

A3X Pro Expert 3

6 AXIS AIRPLANE GYRO & STABILIZER INSTRUCTION MANUAL

For Firmware Version 1.1, Data Version 1.0

2018.8.1 Revision



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info@bay-tec.de	2



IMPORTANT NOTES

Radio controlled (R/C) models are not toys! The propellers rotate at high speed and pose potential risk. They may cause severe injury due to improper usage. It is necessary to observe common safety rules for R/C models and the local law. Read the following instructions thoroughly before the first use of your A3 Super 3 and setup the gyro carefully according to this manual. We also recommend that you seek the assistance of an experienced pilot before attempting to fly with our gyros for the first time.



IMPORTANT NOTES

Always turn on the transmitter before power on the plane and the gyro. After Power on, A3 Super 3 needs to perform an initialization which includes the gyroscope calibration and stick centering. Keep the plane still and wait for the gyro to initialize, the initialization will take about 2 seconds and the LED will blink blue several times. Don't move the plane and keep all the sticks in their original position until the initialization is done. After a successful initialization, the aileron servo(s) will give you a short up and down move. If the LED retains solid blue, stop moving the plane then the initialization will start automatically.



IMPORTANT NOTES

Always check the gyro direction for each channel before takeoff. An opposite reaction of the gyro could lead to losing control or crash during flight!



IMPORTANT NOTES

Never use a very small setting of basic gain, attitude gain and master gain when flying with the gyro in Trainer mode, or it will lead to a weak control or even losing control of the plane.



IMPORTANT NOTES

When flying, you can fine tune the surfaces by turning the trimming buttons on the transmitter as before, this is allowed. However, we still recommend that always adjust the center position of the servos by using the "servo trimming" function provided by A3 Super 3 if possible.



IMPORTANT NOTES

When connecting the gyro to the PC or the program card, the external LED will always light in solid Violet, and can no longer be used to display the status of the gyro, this is normal.



IMPORTANT NOTES

When connecting the gyro to the PC, the gyro will get power from the USB but it will not pass the power to the servos and the receiver. This is designed to protect the USB port and the internal power IC of the gyro. For this reason, you have to connect the battery for your plane if the radio system is needed while setting up the gyro.

1. INTRODUCTION

Thank you for purchasing our products.

A3X Pro Expert 3 (hereinafter referred to as A3X 3) is a high-performance and functional 6-axis gyro and stabilizer designed for R/C airplanes. This gyro can be used with nearly any size and type of R/C airplanes and it will make the flying even easier and comfortable.

Features

1. 32-bit MCU, high-precision 6-axis MEMS sensor, improved hardware platform and new firmware solution provide more reliable performance.
2. 6 flight modes, including Gyro-Off mode, Normal mode, Trainer mode, Atti-Lock mode, Auto-Level mode and Auto-Hover mode.
3. 6-position flight mode switching supported.
4. Compatible with most standard receivers, standard PPM single-line receivers and Futaba's S.Bus and S.Bus 2 receivers.
5. 7 wing types, dual aileron, dual elevator, delta-wing and v-tail supported.
6. External LED module, integrated with data interface, flat or upright various mounting orientations supported.
7. Sub trim and travel limit settings for servos, separate stick Rate and EXP settings for each mode.
8. Pass-through function for [A2] and [E2] channels.
9. Customizable hardware and software low pass filters for gyroscope and accelerometer, enable you to optimize the performance of the gyro as you wish.
10. Quick setup supported by using the programming card while flying outside.

Thank you for your confidence and wish you fun and great flights with A3X Pro Expert 3 !

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2. SETUP PROCEDURE OVERVIEW

The procedure below will show you how to install and setup the A3X 3 step by step.

1. PREPARING YOUR PLANE

Before installing the gyro, make sure that the plane is well installed, connect all the control surfaces to the servos and make them center by adjusting the linkages. Install the receiver and bind it to the transmitter in advance.

2. PREPARING YOUR TRANSMITTER

Create a new fixed-wing model in your transmitter. Disable all mixing functions on the output channels. Each control function must exactly control one output channel. Activate the second aileron or second elevator channel if you need. Assign a 3-position (or 6-position) toggle switch for flight mode control. Assign a knob or slider for remote master gain control if needed. Keep all the sticks in their middle positions (the throttle stick should be in the lowest).

3. INSTALLING THE GYRO

Mount the A3S2 on the plane, connect the receiver and servos to the gyro carefully. See Page 6 “3.Installation” and Page 8 “4. Receiver & Servos Connection”.

4. POWER ON AND INITIALIZATION

Power on the plane, keep the plane still and wait for the gyro to initialize. The initialization will take about 2 seconds and the LED will blink blue several times. Don't move the plane and keep all sticks in their original positions until the initialization is done. After a successful initialization, it does a short move of the aileron servo(s). If the LED retains solid blue, stop moving the plane then the initialization will start automatically.

5. BASIC SETUP

When the gyro is ready, connect it to the PC or the program card to complete the basic setups, such as flight mode, mounting orientation, wing type and receiver type, etc. If a PPM or S.Bus single-line receiver is used, change the receiver type now and restart the gyro to make the new setting take effect.

6. TRANSMITTER CALIBRATION

Go to the Radio tab of the software, move the sticks, mode switch and gain control knob (or slider) and check if all of the input channels work correctly using the channel monitor of the software. Reverse the sticks or reassign the channels if needed. Adjust the servo travel or end-point setting of the transmitter to make the progress bar be in the right position of +100% or -100% when moving the stick, switch and knob (or slider) to the full left or full right position for each channel. For more details of transmitter calibration, see Page 23 “9.7.1.”



7. CHECKING FOR GYRO DIRECTIONS

Switch to normal mode, check the gyro direction for each channel one by one, and reverse it if the gyro reacts in the wrong direction on the Gyro tab of the software. This procedure is extremely important because an opposite reaction of the gyro could lead to losing control or even crash after takeoff! See Page 15 “6. Gyro Direction”.



8. SERVO TRIMMING AND TRAVEL LIMITING

Go to the Servo tab of the software, click the “Servo Trimming” and “Travel Limiting” buttons to adjust the center position and travel limits of the servos using your transmitter. See Page 25 “9.8.1.Servo Trimming” and Page 26 “9.8.2.Travel Limiting”.



9. ATTITUDE CALIBRATION

If you are going to fly with the gyro in Trainer mode or Auto-Level mode, you are suggested to perform a level calibration to offset the angle deviation caused by installation. See Page 28 “9.9.1.Level Calibration”. In the same way, a hover calibration is recommended to perform if the Auto-Hover mode will be used in the future. See Page 29 “9.9.2.Hover Calibration”.



10. TEST FLIGHT

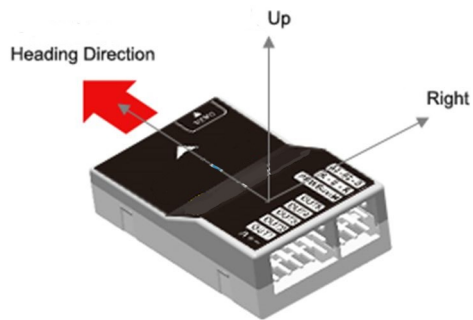
Up to now, you have basically finished the installation and settings of the A3X 3. It's ready for first flight and the gyro gains should be fine-tuned during the flight.

3. INSTALLATION

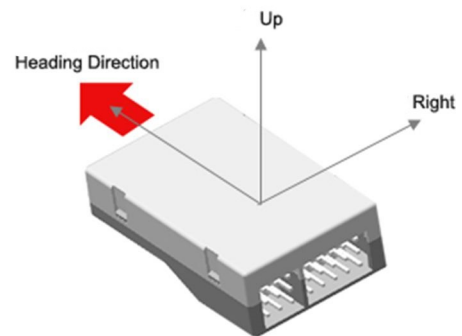
Use one of the supplied 3M pads to attach the gyro to your plane firmly. For best performance the gyro should be mounted as close to the C.G. as possible, and the housing edges must be aligned exactly parallel to all three rotation axis of the plane. The gyro can be attached flat or upright, and even upside down, however, you have to ensure the arrow on the sticker always point to the heading direction, otherwise the gyro will not work normally when operating it in Trainer mode, Auto-Level and Auto-Hover modes.

The external LED module is designed for intuitively displaying the system status and easier connecting to the PC and program card. You can attach it wherever you like and connect it with the main controller using the supplied 4-pin wire.

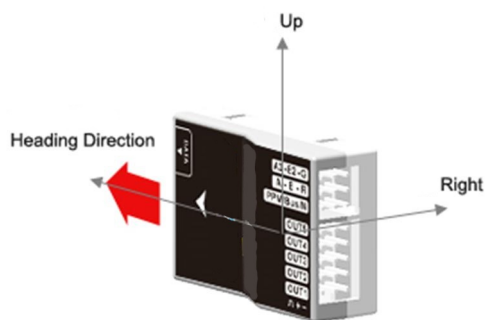
Flat: face up, socket pointing to rear.



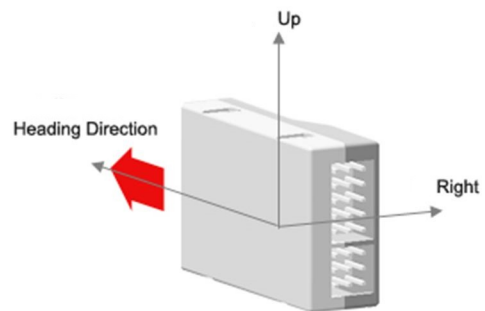
Flat Inverted: face down, socket pointing to rear.



Upright: [DATA] up, socket pointing to rear.



Upright Inverted: [DATA] down, socket pointing to rear.



CAUTION

1. You need only one piece of the tapes each time, a soft or thick mounting may probably impact the performance of the gyro.
2. Never use the hot-melt glue or nylon ties to fix the gyro onto the plane!
3. The gyro is a sensing device, please make enough space around it and keep as far away from other electronic devices or wires as possible.

4. RECEIVER & SERVOS CONNECTION

A3X Pro has 7 separate input channels which used to connect to the receiver and 5 output channels for servos, and supports standard receivers and PPM or Futaba's S.BUS(or S.BUS 2) single-line receivers. There are 7 different wing type available for airplane. The connection for servos will vary depending on the wing type selected. However, [A] Aileron, [E] Elevator and [R] Rudder should always be connected to the receiver in most cases. [PPM/Bus/M] is used to switch the flight mode, even if you don't want to change the flight mode during flight, you still need to connect it to a free receiver port to get power supply for the gyro. [G] is used to adjust the master gain, connecting this channel is not a must if you don't want to change the gain by the transmitter. [A2] and [E2] are used for the second aileron and second elevator control channels. If the wing type currently selected contains only one aileron or elevator servo, [A2] or [E2] will become a pass-through channel automatically, it means that the input signal applied to [A2] or [E2] will directly be passed to the output channel [OUT4] or [OUT5] when [A2] or [E2] is unused. It is possible to use them as any other purpose, e.g. throttle, gear or flap.

4.1. PORT DESCRIPTION

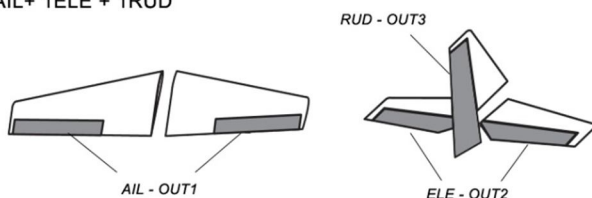
Input Channel	Description	Output Channel	Description
A	To Aileron channel of the receiver	OUT1	To aileron servo
E	To Elevator channel of the receiver	OUT2	To elevator servo
R	To Rudder channel of the receiver	OUT3	To rudder servo
A2	To Aileron 2 channel of the receiver	OUT4	To the second aileron servo
E2	To Elevator 2 channel of the receiver	OUT5	To the second elevator servo
G	Remote master gain control		
PPM/SBus/M	Flight mode switch channel, PPM or S.BUS input channel, power supply port of the gyro.		

4.2. SUPPORTED WING TYPE

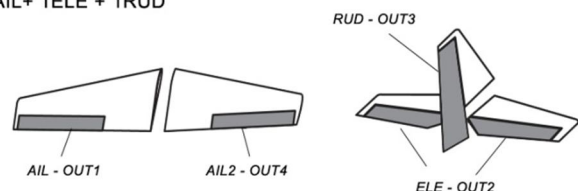
A3X 3 supports standard fixed-wing, flying-wing(delta-wing) and v-tail and provides 7 different wing types for you. The following illustration gives the connection of the servos for each type.

Standard Wing Type

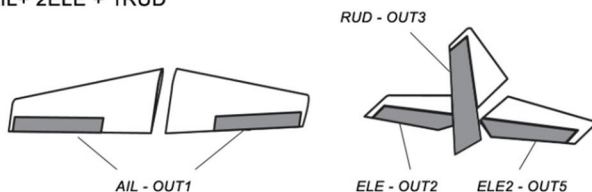
1 AIL+ 1ELE + 1RUD



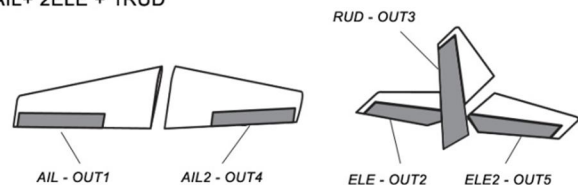
2AIL+ 1ELE + 1RUD



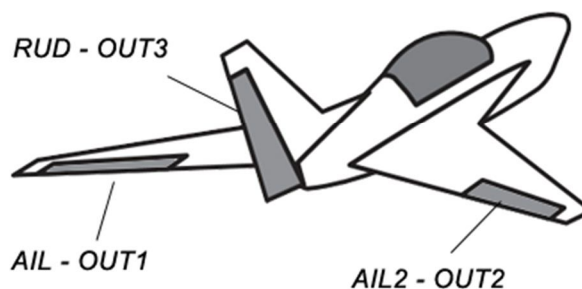
1AIL+ 2ELE + 1RUD



2AIL+ 2ELE + 1RUD

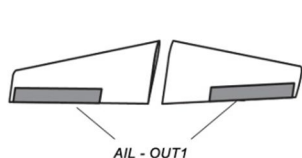


Flying Wing (Delta)

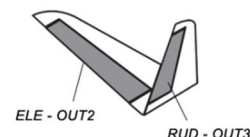
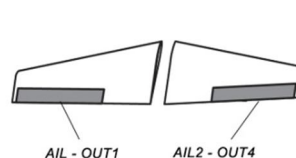
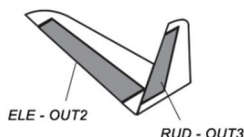


V Tail

1AIL + VTAIL



2AIL + VTAIL



CAUTION

1. Again make sure that there are no mixing functions active on your transmitter. Have a look at the radio's servo monitor and verify that each stick controls only one output channel (except for aileron stick which controls aileron and aileron 2 if dual aileron is used, or elevator stick which controls elevator and elevator 2 if dual elevator is used).
2. If dual aileron wing type is selected, [A] is used to control the servo connected at [OUT1], [A2] is used to control the servo connected at [OUT4], in this case if [A2] is disconnected, [OUT1] and [OUT4] will be switched to be controlled by [A] simultaneously, just as using a Y-extension cable on aileron.
3. If dual elevator wing type is selected, [E] is used to control the servo connected at [OUT2], [E2] is used to control the servo connected at [OUT5], in this case if [E2] is disconnected, [OUT2] and [OUT5] will be switched to be controlled by [E] simultaneously.
4. Most flying-wings have no rudder, in this case, [R] is unnecessary to connect.
5. [OUT4] and [OUT5] will become pass-through channels when they are unused.

