changes.


Attitude Source Attitude Source:

GPS : Attitude acquisition through GPS

AR PRESS : Attitude acquisition through barometer(recommend)

Lock Dir/Heig Lock direction and height (Cruise flight):

ON : Under balance mode, when CH1 and CH2 stick back to center, height and direction will be locked and keep straight & constant-height flight.

OSD shows  . Aileron and elevator can also be controlled through CH1 and CH2.

OFF: Turn off the mode.

Set RTH Parameters



Max Roll Max roll angle while return to home, 20 to 40 degree recommended.

Max UP Max pitch (up) angle while return to home, 20 to 40 degree recommended.

Max Down Max pitch (down) angle while return to home, 20 to 35 degree recommended

Elevate Angle Level flight's elevate angle, 3 to 15 degree recommended. Please adjust this value while pitch up or down to have level flight even the stick is back to center.

RTH Throttle Return to home throttle (%)

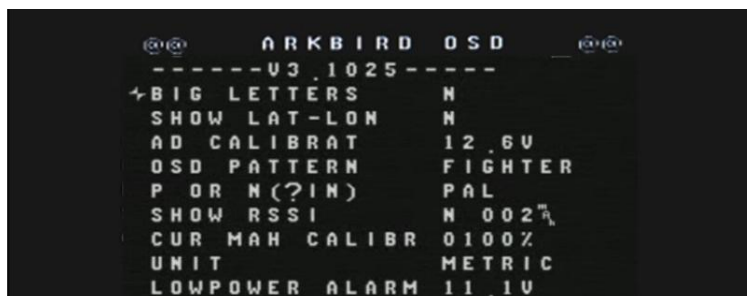
AUTO Throttle The autopilot will use the throttle value of level flight automatically as return to home throttle. (Default)

Safe Speed Minimum speed of return to home (when speed is less than the certain value, it will accelerate throttle in proportion to avoid lost while being upwind.)

Safe Height Safe Height (The minimum height of return to home, 80 to 200 m recommended.)

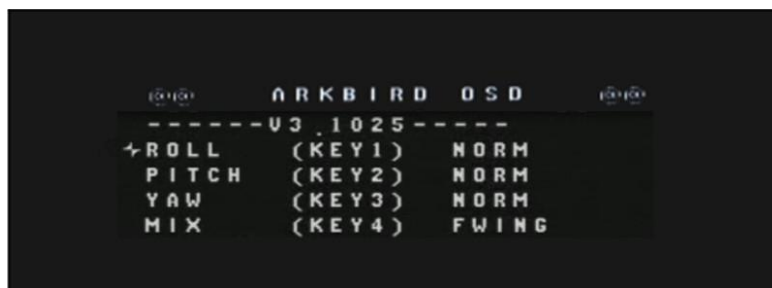
Throttle Safe Throttle Safe (When distance and height are less than 30m, for safety concern, there is no throttle output under RTH Mode.)

Set OSD Parameters



- Big Letters** Size of the characters selection
- Show Lat-long** Show longitude and altitude
- AD Calibrate** Battery voltage calibration
- OSD Pattern** OSD interface selection
 (Simple:Show home angle and voltage only)
 (Default:Normal interface)
 (Fighter:HUD interface)
 (ALL Info:Show all attitude information)
- P or N(Xin)** PAL/ NTSC selection
- Show Current** Current Value Display
- Cur Calibrat** Current calibration %. The rheometer will adjust and input the correct power.consumption after landing to calibrate the displayed battery capacity (MAH).
- Unit** F (Foot) and m (Meter) Unit Selection;
- LowPowerAlarm** (Low Voltage Alarm)Option. There will be a flicker alarm when dynamic power is lower than this value.

Flight Parameters



Note: Adjusting these four parameters is equivalent to adjusting the Dip switch.

- Roll (KEY1)** Roll Reverse
- Pitch (KEY2)** Pitch Reverse
- Yaw (KEY3)** Yaw Reverse
- FlyWing (KEY4)** Conventional / Delta Wing / V-tail

Note: Delta-wing mixed control will not work after setting the V-tail mixed control. You cannot set it back to delta-wing mixed control by adjusting Dip Switch 4.