4.3. USING PASS-THROUGH FUNCTION OF [A2] & [E2]

For most planes, the second aileron and second elevator channels are not used, in this case, [A2] and [E2] can be used as any other purpose, it means that the input signal applied to [A2] and [E2] will directly be passed to the output channel [OUT4] and [OUT5] automatically. It will be useful in some cases, for an example, if your receiver provides only one single-line output channel without any separate outputs for you to connect the ESC or throttle servo, you can connect the ESC or the throttle servo at [OUT4] or [OUT5] by assigning the throttle channel number to [A2] or [E2] in the software. Besides being used as throttle, [A2] and [E2] can be also used as gear, flap or other channels as you need.

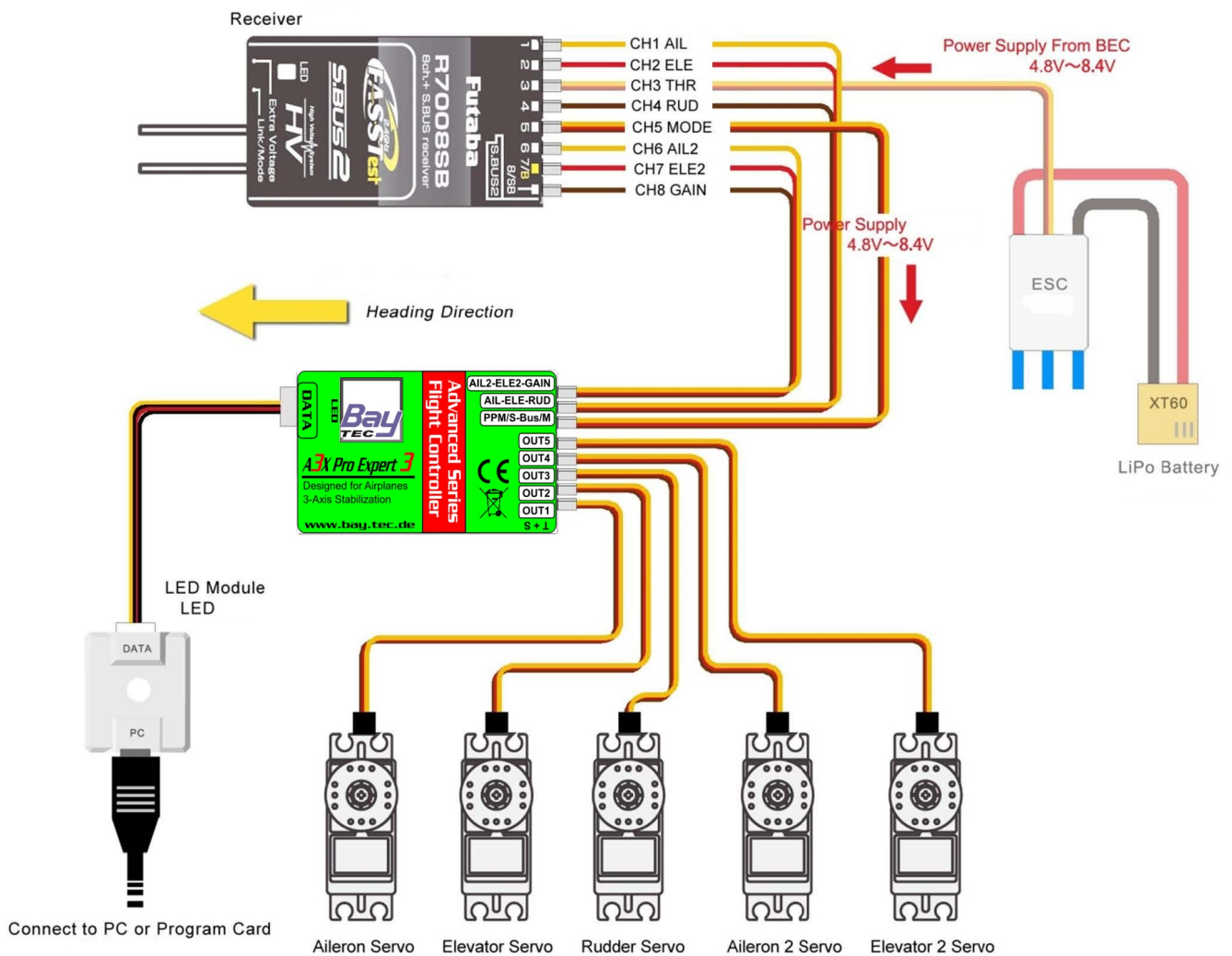
The pass-through function of [A2] and [E2] are also available when using a standard receiver. For example, if 2AIL+1ELE+1RUD type is selected, the [E2] is free so you can connect it to the throttle channel of the receiver and get the ESC or throttle servo connected at [OUT5], it is just the same as connecting the ESC or throttle servo directly to the receiver. But sometimes it will be more convenient for wiring. As another example, when 1AIL+1ELE+1RUD type is using, both [A2] and [E2] are free. You can connect [A2] to the throttle channel and [E2] to the gear channel of your receiver, then connect the ESC or throttle servo to [OUT4] and the gear servo to [OUT5].

The wing type currently selected determines when the pass-through function of [A2] and [E2] will come into effect. In the following table ● indicates pass-through function of [A2] is activated and ● indicates pass-through function of [E2] is activated.

Channels Wing Type	Input (Receiver)					Output (Servos)				
	A	E	R	A2	E2	OUT1	OUT2	OUT3	OUT4	OUT5
1AIL+1ELE+1RUD				●	●				●	●
2AIL+1ELE+1RUD					●					●
1AIL+2ELE+1RUD				●					●	
2AIL+2ELE+1RUD										
Flying-wing (Delta)				●	●				●	●
1AIL+VTAIL				●	●				●	●
2AIL+VTAIL					●					●

4.4. STANDARD RECEIVER CONNECTION (for electric planes)

If you are using the A3X 3 on an electric plane, the following illustration shows you how to connect the gyro to your receiver. This illustration is only intended as an example for 2AIL+2ELE+1RUD wing type. In practice, you may need to adjust the wiring to meet your need.

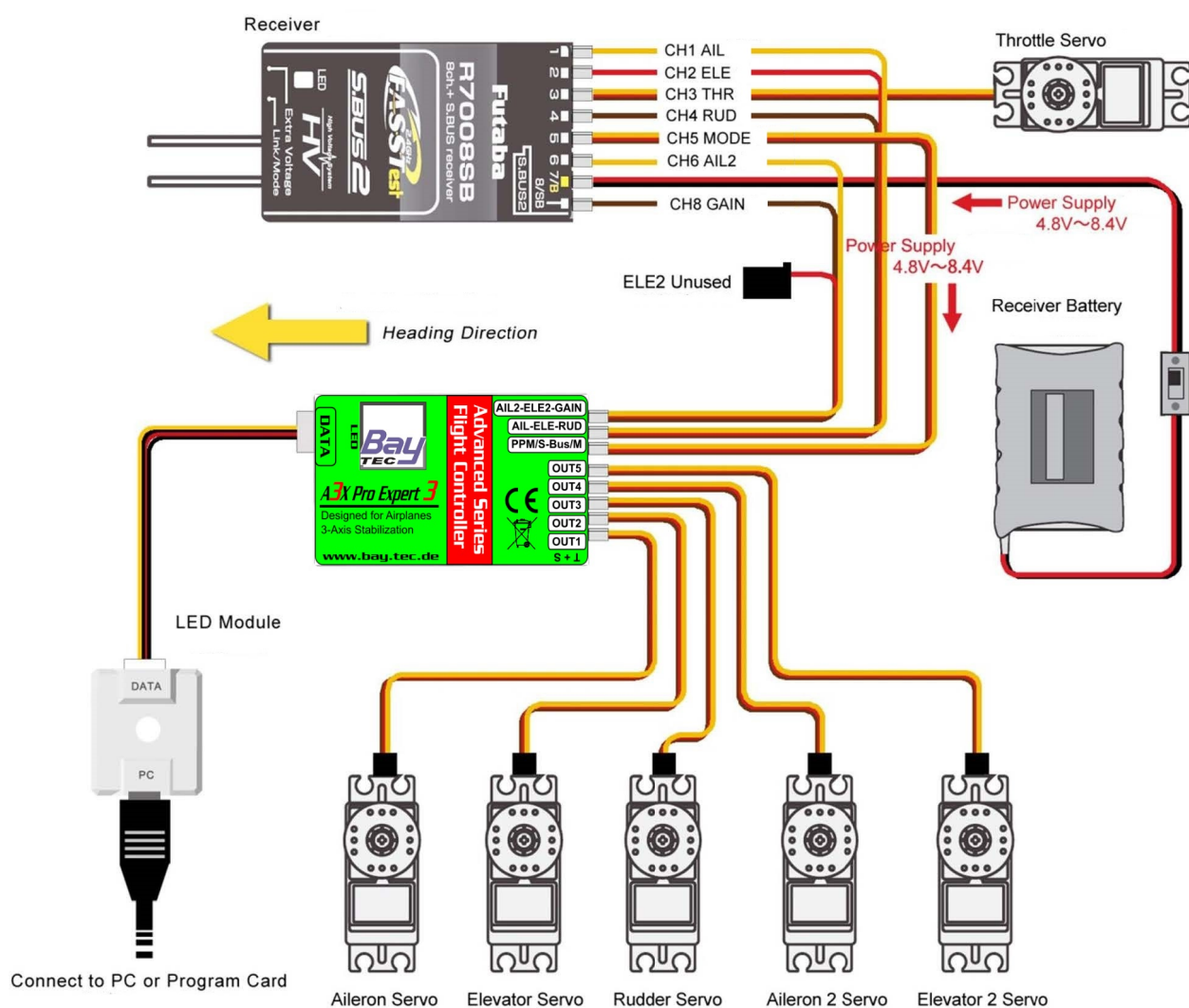


CAUTION

1. Pay attention to the polarity of the plugs. The orange signal line must always be on the top and the brown on the bottom.
2. Check all the connectors and make sure that all of them are firmly connected to the sockets.
3. Please refer to the instructions of your transmitter for setting up the 3-position switch for flight mode control, and the knob (or slider) for remote master gain control.
4. You have to restart the gyro after you change the receiver type to make the new setting take effect.

4.5. STANDARD RECEIVER CONNECTION (for nitro/gas planes)

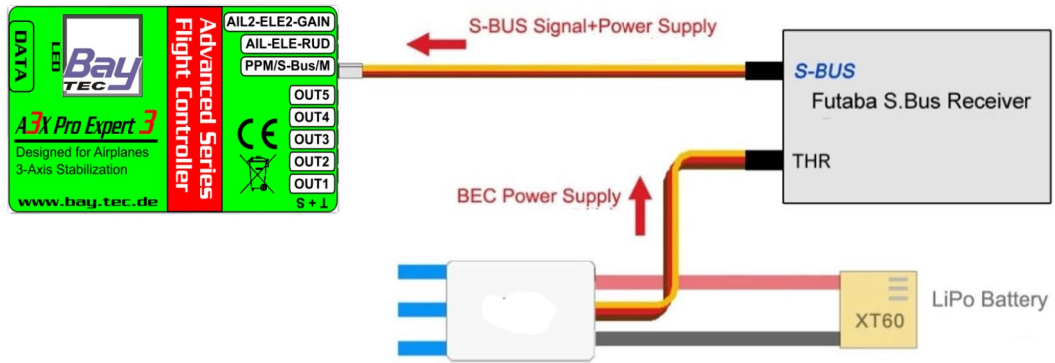
Using the A3X 3 on a nitro/gas plane is similar to electric planes, follow the below illustration to complete connection between the gyro and receiver.



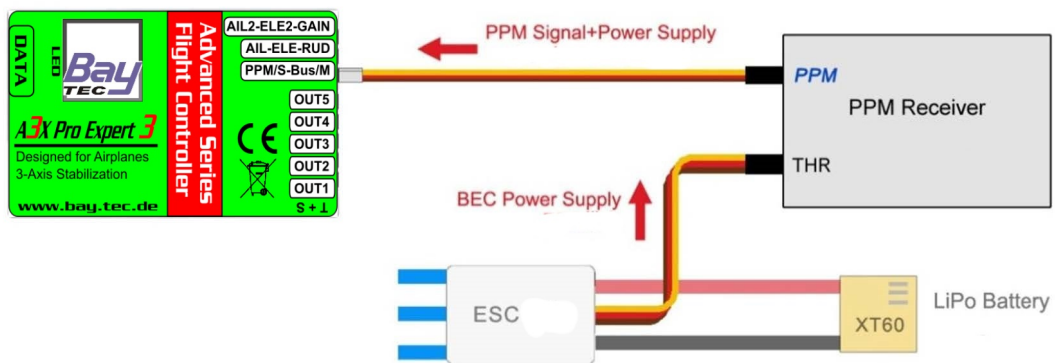
4.6. PPM, S.BUS SINGLE-LINE RECEIVER CONNECTION

Using a single-line receiver (e.g. PPM receiver or Futaba's S.Bus receiver) all channels are transferred by one single wire which connected to [PPM/Bus/M]. When a single-line receiver type has been selected, A3X 3 will load the default channel assignment to recognize the channels from receiver. The default assignment is: CH1=Aileron, CH2=Elevator, CH3=Throttle, CH4=Rudder, CH5=Flight Mode, CH6=Aileron 2, CH7=Elevator 2, CH8=Master Gain. You may program a different channel assignment manually in case the default assignment does not work with your transmitter's function layout. A3X 3 supports a maximum of 14 channels when using a single-line receiver. When programing the channel mapping, select "None" for those channels you don't want to use.

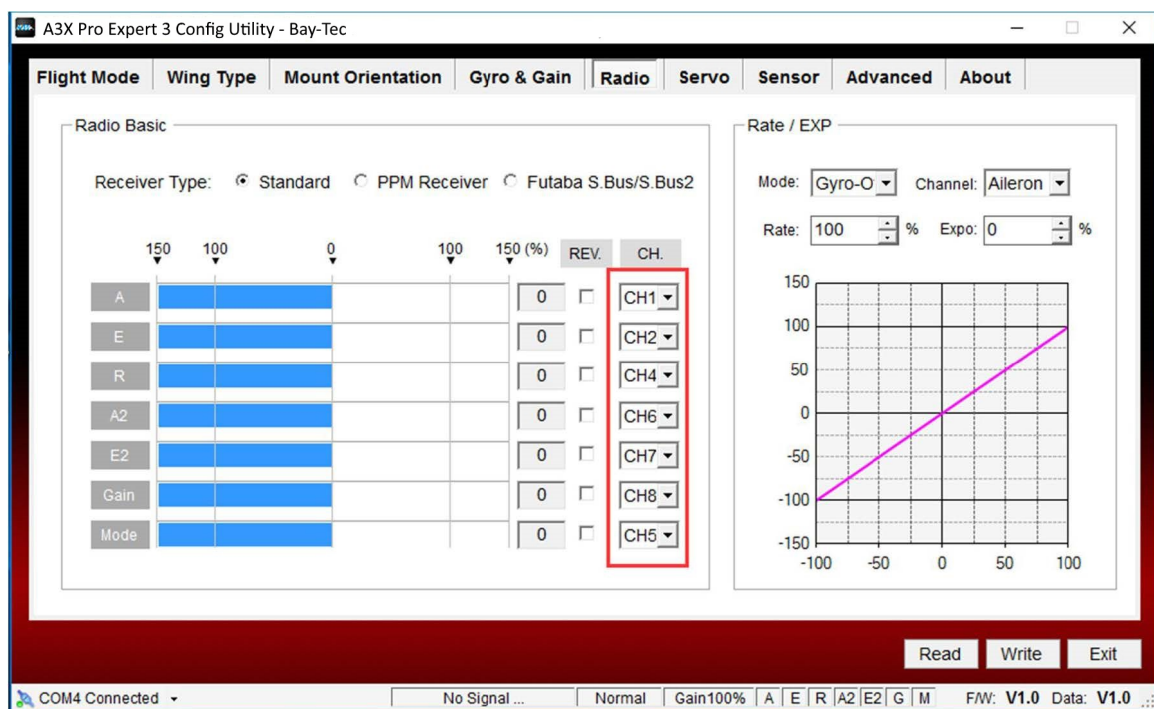
Futaba S-BUS / S-BUS 2 Connection



PPM Single-line Connection



Programming the channel assignment in the software.



5. FLIGHT MODE

A3X 3 provides 6 different flight modes which can be changed by a 3-position switch (or 6-position logic switch) of the transmitter during flight.

GYRO-OFF MODE

Solid Red



Gyro-Off mode is usually used for testing purpose only. When this mode is selected, the gyro will be deactivated completely. The plane will be completely under the control of your transmitter as it was before installing the gyro.

NORMAL MODE

Solid Blue



The Normal mode (also referred to as Rate mode) is the most basic function of the gyro. It works based on the rotation rate control of each axis of the plane. When operating in this mode, the gyro will only correct currently occurring rotational movements, a momentary reaction will be applied to the servos when the plane rotating on corresponding axis, after rotation the servos will move back to their neutral position as soon as the plane standing still immediately. Normal mode can be used with nearly any size and type of airplanes. It can effectively improve the stability and precision of the plane and reduce the stall point specially.

ATTI-LOCK MODE

Flashing Blue



The Atti-Lock mode is also referred to as the 3D mode or AVCS mode. Different from normal mode, the gyro will perform a permanent correction for rotational movements on each axis constantly. Moving the sticks will make the plane rotating at a certain speed on the corresponding axis, as long as the sticks are released the plane will stop and lock its current position immediately. This operation mode is well suited for practicing basic 3D maneuvers such as hovering or knife edge, so we also call it 3D flight mode. Since it can help you to lock the attitude of the plane, it's also helpful for landing. It is worth noting that when the gyro is operated in this mode, the servos will keep driving to one side if a specific control input is given, and the servos will not center even if the sticks are released, this is normal.

TRAINER MODE

Solid Violet



In Trainer mode you can only tilt the plane to a certain angle by giving aileron or elevator stick input. Roll and loop are not allowed in this mode, the plane will be stabilized all the time, independent of any stick input. This prevents the plane from being tilted into a larger angle that may cause a danger. As soon as the sticks are released, the plane will be brought back to horizontal position automatically. You can use this mode as emergency rescue, or in other applications, e.g. to have a training for new beginners or to use for FPV. The maximum angle allowed of trainer mode can be set using the program card or the software. In addition, changing the stick rate can also affect the max tilt angle.

AUTO-LEVEL MODE

Flashing Violet

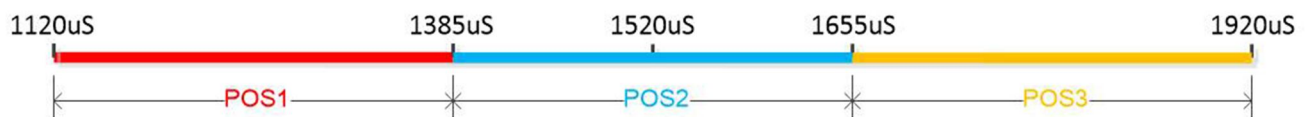


When operating in Auto-Level mode, the plane will be brought to normal horizontal position automatically when releasing the sticks. Different from the Trainer mode, there is no maximum angle limitation in this mode and the plane will be stabilized only when there is no specific control inputs from aileron and elevator sticks. This mode can be used if the pilot becomes disoriented and would like to save the plane from crashing.

The Auto-Hover mode provides the same functionality as the Auto-Level mode. The only difference is that when you release the sticks, the plane will be brought to vertical position (nose up) and keeps hovering. This flight mode is designed to help you to learn hovering maneuver and reduce the probability of crashing.

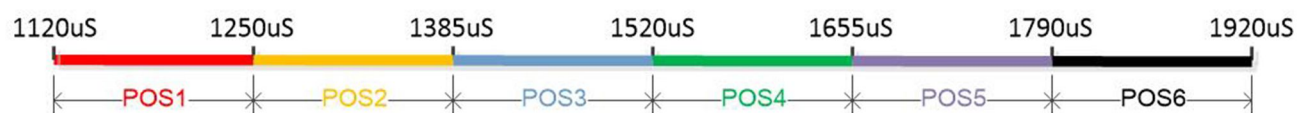
5.1. 3-POSITION MODE SWITCHING

Usually any one of the 3-position toggle switches on your transmitter can be used to switch the flight mode. Sometimes you can use gear or flap channel directly. In order to read three states from the input signal, the pulse length of the input signal must meet the requirement of range as shown below. The flight mode associated to each position can be preset in the software or program card.



5.2. 6-POSITION MODE SWITCHING

A3X 3 also supports 6-position flight mode switching, which allows you switch among all 6 flight modes during flight. To do this, you need to program a mixing function with one 2-position and one 3-position switch on your transmitter. To read six states from the input signal correctly, the pulse length of the input signal must meet the requirement of range as shown below.



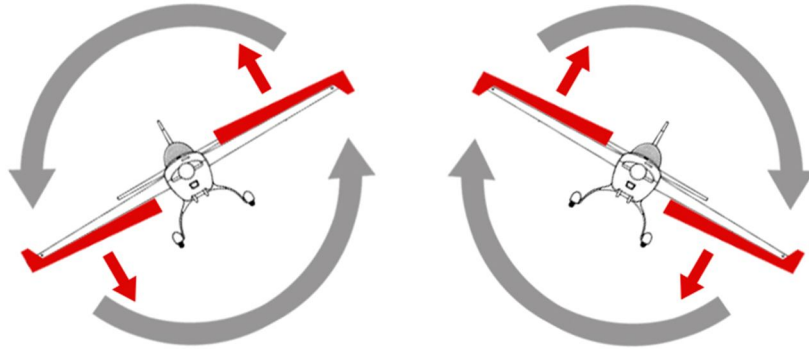
To enable a 6-position logic switch, advanced programmable mixing functions should be supported by your transmitter. We will provide some examples for you to show how to program the mixing on some common radios on our website.

6. GYRO DIRECTION

It's extremely important to make sure that the gyro reacts in the correct direction for each channel before flight. An opposite reaction of the gyro could lead to losing control or even crash!

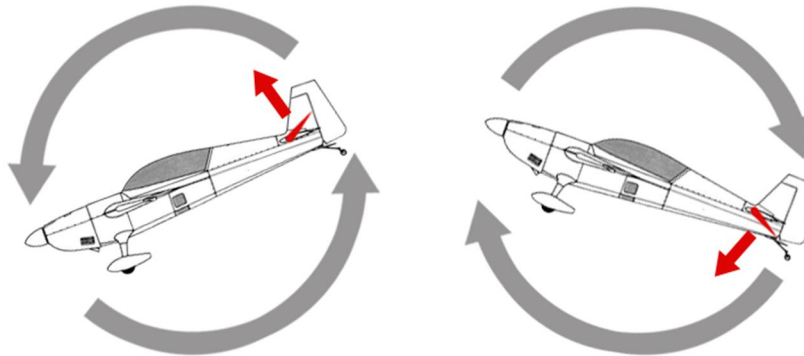
Check the gyro direction in aileron direction

Quickly move the right wing downward around the roll axis, the right aileron surface should flap down and the left flap up as shown below.



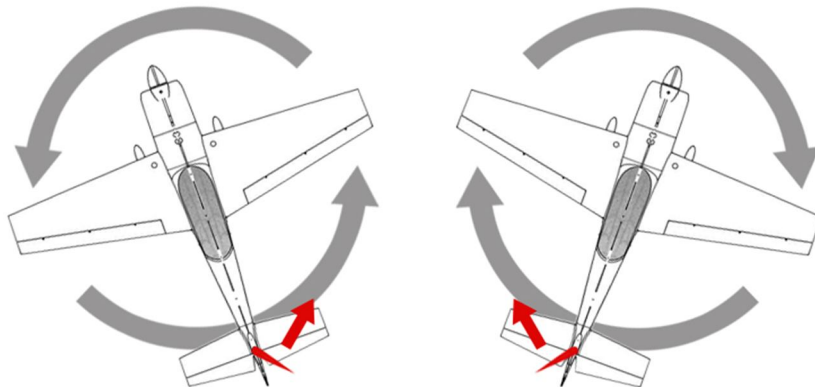
Check the gyro direction in elevator direction

Quickly move the nose of the plane downward around the pitch axis, the elevator surface should flap up as shown below.



Check the gyro direction in rudder direction

Quickly move the nose of the plane to the left around the yaw axis, the rudder surface should flap right as shown below.



7. GAIN SETTINGS

Basic Gain

Basic gain determines the momentary reaction strength of the gyro. The momentary correction exists and plays an important role in all flight modes except off mode. Basic gain is the basis of all gain settings and it will directly affect the performance of the gyro in all flight modes.

Before adjusting other gains, you need to get an appropriate basic gain first. In general the higher the gain the harder the plane will stop after rotation and the more stable and precise the plane will fly. But if the gain is too high the plane will tend to oscillate at high frequency on the corresponding axis. If too small, the operation and stability will not be so good and the plane does not stop precisely and overshoots. The gyro will be deactivated completely if you turn the basic gain to 0%.

For the first flight test it is recommended to start with a lower basic gain setting (e.g. 30%) and switch the gyro to normal mode. In case the plane starts to oscillate in flight then reduce the gain of the corresponding axis. If the control feels weak and imprecise and doesn't hold position when stopping then increase the gain, according to this approach, fine tune the basic gain until you get the best performance.

Lock Gain

The lock gain determines the effect of attitude locking when operating in Atti-Lock flight mode. A lower lock gain can cause an attitude drift of the plane when there is no control command sent from the transmitter during flight. However if the gain is too large, the plane will become too sensitive and overshoot. A fine lock gain should be able to lock the attitude of the plane all the time.

Atti Gain

The attitude gain is only valid in Trainer mode. It determines the reaction speed of attitude with command stick input, the larger the setting is, the quicker the reaction and sharper control behavior will be. When operating the gyro in Trainer mode, the stick input will not be applied to the servos directly. Instead, the amount of the movement of the servos is determined by the tilt angle of the plane and the attitude gain settings. For this reason, you can't set the attitude gain to 0 or a very low value, which will lead to a weak control or even losing control of the plane. In the same way, the basic gain and master gain will also affect the amount of the movement of the servos, so a lower basic gain and master gain are also not allowed when flying in Trainer mode.

Level Gain

The level gain is only valid in Auto-Level mode. It determines the speed of returning level position when releasing the sticks. The larger the level gain, the quicker the plane will be brought back to horizontal position. A lower level gain (e.g. 30~50%) is recommended to let the plane recover to level flight more slowly and smoothly after you release the sticks. If you want to use the Auto-Level mode as emergency rescue during flight, then a larger level gain may be needed to make the plane quickly recover to level position when switching into this mode.

Hover Gain


The hover gain is only used for Auto-Hover mode. It determines the amount of the correction which will always stabilize the

plane in the vertical direction. If the gain is too low, the plane will lean sideways while hovering. In order to get firmly hovering, you can simply set the hover gain to maximum.

Response Gain

The response gain is used to adjust the control behavior of the gyro. It determines how sensitive the A3X 3 will react to stick inputs for aileron, elevator and rudder. Unlike the EXP settings, it works by changing the gain dynamically according to the position of the sticks. As a result of increasing the response gain, the plane will become more responsive. Please note that the response setting will only affect the behavior of the plane when you moving the sticks. It doesn't do anything while the sticks are released.

8. LED DESCRIPTIONS

	Blue, Flashing	Power-on initialization and self-test
	Solid Red	Gyro-Off Mode
	Solid Blue	Normal Mode
	Blue, Flashing	Atti-Lock Mode
	Solid Violet	Trainer Mode
	Violet, Flashing	Auto-Level Mode
	Violet, Fast Flashing	Auto-Hover Mode
	Red, Slow Flashing	TX signal lost. Check the connection to the receiver
	Red, Fast Flashing	Gyroscope sensor error
	Blue, Fast Flashing	Calibrating or testing

9. CONFIG SOFTWARE

Please download the A3X 3 Config Utility and the USB driver installer from our website www.bay-tec.de. Run the setup and follow the instructions to complete the installation. You will then get an icon on your desktop, as shown to the right.