Fence Area Set



Switching to CH5 > 50% and 30% < CH6 < 70%, within rectangle area and above safe height it is Balance Mode, otherwise it switches to RTH mode.

Fence Mode Fence Mode, "ON" or "OFF"

North Dist North Distance (m)

East Dist East Distance (m)

South Dist South Distance (m)

West Dist West Distance (m)

Safe Height Set Height (m)



Way Point Set

Set four way points (WP1~WP4), allow to turn on/off separately.

Set Custom Mode as Way Point Mode (CH5 > 50% and 30% < CH6 < 70%). The plane will fly in a loop upon the sequence of 1 to 4, skip the waypoint turned off, and return to home while over the safe time.

WP safe time -----WP safe time.

Returning to home if reaches the safe time. Re-timing only next power-on.

WP1 -----WP 1 On/Off

Lng Dist -----Waypoint 1 East-West distance away from Home (m)

">" means East and "<" means West.

Lat Dist -----Waypoint 1 South-North distance away from Home (m) "≃" means

South and "≂" means North

Height -----Waypoint 1 Height (m)

WP2 -----WP 2 On/Off

Lng Dist -----Waypoint 2 East-West distance away from Home (m)

">" means East and "<" means West

Lat Dist -----Waypoint 2 South-North distance away from Home (m)

"≃" means South and "≂" means North

Height -----Waypoint 2 Height (m)

WP3 -----WP 3 On/Off

Lng Dist -----Waypoint 3 East-West distance away from Home (m)

">" means East and "<" means West

Lat Dist -----Waypoint 3 South-North distance away from Home (m) "≃" means South and

"≂" means North

Height -----Waypoint 3 Height(m)



10 Balance Mode and RTH Adjustment **(Very Important)**

Arkbird's default parameters will be ok for most plane types. But if the most ideal situation expected, please refer to the following methods:

First time installation, do a **neutral point alignment**. Plane shall be put paralleled to the ground before neutral point check, moving aileron stick left and right to get start. (Refer to CTL menu)

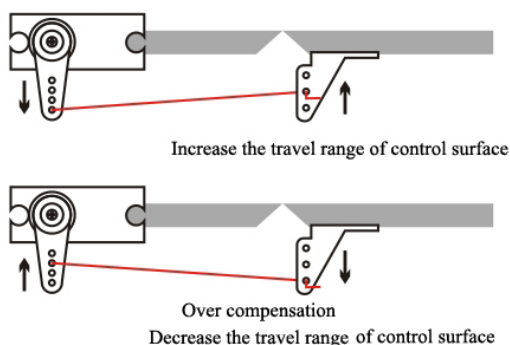
Roll the plane to right and left 45 degree after neutral point check to see if OSD horizon line tilts accordingly and quickly.

Please fly on default and record OSD video on the ground. Observe the attitude through OSD and adjust parameters.

Adjusting Balance Mode:

Purpose: Stick and SUB-TRIM back to center, plane can be able to flight levelly.

1. Please increase control value (“ctl” in CTL menu) or plane’s control surface when the stability not good enough (drift even stick back to center), and decrease it when the plane swings.

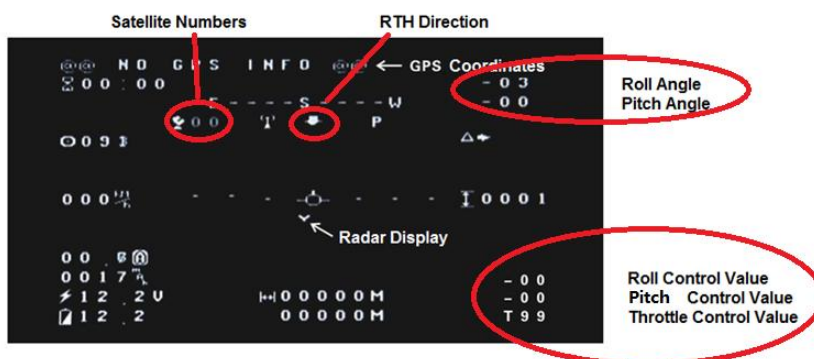


2. If plane pitches up or down when stick back to center, please adjust the “**elevate angle**” value (Do not adjust through SUB-TRIM, otherwise RTH Mode won’t be precise.)