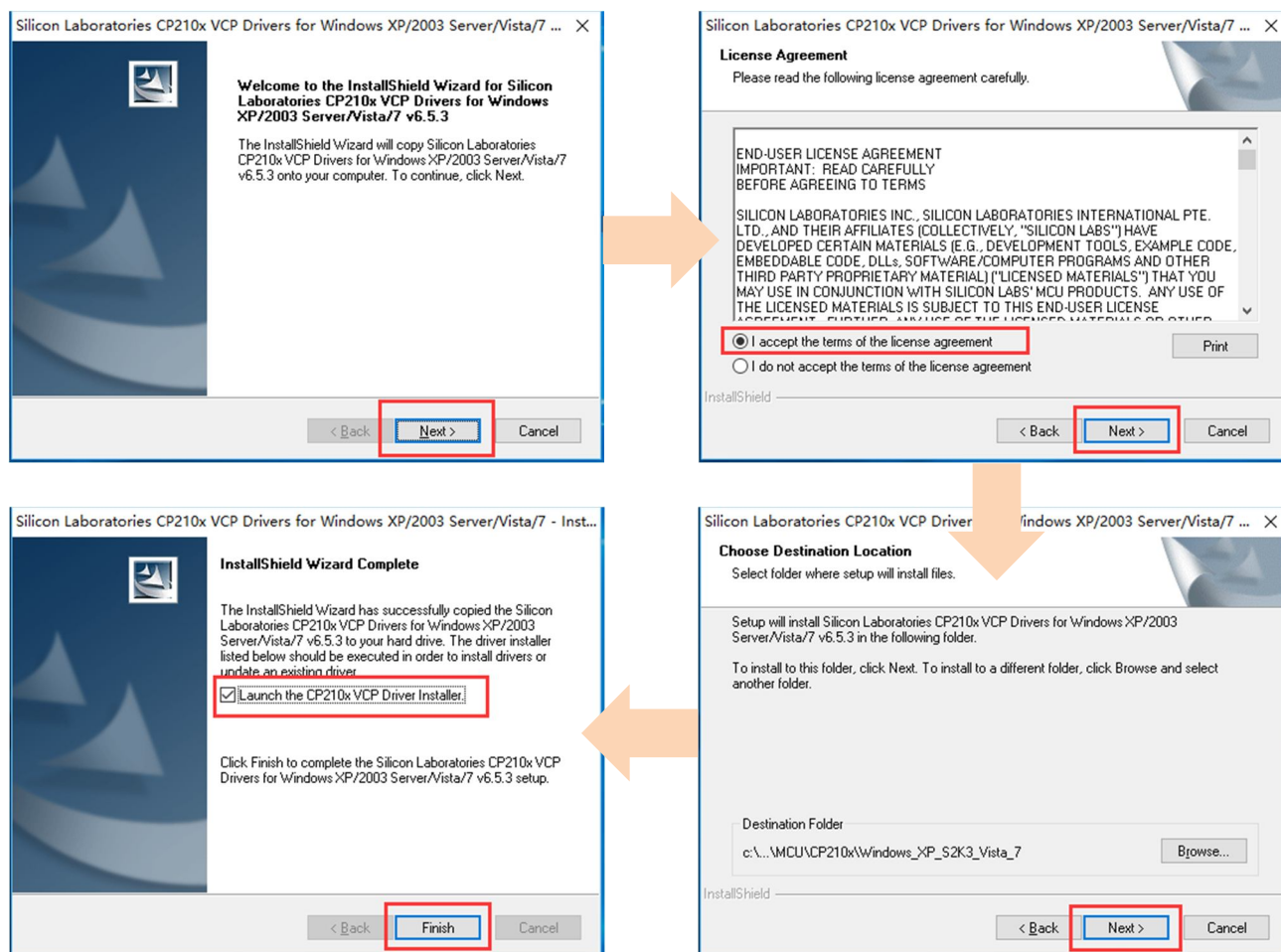


CAUTION

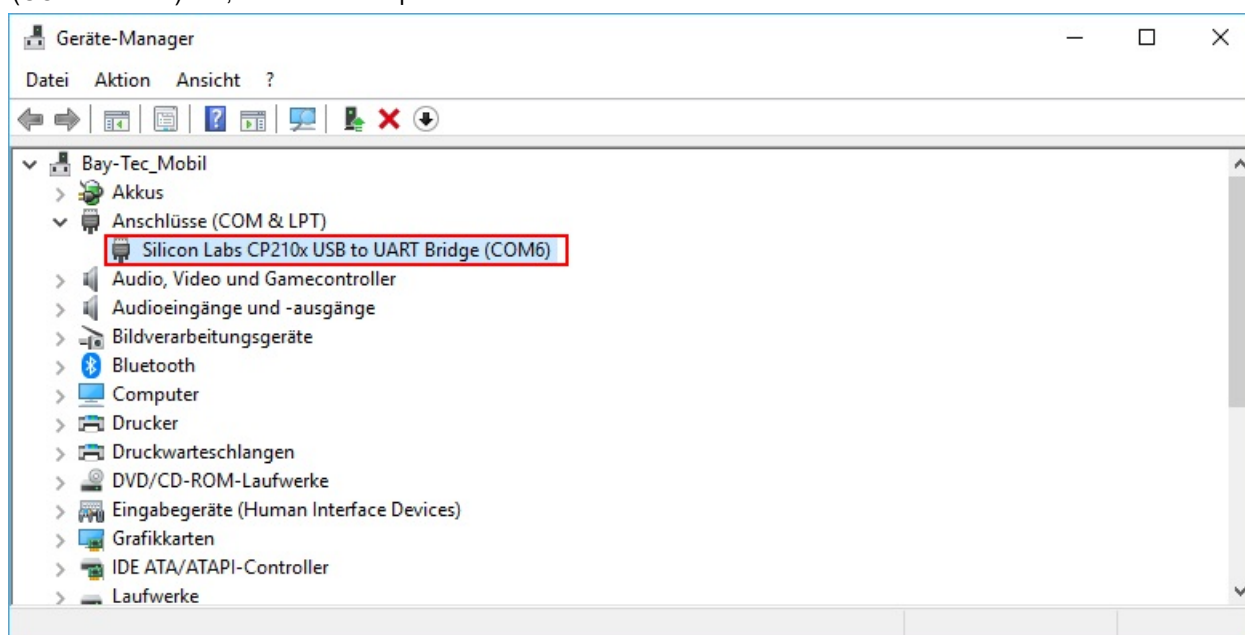
1. The utility supports Windows XP, Windows 7, Windows 8 and Windows 10 (32 or 64 bit).
2. If the installation fails, please install Microsoft .NET Framework 4 first. The framework installer can be obtained from our website or microsoft.com.
3. Don't forget to install the USB driver (CP210x_VCP) before operating the config software.

9.1. INSTALL THE USB DRIVER

Run the USB driver installer and follow the instructions to complete the installation of Silicon Laboratories CP210x VCP driver, as shown below.

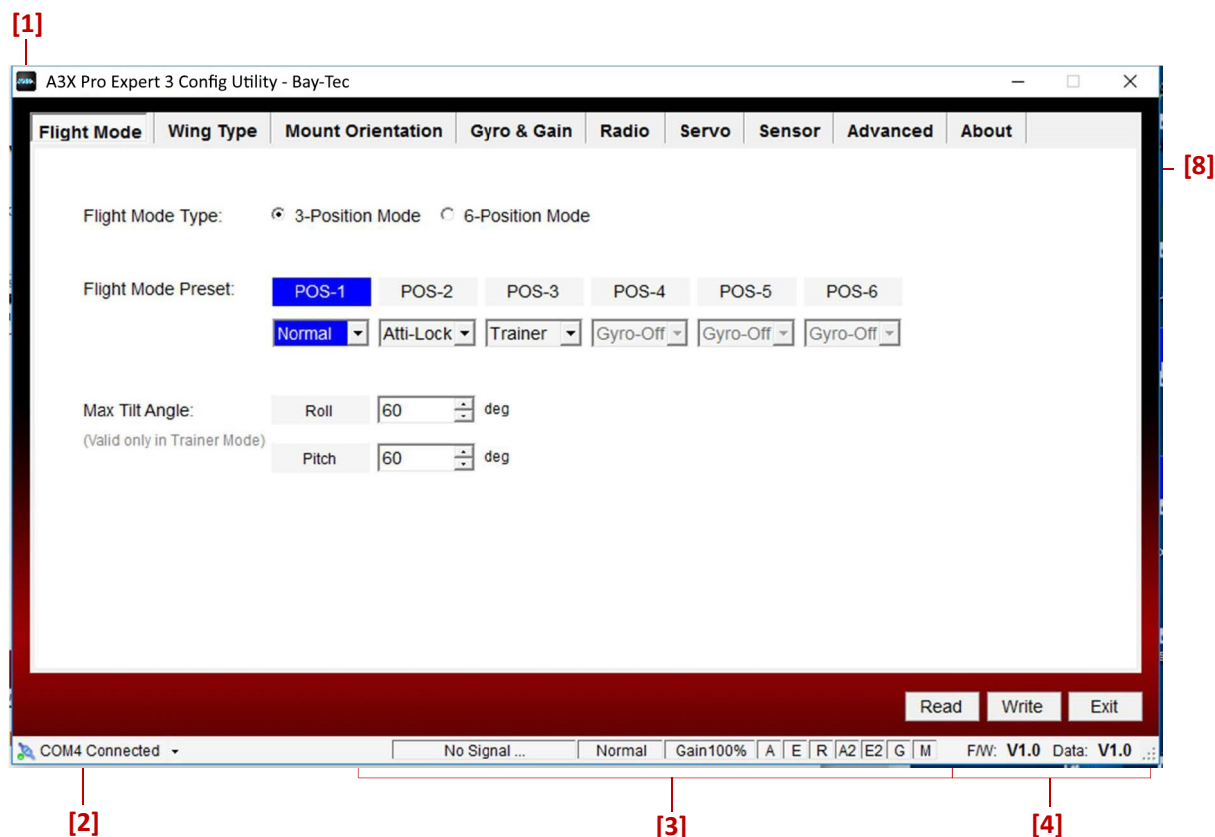


After setup, insert the USB adapter into the PC and wait until the windows finishes scanning and installing the new hardware. Then open the Device Manager and find the item "Silicon Labs CP210x USB to UART Bridge (COMX)" from the Ports (COM and LPT) List, remember this port number and it will be used later.



9.2. OVERVIEW OF THE SOFTWARE



Double-click the icon on your desktop to run the software, you will get the following GUI.



[1] Main Menu

Click the icon on the top-left corner will pop up a menu that contains the most commonly used functions. You can change the language between English, Simplified Chinese and Traditional Chinese in the menu, after change the language, you need to restart the software to make the new language take effect.

[2] Port List

Click to reload the available port list. Click the arrow to open the port list and select your port. The icon  means that the port has been opened successfully. If you get a greyed icon like  you will need to verify that you have inserted the USB adapter and installed the USB driver successfully.

[3] System Information

Display the system information of the gyro, including the system state, current flight mode, master gain and the RX status of each input channel.

[4] Device Information

After successful reading, the current firmware version and data version will be displayed here.

[5] Read

Click this button to read the config data from the gyro.

[6] Write

After you have changed the configuration, click this button to send the changes to the gyro and save.

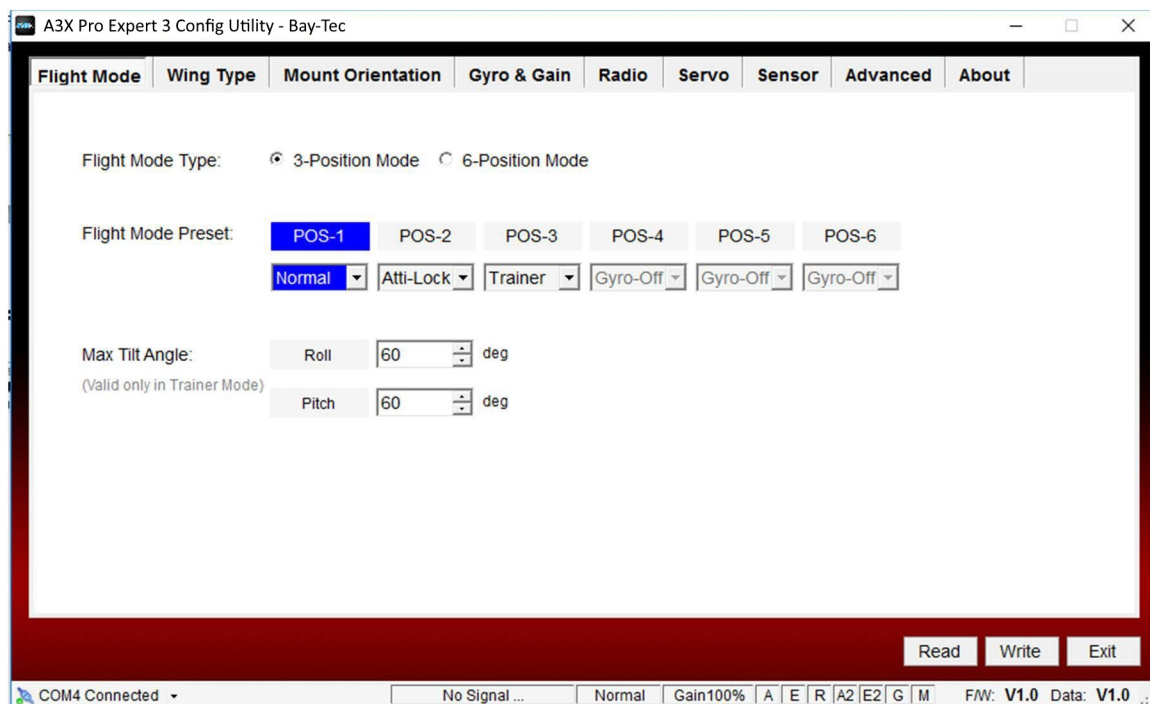
[7] Exit

Exit the application

[8] Setting Functions

All available setting functions are grouped and listed here.

9.3. FLIGHT MODE



[1] Flight Mode Type

Choose either 3-position or 6-position switch for flight mode control.

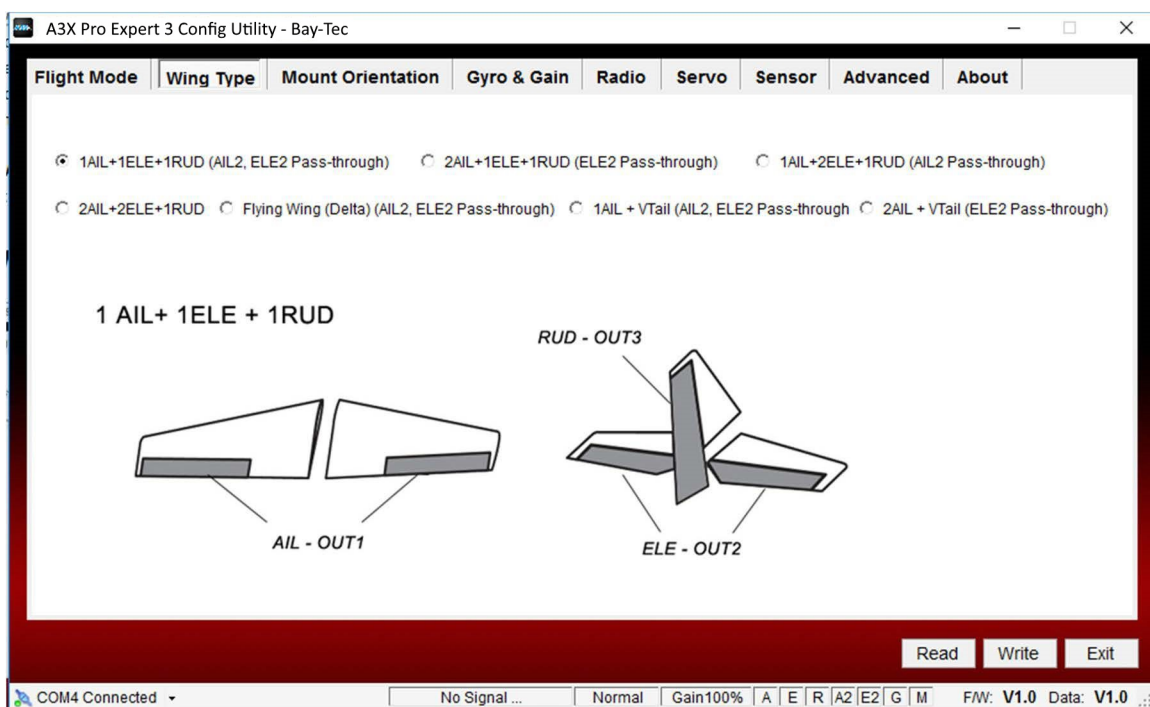
[2] Flight Mode Preset

Assign the desired flight mode for each position of the switch, blue background color is used to indicate the position currently selected when you flipping the switch.

[3] Max Tilt Angle

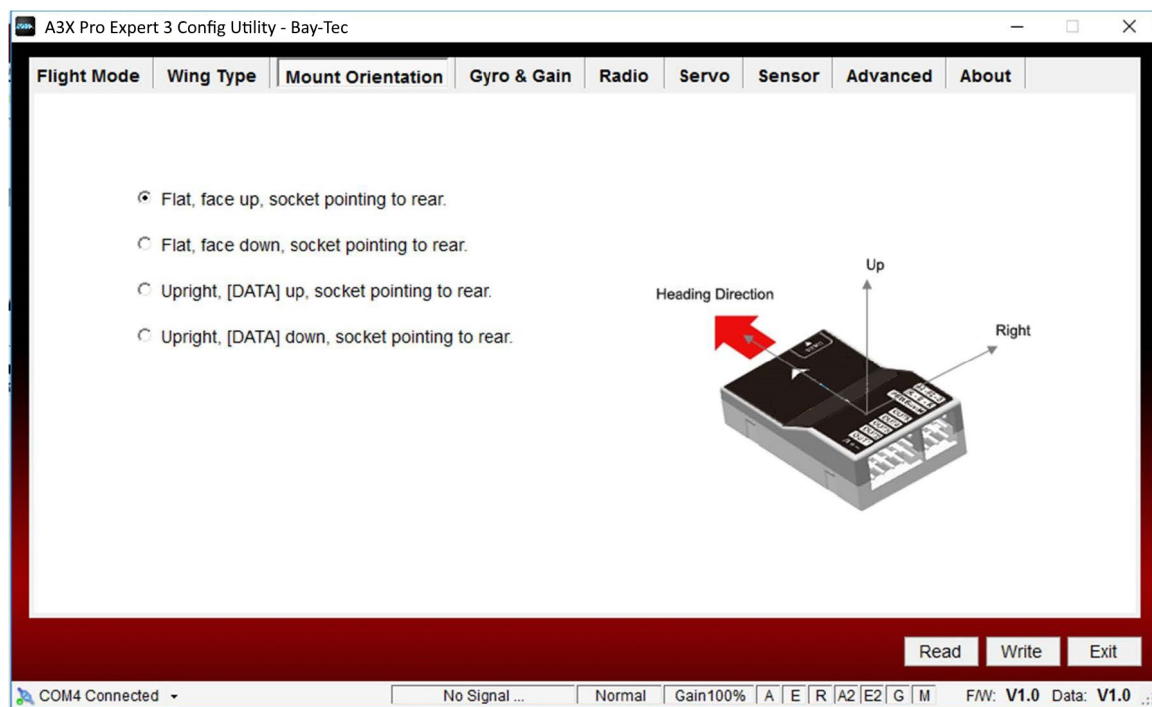
The max tilt angle setting is only used for Trainer mode. Adjustment range is 30~90deg, the default setting is 60 deg.

9.4. WING TYPE



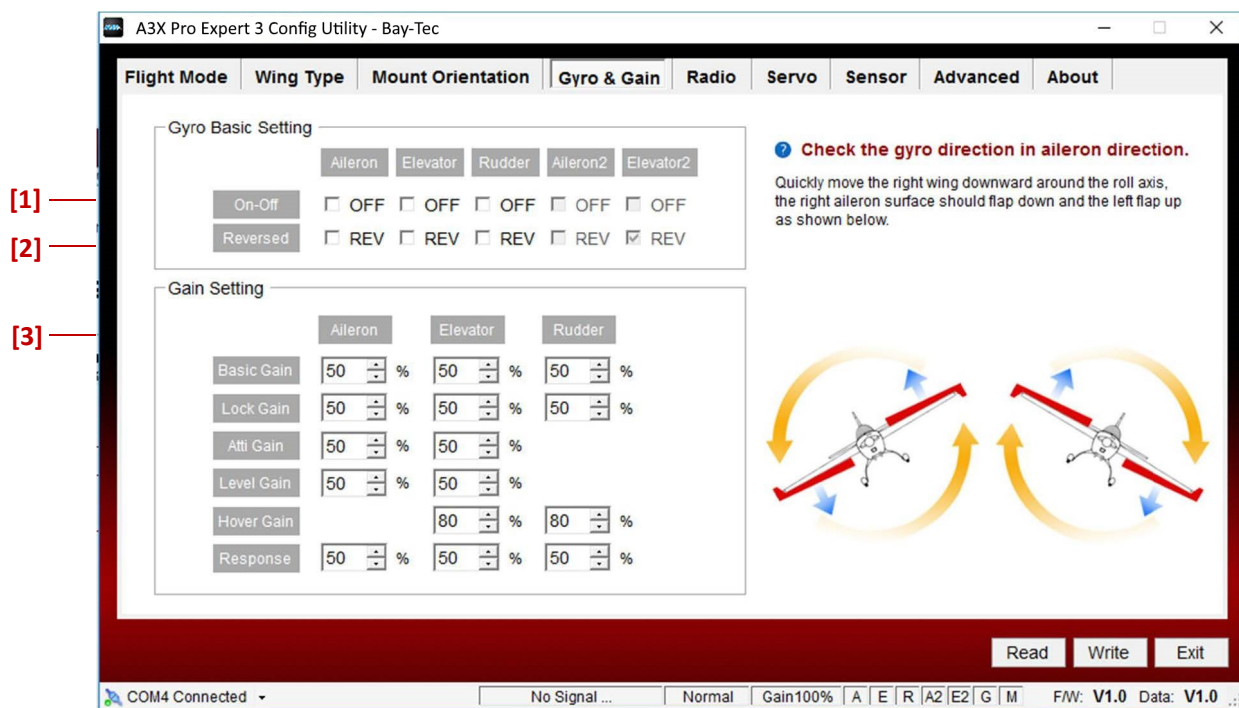
Choose a wing type matched to your plane and connect the servos to the corresponding sockets following the illustration.
info@bay-tec.de

9.5. MOUNT ORIENTATION



Choose the mounting orientation of your A3X 3. The orientation in the picture should look as same as yours.

9.6. GYRO SETTINGS



[1] Gyro On-Off

You can disable the gyro separately for each channel.

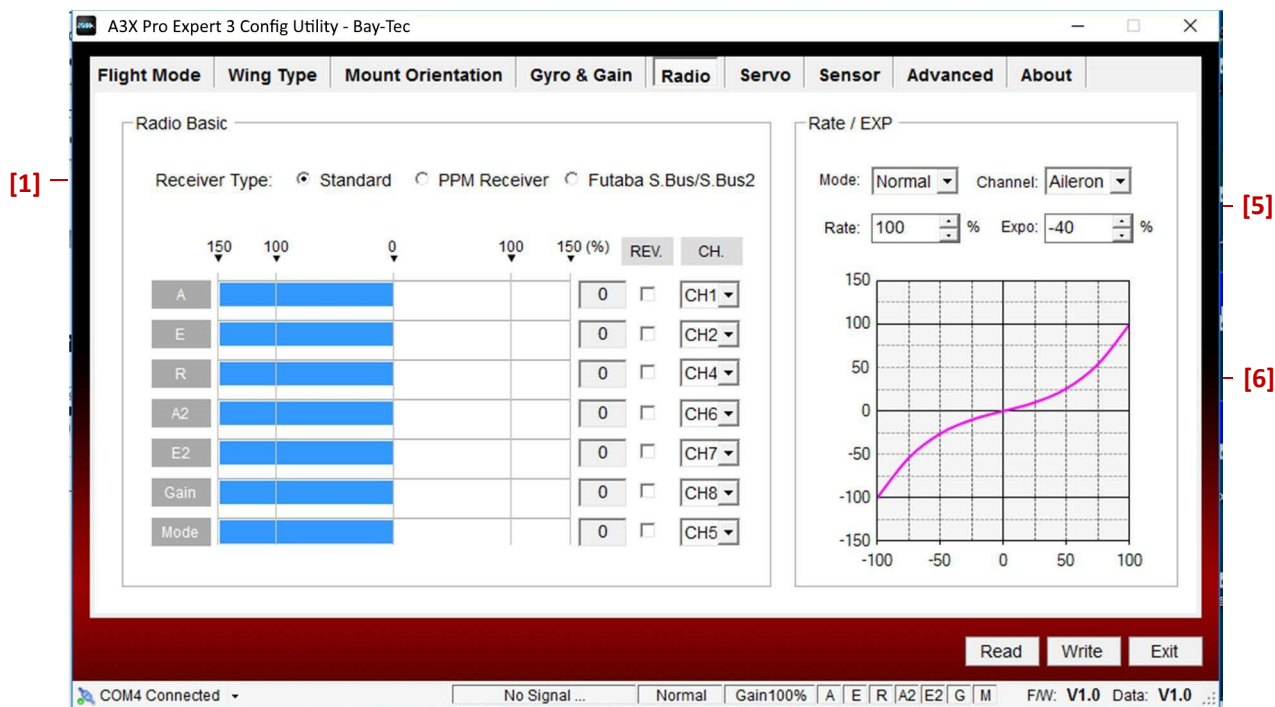
[2] Gyro Direction

Reverse the gyro if it reacts in opposite direction.

[3] Gain Settings

Adjust the gain of each axis for each flight mode.

9.7. RADIO SETTINGS



[1] Receiver Type Selection

Choose your receiver type then restart the gyro to make the new setting take effect.

[2] Channel Monitor

The channel monitor displays the stick positions for each channel graphically and numerically.

[3] Stick Reverse

Change the direction of an individual servo's response to a stick input.

[4] Function Assignment

It is used to assign the channel number for each channel when using a PPM or S.Bus single-line receiver. Choose 'None' for those channels you don't want to use.

[5] Stick Rate & Expo

In order to improve the control behavior, A3X 3 allows you to set different Rate and EXP curve of the stick functions (aileron, elevator and rudder) for each flight mode separately. To do this, first select the flight mode and the channel you want to set from the drop down list, then adjust the rate and expo settings, after you have finished the adjustment, click "Write" to save the settings to the gyro. The rate is used to adjust the amount of throw of the sticks, it can be varied from 0% to 150%, the larger the rate, the quicker the reaction of the plane; The expo is used to adjust the operational curve of the sticks, it can be varied from -100% to +100%, positive number means the control will be more sensitive near the center position of the stick, and negative number means the control will be smooth or softened near the center position of the stick. This is quite similar to the D/R or ARF settings on Futaba's radio.

[6] Graph of Rate and Expo Setting

The graph shows the curve of the stick currently set.

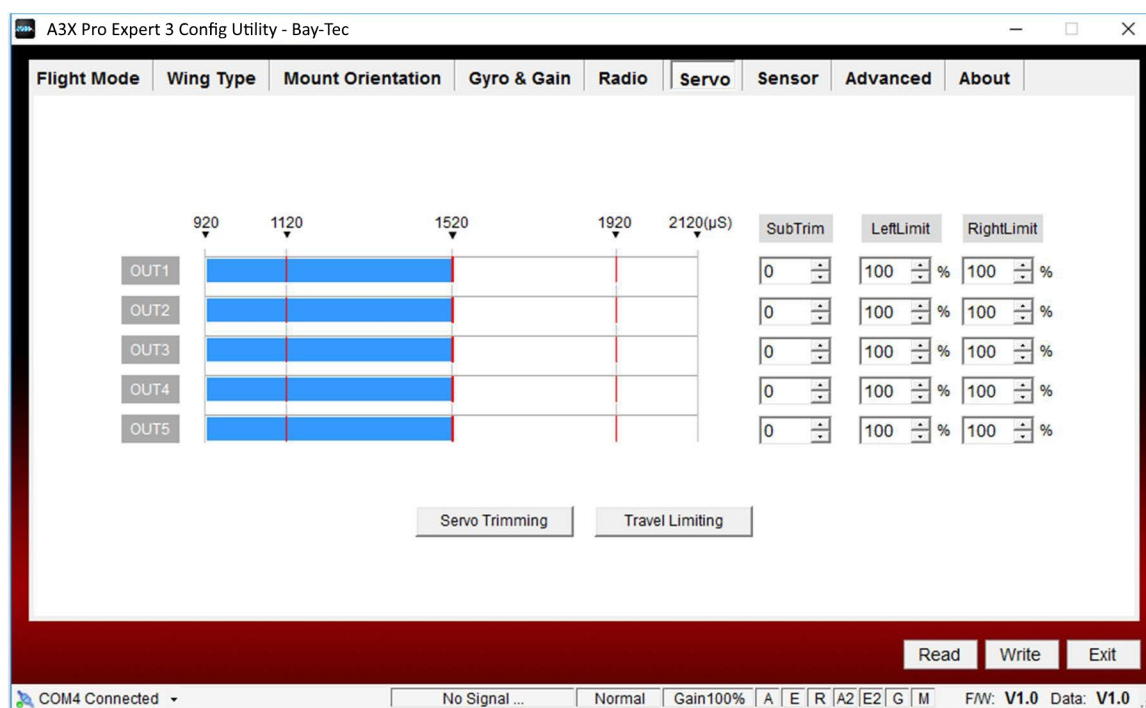
9.7.1. Transmitter Calibration

In order to make better use of the stick Rate and EXP of the gyro, a manual transmitter calibration is recommended to perform in this page. You don't need to calibrate the [AIL2] and [ELE2] channels if they are used as pass-through channels.

Step 1: Neutral Calibration for [Gain] and [Mode] Move the mode switch and gain control knob (or slider) to their center positions, the progress bar [MOD] and [GAIN] should be in the right position of 0%. If not, adjust the Sub-Trim setting of your transmitter to fix it.

Step 2: Travel Calibration for All Channels Move the sticks, mode switch and gain control knob (or slider) for each channel to its full left or full right position, the progress bar should be in the right position of +100% or -100%. If not, adjust the left or right travel setting of the corresponding channel to fix it using the End-Point or Servo Travel setting function on your transmitter.

9.8. SERVO SETTINGS



[1] Servo Monitor

The servo monitor displays the servo positions for each channel graphically and numerically. The three red lines on the progress bar represent left travel limit, center position and right travel limit from left to right.

[2] Sub Trim

The sub-trim function is used to adjust the servo neutral position, and to make fine adjustment to the control surface after linkages and pushrods are hooked up. The neutral adjustment can be varied from -125% to +125%, corresponding to pulse length of $1520 \pm 250\mu\text{s}$. The sub trim setting is not available for the pass-through channels.

[3] Travel Limits

Travel limits can be varied from 0% to 150% in each direction of the servos. The default setting is 130%. It's used to protect the linkages, for example, if you have set the stick rate to 100% for aileron, after superimposing the correction of the gyro, the final amount of the movement of the aileron servo(s) may probably exceed 100%, which could cause damage to the linkages and pushrods. But after setting a certain limits the total movement of the servos will be limited in a safe range. The travel limit setting is not available for the pass-through channels.

Travel	100%	130%	150%
Pulse Length	$\pm 400\mu\text{s}$	$\pm 520\mu\text{s}$	$\pm 600\mu\text{s}$

[4] Servo Trimming

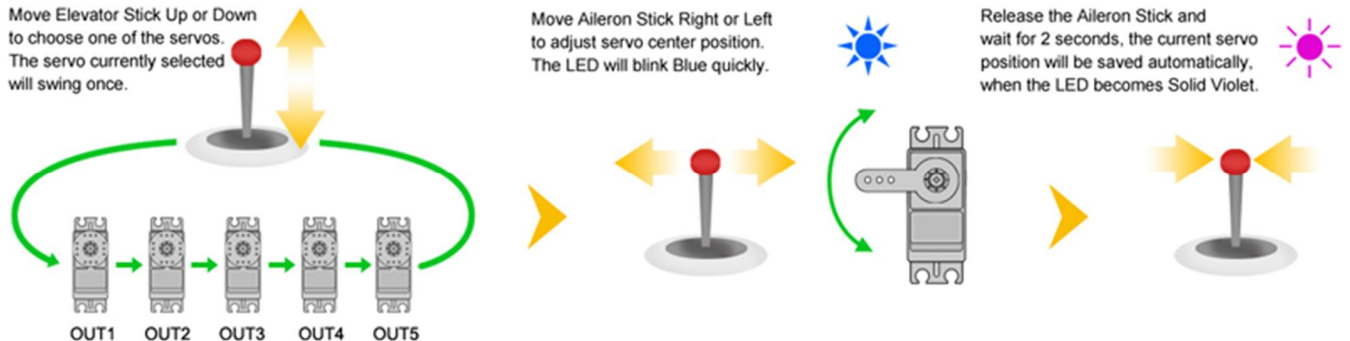
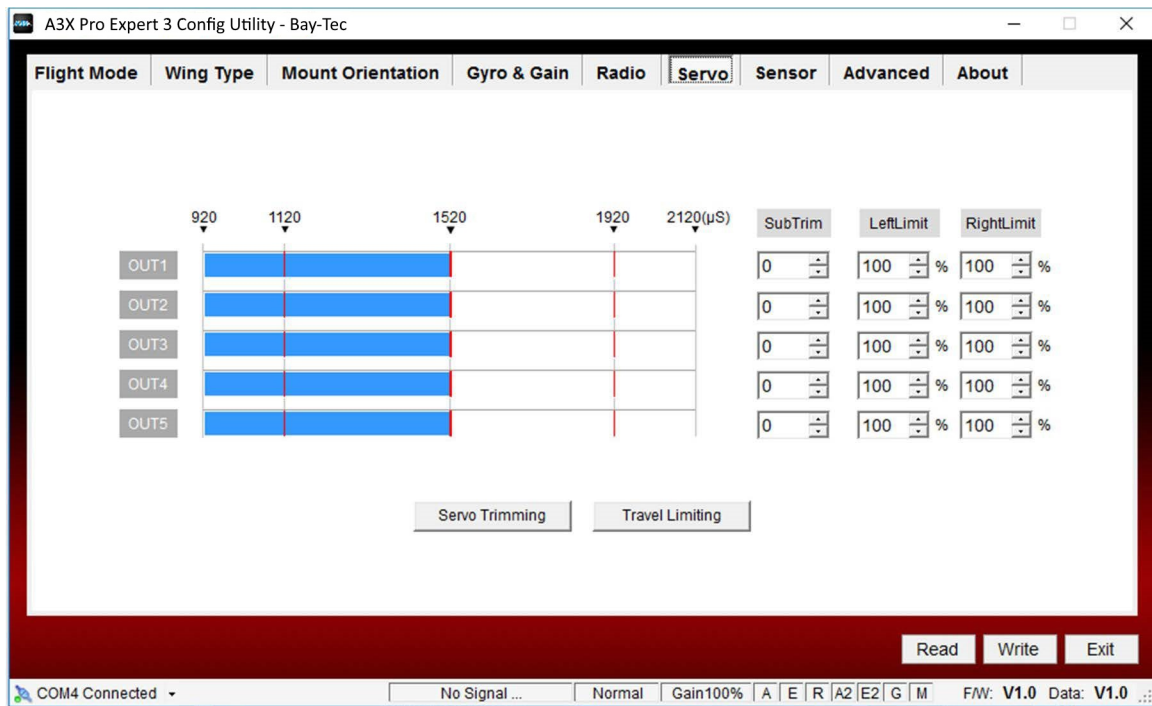
This function allows you to fine tune the servo neutral position using the transmitter. For more details, see Page 25.