Adjusting Return to Home Mode:

1. Switch to RTH Mode, Important parameters “**Home Direction,**” “**Roll Angle,**” “**Pitch Angle,**” and “**RTH Throttle**” shown on OSD shall be checked all the time.

Flying to certain height, switch to RTH Mode and check if these data are appropriate.



- Adjust RTH parameters referring to these values. If the roll angle is too small to return promptly, please increase the **Max Roll**. If the turning is too fast so that the RTH line is “S” sharp, decrease the Max Roll and **increase Rudder control (Yaw ctl)**
- Adjust **Max Up** and **Max Down** to make plane pitch up and down smoothly. (Too prompt or slow are improper)

4. Based on how far and high expect to fly, adjust **safe height** as high as possible (If fly far than 2km, please adjust this value more than 150m). Please set cruise speed as "**Safe speed**" in RTH menu.

11 FAQ and Solutions:



★When switching to Balance Mode, the elevator will lift up a bit because the "Elevate Angle in a level flight" in the menu is defaulted as 5°. Which means the plane will rise a bit in a level flight to ensure a level route.

★If the aileron has touched the edge which prevents you entering the menu, please check if the route setup is too small on the remote control.

★It's normal when the direction of compass and return arrow is inaccurate while testing on the ground. The data will be calibrated by GPS in 10s after the plane takes off.

12 Other FAQ:



Q: There is no OSD / OSD is incomplete

A: Check the wiring, restart the power.

Notice that if separated supply, the **sequence to power on** is OSD 12V first, and then ESC **flight power**.

Otherwise, the OSD cannot initialize and display.

If there shows OSD but incomplete, check PAL/ NTSC signal custom option or change display device, some USB-AV card output is incomplete

Q: OSD disappear once plugged the camera

A: Change PAL/ NTSC option, use mainstream FPV specialized camera, some surveillance camera is compatible.

Q: Cannot locate home, displaying "Waiting GPS Home"

A: Seeing OSD "Waiting GPS Home" proves GPS wiring is OK, otherwise, please check GPS wiring.

GPS's white antenna shall face up; keep GPS away from Video TX and Camera. Some inferior Video TX's antenna will affect GPS, too. You can try to remove the casing of GPS, or put a layer of tin foil paper under GPS to enhance the performance.

GPS can only work Outdoors, First time about 5-10 minutes, next power on of the same day it would take less than 10seconds to locate.

Q: Plane tilts under Balance Mode / Manual Mode, can I adjust the radio TRIM

A: First time installation, do a **neutral point alignment**. Radio stick and SUB-TRIM back to center, adjust plane's CG and travel angle to make plane balanced.

Arkbird can produce compensation when CG & travel angle is not appropriate, but it is not mechanical stable, there would be hidden trouble under RTH mode. So firstly make sure plane can fly stably in horizontal under Manual Mode.

Q: Inaccurate Return-To-Home

A: Adjust remote control rudder angle to 100% and sub-trim back to center. Check carefully in reference to the

“Debugging Skills for Balance and RTH Mode” chapter of our instructions.

Make ground video recordings. When switching to RTH or other autonomous flight modes, Roll/ Pitch inclination value and throttle control value will be shown at the bottom right corner of OSD. These data will tell you if the control values are proper and will help you judge which parameter needs to be sub-trimmed.

13 Attention:

Please read through carefully:

1. The design purpose of autopilot is to keep balance of flight, it is not able to manipulate plane or prevent stall. You must have sufficient experiences of fixed wing to control the flight.
2. The autopilot is only for small-scale RC model. For safety concern, please do not install in plane for aerial photography which might fly over crowd.
3. Please install the autopilot depends on your demands and check the condition before flying every time.
4. Any equipments and electric products on the plane couldn't be completely reliable, please using this system following the instruction. The system provider is not responsible for any direct or indirect loss and consequence caused by using this product.