[5] Travel Limiting

This function allows you to adjust the travel limits of the servos using the transmitter. For more details, see Page 26.

9.8.1. Servo Trimming

This function allows you to adjust the center position of the servos using the transmitter. It will be more convenient and more intuitive.



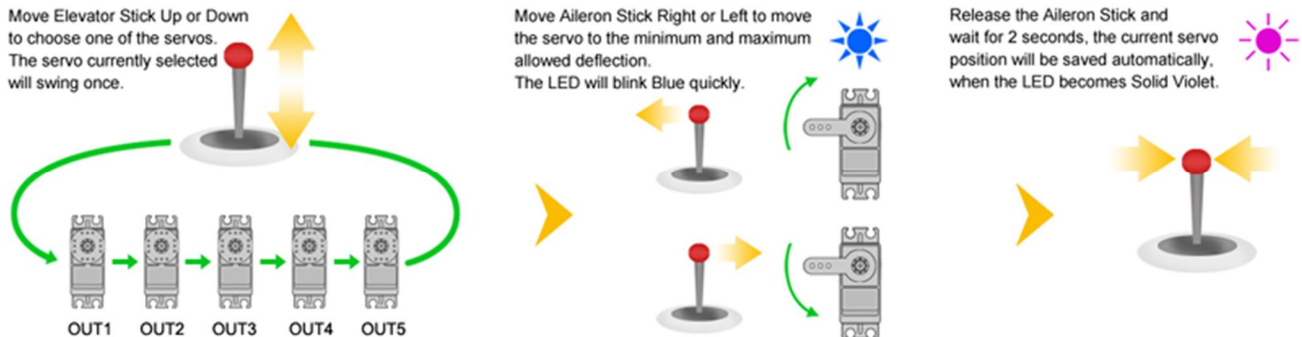
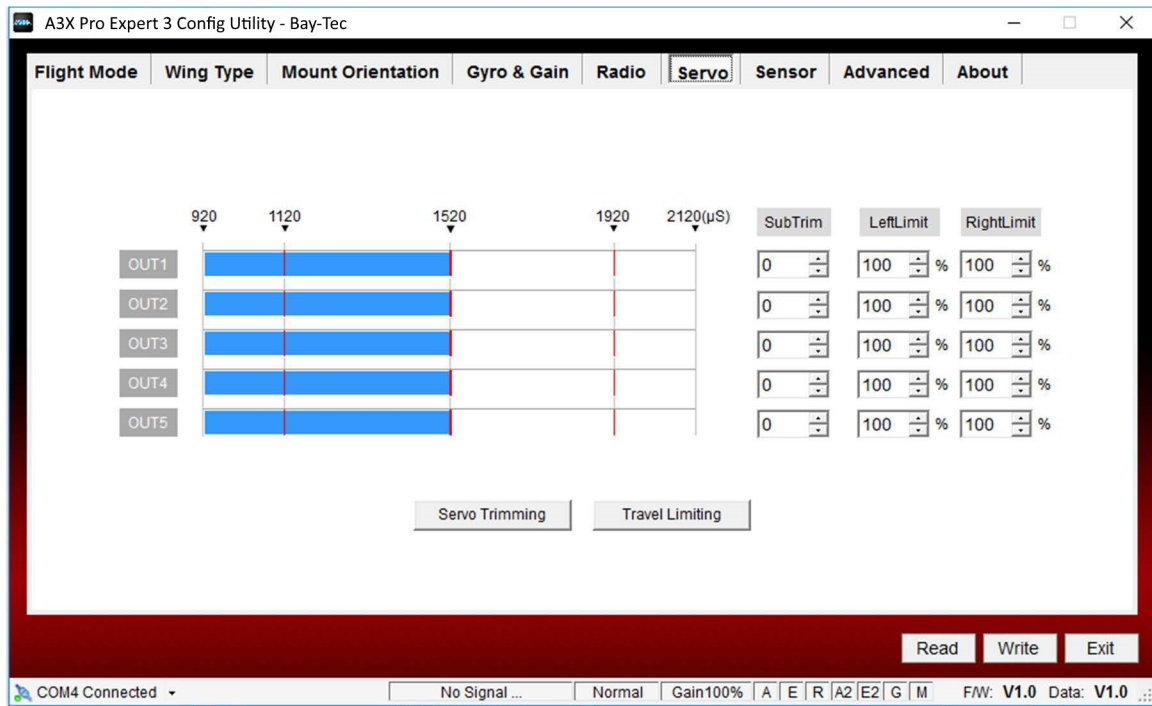
Click the “Servo Trimming” button to enter the setting procedure in the “Servo” page. After entering, move the elevator stick up or down to select one of the servos connected at [OUT1] to [OUT5] (the pass-through channels will be skipped automatically). The current servo will indicate its selection to you by a short up and down move. By default, the servo connected at [OUT1] is always the first one selected after you entering the procedure.

When the desired servo has been chosen, move and hold the aileron stick into one direction to change the center position for it, when it reaches the desired position release the aileron stick and wait for about 2 seconds until the LED turns solid violet, the current servo position will be saved as the new neutral automatically. While moving the servo, the LED will blink blue and a rapid red blinking indicates that the servo has reached the maximum center position allowed. The new neutral position of current servo will also be saved when you switching to the next servo.

After you have finished the setting, just flip the flight mode switch or click the Exit button to exit and back to standby state.

9.8.2. Travel Limiting

This function allows you to adjust the travel limits of the servos using the transmitter. It will be more convenient and more intuitive.

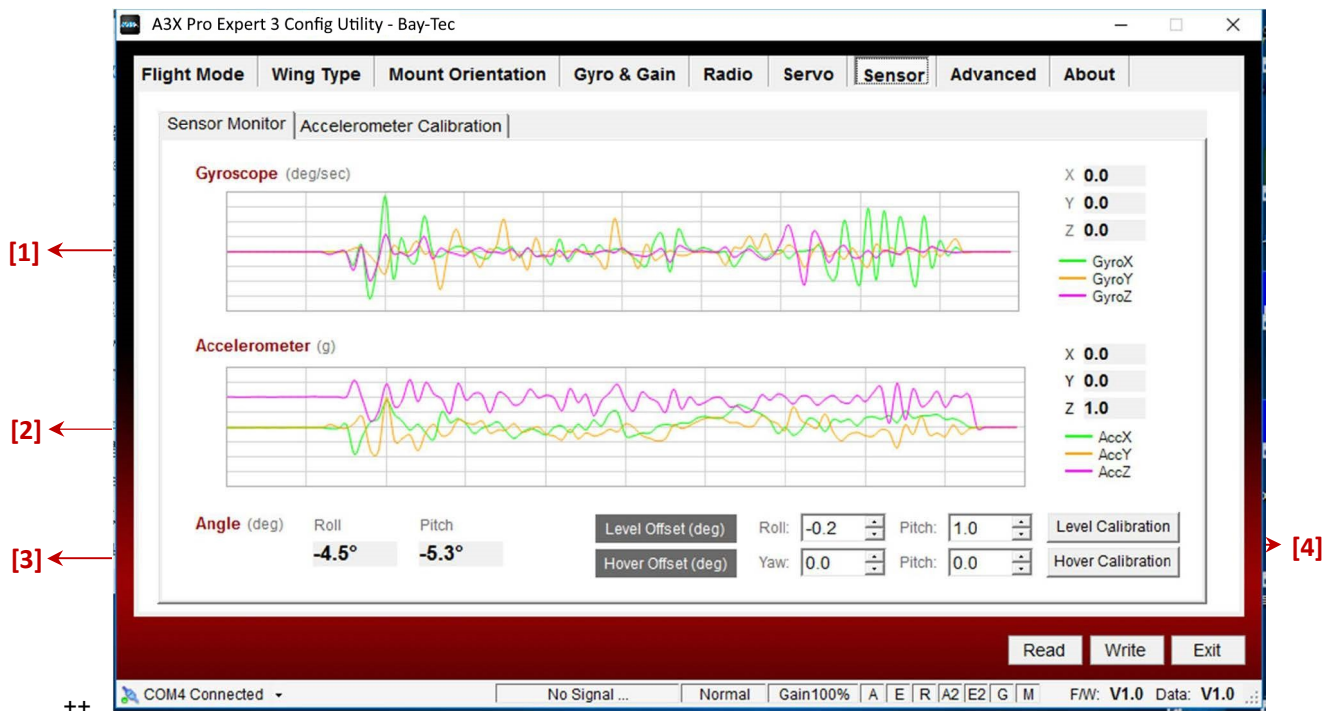


Click the "Travel Limiting" button to enter the setting procedure in the "Servo" page. After entering, move the elevator stick up or down to select one of the servos connected at [OUT1] to [OUT5] (the pass-through channels will be skipped automatically). The current servo will indicate its selection to you by a short up and down move. By default, the servo connected at [OUT1] is always the first one selected after you entering the procedure.

When the desired servo has been chosen, move and hold the aileron stick into one direction to move the servo until it reaches the maximum allowed throw without any binding or stall, then release the aileron stick and wait for about 2 seconds until the LED turns solid violet, the current position will be saved as the new travel limit automatically. Then move the servo to the opposite direction and wait until also this position gets stored. While moving the servo, the LED will blink blue and a rapid red blinking indicates that the servo has reached the maximum allowed (i.e. 150%). The new travel limit of current servo will also be saved when you switching to the next servo.

After you have finished the setting, just flip the flight mode switch or click the Exit button to exit and back to standby state.

9.9. SENSOR MONITOR



[1] Real-time Chart of the Gyroscope Reading

Display the real-time reading of the gyroscope graphically.

[2] Real-time Chart of the Accelerometer Reading

Display the real-time reading of the accelerometer graphically.

[3] Attitude Indication

Display the real-time angle on roll and pitch axes.

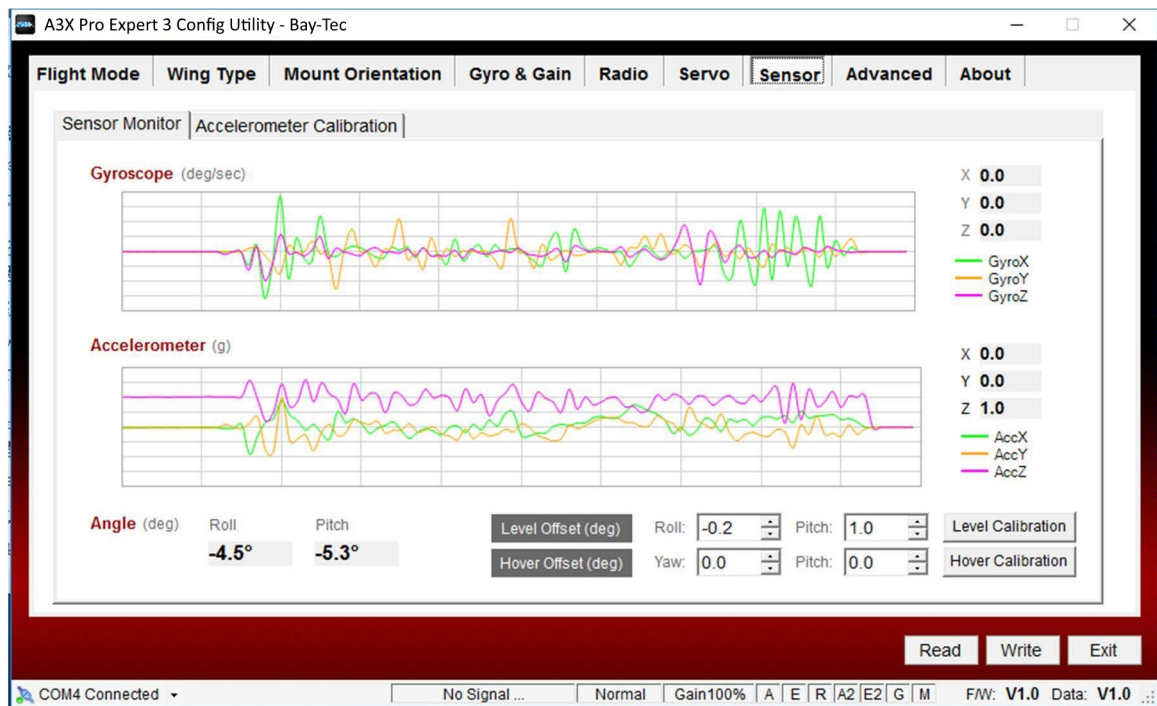
[4] Level and Hover Offset & Auto Calibration

You can modify the level and hover offset values here, the value can be adjusted from -25 degree to +25 degree with the step of 0.2 degree. If the angle deviation exceeds ± 25 degree, you have to re-install the gyro to reduce the angle deviation caused by installation. Clicking the "Level Calibration" or "Hover Calibration" button can perform an automatic calibration, for more details, see Page 28 and Page 29.

9.9.1. Level Calibration

When flying in Trainer mode or Auto-Level mode, A3X 3 needs to know the angle of the plane in both roll and pitch direction, this is achieved by calculating the attitude of its own. A small angle deviation caused by installation can lead to an unexpected behavior when flying in Trainer mode or Auto-Level mode. For this reason, a level calibration is recommended to offset the error caused by installation and to establish a proper level reference of your plane after installing the gyro.

The calibration can be done by manually modifying the offset values in roll and pitch direction or performing an automatic calibration. Usually the calibration only has to be performed once after installation.



Calibration

Step 1

Before calibrating, the plane should be placed on the horizontal ground and make the wing parallel to the ground. Make the plane slightly nose-up because a certain elevation angle is usually required to maintain level flight for most planes.

Step 2

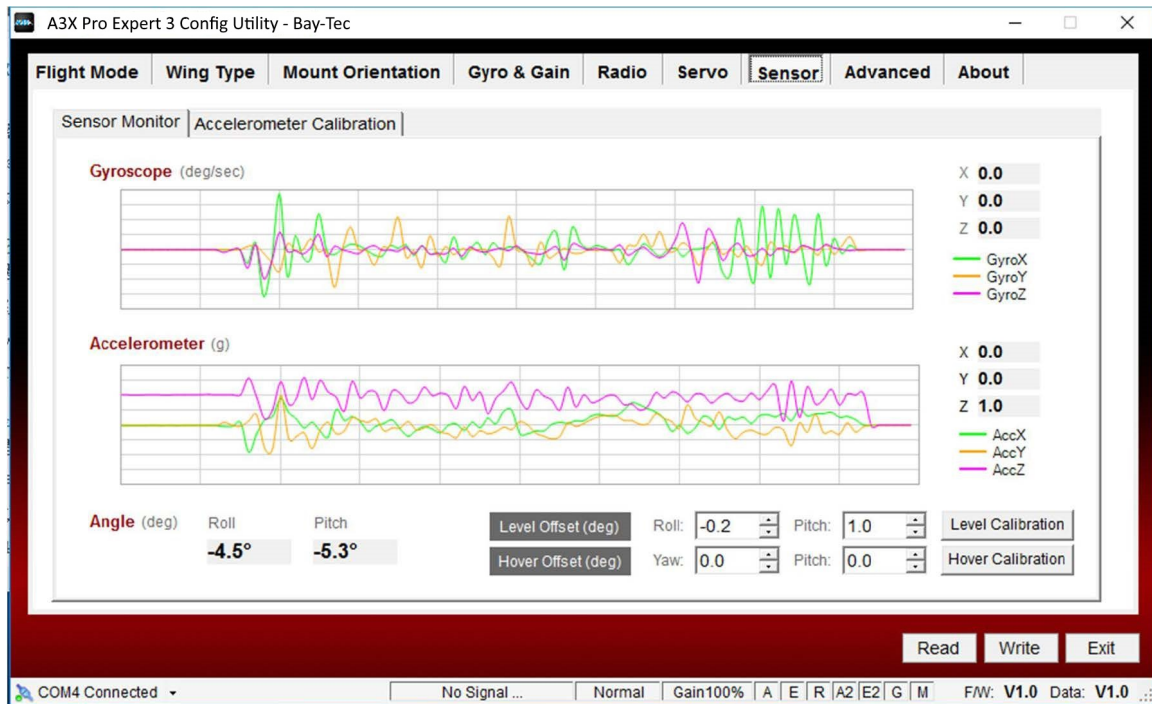
Click the "Level Calibration" button to start the calibration, it will take you several seconds and the LED will blink blue rapidly during calibrating. Don't move the plane and keep its attitude until the calibration is done.

Step 3

After a successful calibration, the new offset values will be displayed on the screen and you can adjust them manually in the future. In addition, a rapid red blinking is used to indicate that the result exceeds the maximum permissible value (i.e. $\pm 25^\circ$), in this case, you have to re-install the gyro to reduce the deviation caused by installation.

9.9.2. Hover Calibration

As a same reason, a hover calibration is recommended to perform after installation if you want to fly with Auto-Hover mode. The procedure is quite similar to that of level calibration. The only difference is in the first step. Before calibrating, you need to lift the plane and make it vertical to the ground instead of putting it on the ground. For more information about how to perform the calibration, please refer to “Level Calibration”.

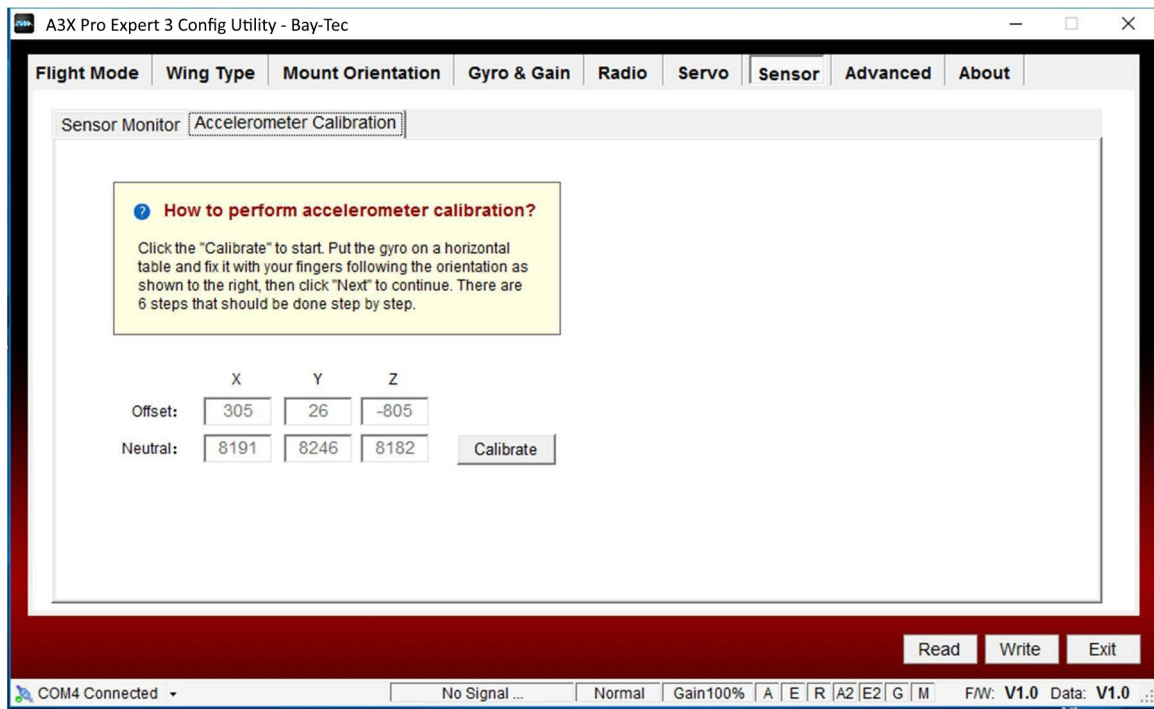


9.9.3. Accelerometer Calibration

Before leaving the factory every unit has been carefully tested and calibrated. Usually you don't need to perform a calibration of the accelerometer during use. However, in some specific cases, we'd suggest you re-calibrate the accelerometer to obtain better performance, these include special conditions such as temperature changes those will probably cause the mechanical characteristics changes of the sensor. The calibration should be done on a horizontal desktop, follow the steps below until all of the 6 different orientations have been completed successfully.

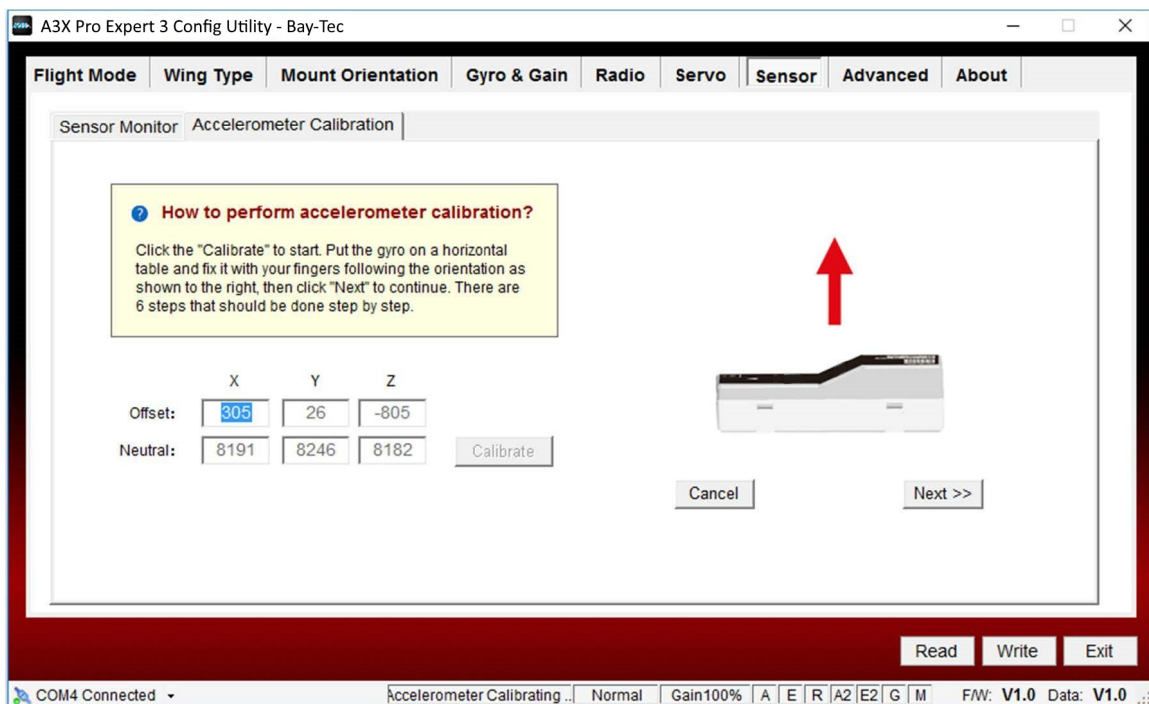
Step 1

Connect the A3X 3 to the PC, open the software and go to the "Sensor" tab, click the "Calibrate" button to enter the calibration procedure.



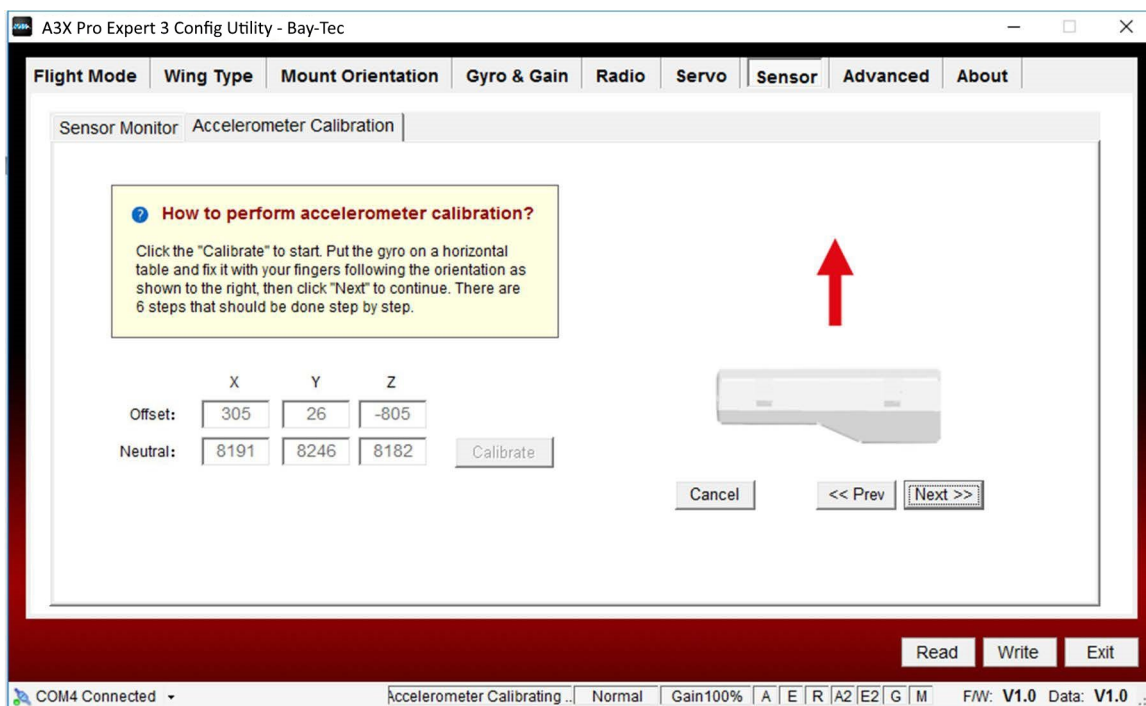
Step 2

Put the gyro on the table with the sticker on top and fix it with your fingers, then press "Next" to continue, the calibration of each step will take about 2 seconds, during calibrating, the LED will blink blue several times and then light up solid in blue. Don't move the gyro until the calibration is done.



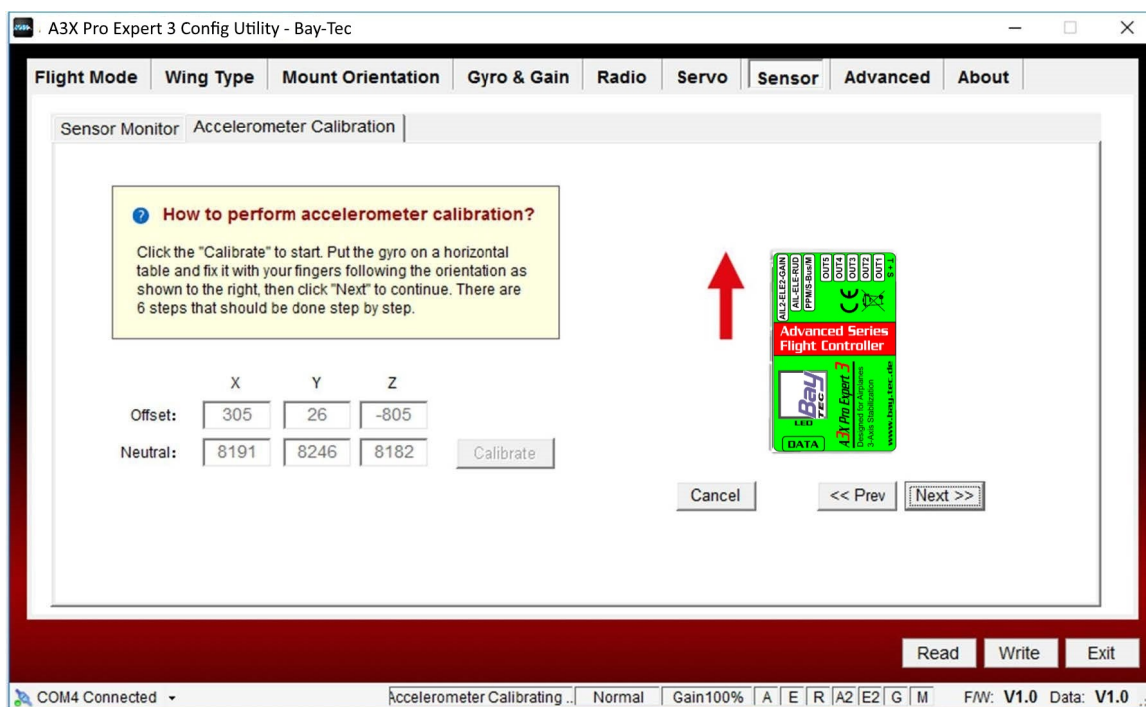
Step 3

Now turn the gyro around and fix it with the sticker showing down, press “Next” to continue and wait until the calibration is done, just like the last step.



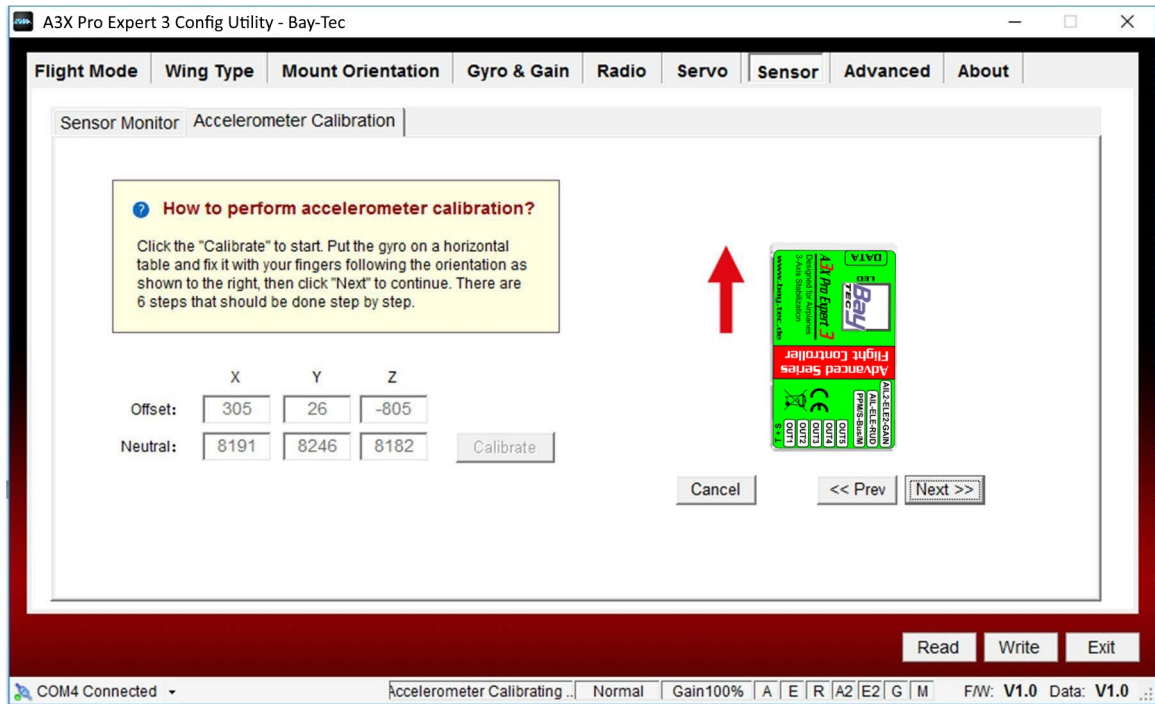
Step 4

Now stand it up with the arrow pointing to the table. Fix it with your fingers and make sure it is vertical to the desktop. Press “Next” to continue and wait until the calibration is done.

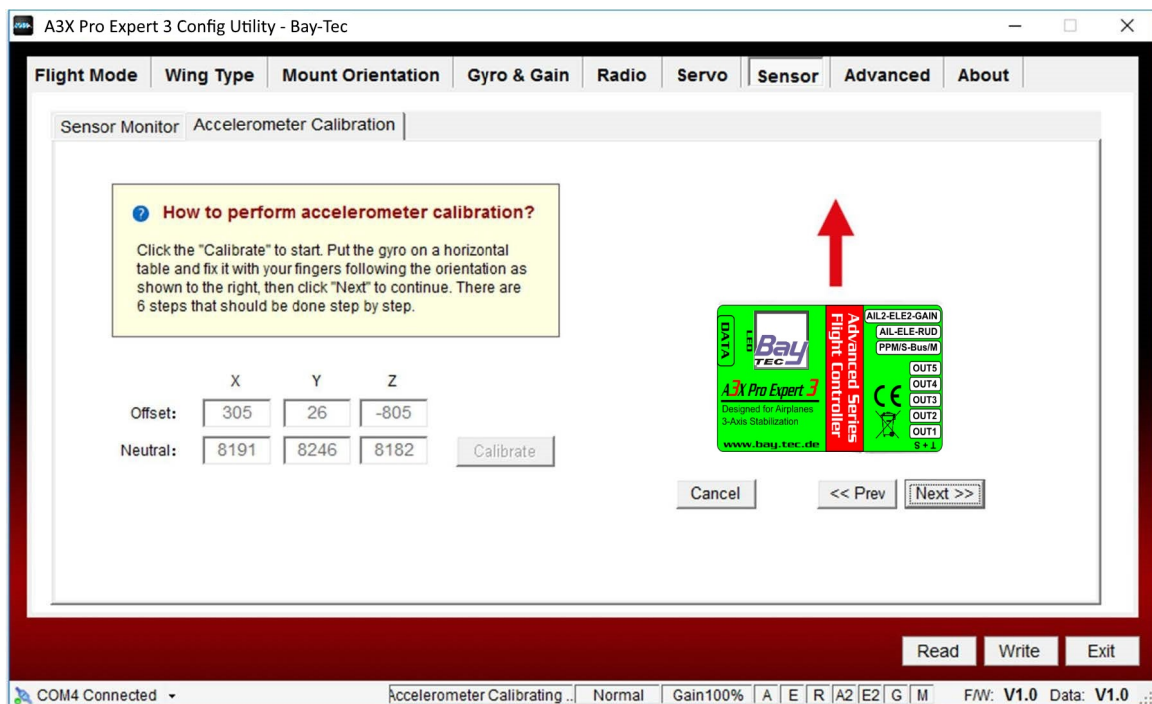


Step 5

Now turn the gyro around and fix it with the arrow pointing upwards, press “Next” to continue and wait until the calibration is done.

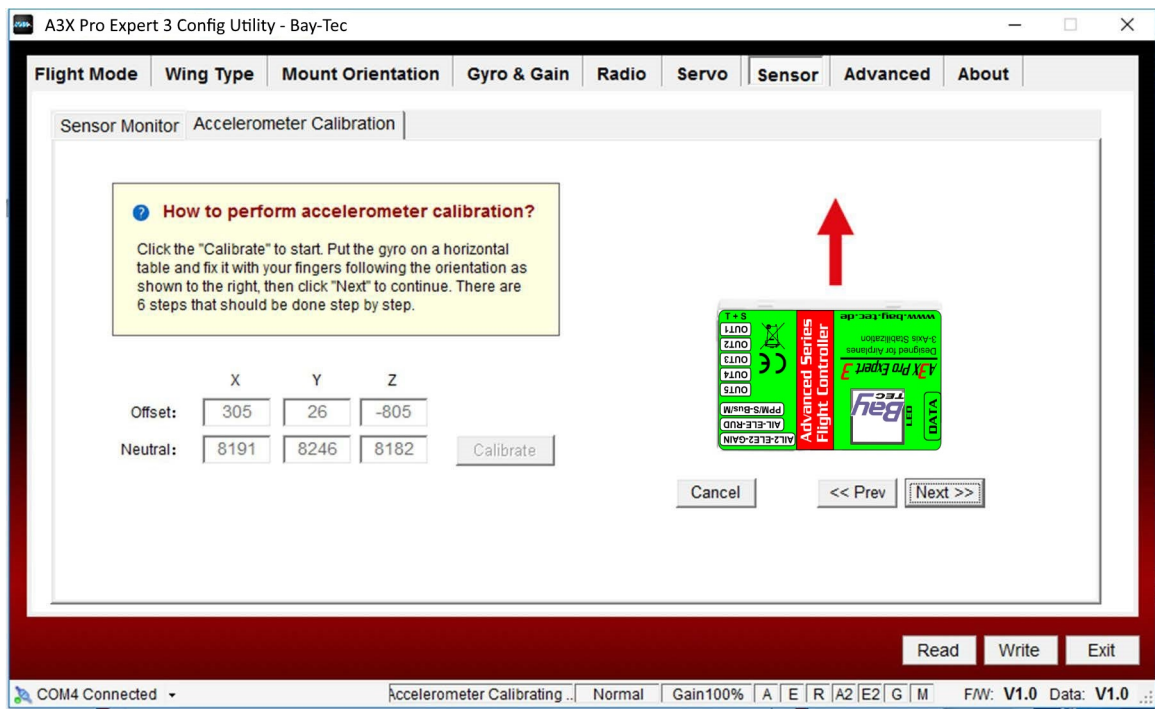
**Step 6**

Now change to another orientation and make the gyro look like it is in the picture, with the long side of the housing on the table and the [DATA] socket up. Fix it with your fingers and make sure it is vertical to the desktop. Press “Next” to continue and wait until the calibration is done.

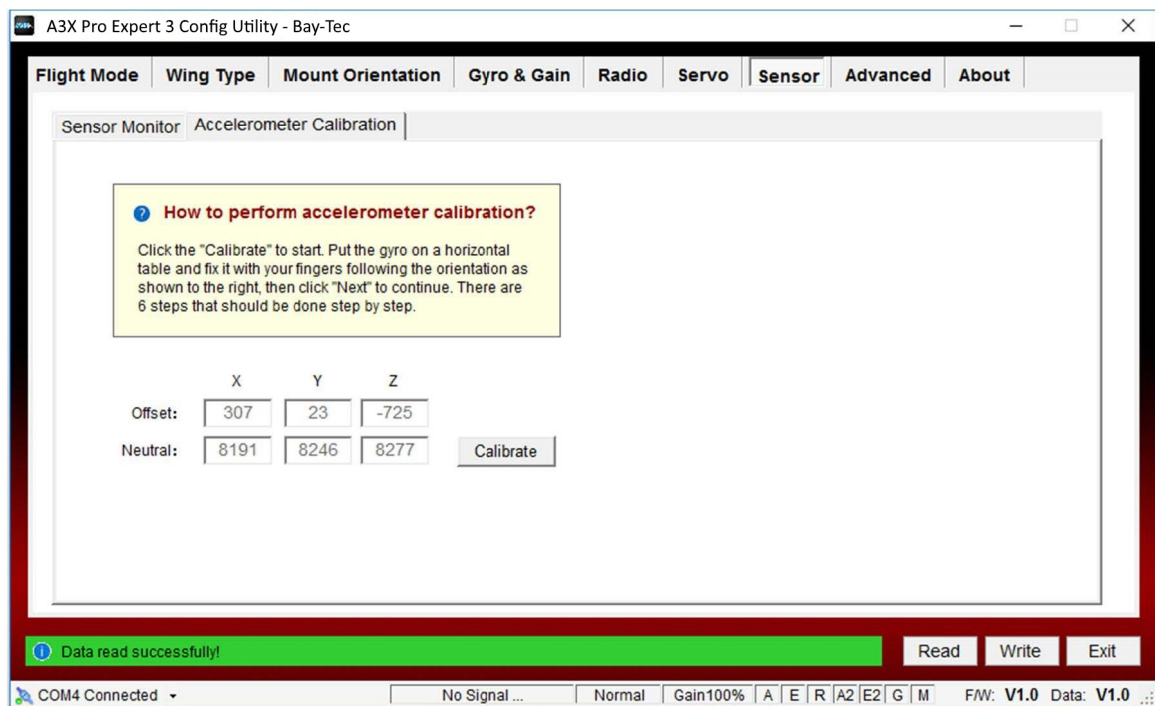


Step 7

Now turn the gyro around and make the [DATA] socket down. Again fix it with your fingers and press “Next” to continue and wait until the calibration is done.

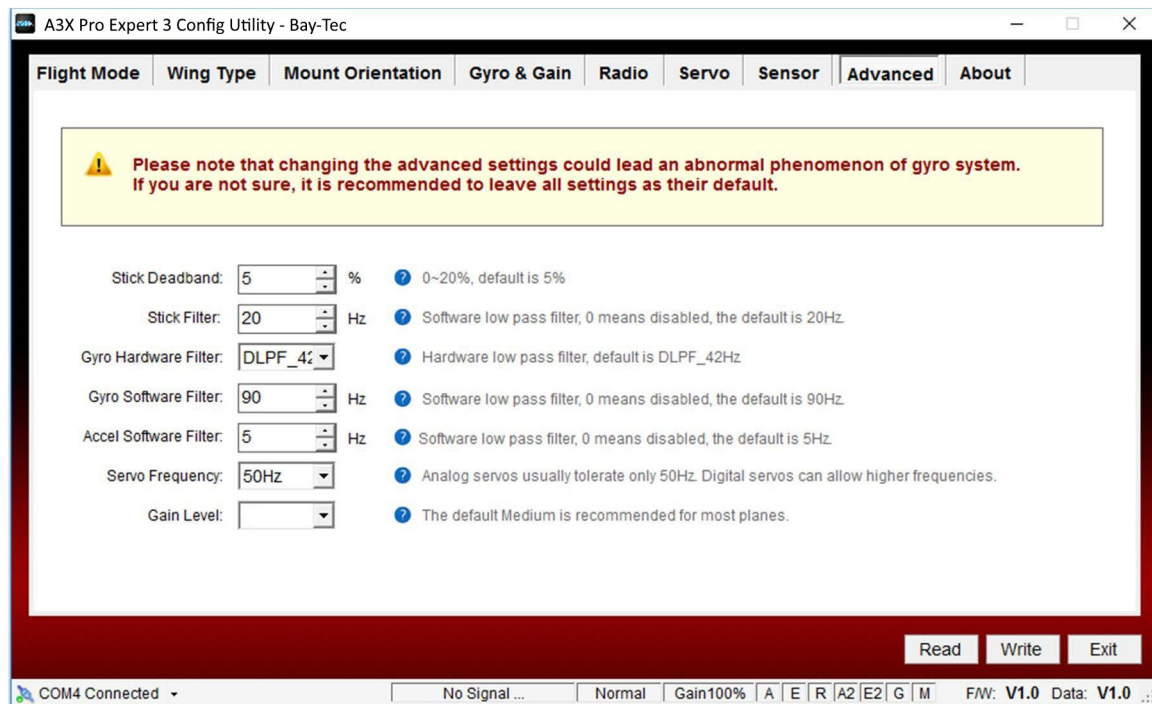
**Step 8**

After you have finished all of the steps above, you can see the new calibration results of each axis on the screen.



9.10. Erweiterte Einstellungen

Changing the advanced settings incorrectly can lead an abnormal phenomenon of the gyro system. If you are not sure, it is recommended to leave all settings as their default.



[1] Stick Deadband

The stick deadband is the range around the very center of the sticks at where the controller will not react. Some transmitters have the problem that when the sticks are brought back after an input, they are not exactly at the same center position as before which may generate a deviation on the corresponding function, in this condition, you can increase the setting of stick dead band to fix it. Adjustment range: 0% ~ 20%, the default is 5%.

[2] Stick Filter

Set the cut-off frequency of the low pass filter for the stick inputs. The default is 20Hz, set to zero to disable the filter.

[3] Gyro Hardware Filter

Set the cut-off frequency of the built-in hardware low pass filter of the gyro sensor. The default is DLPF_42Hz, lower the frequency can get a better reduction of noise from external vibrations.

[4] Gyro Software Filter

Set the cut-off frequency of the software low pass filter for the gyro. The default is 90Hz. This filter can be also used to reduce the impaction of vibrations for the gyroscope sensor. Set to zero to disable the filter.

[5] Accelerometer Software Filter

Set the cut-off frequency of the software low pass filter for the accelerometer. The default is 5Hz. It's used to reduce the impaction of vibrations for the accelerometer sensor. Set to zero to disable the filter.

[6] Servo Frequency

Set the working frequency for the servos. The analog servos can only work with 50Hz. If you don't know what the maximum update rate that is tolerated by your servos never use more than 50Hz. The higher the frequency the better it is for the flight performance of the gyro but you must check the servo specifications before increasing the setting. Otherwise the servos may get damaged! This setting will affect all servos simultaneously.

[7] Gain Level

Change the level of the basic gain, the default "Medium" can satisfy most planes.

10. PROGRAM CARD

If you have purchased a full set of A3XP, a programming card is included to let you program the gyro more easily instead of using a PC or a laptop. The modifications made via the box will take effect immediately without a final confirmation and you just need to simply pull out the box when you have finished the setting.

10.1. BUTTONS

- UP/+** Scroll up the menu or increase the value.
- DN/-** Scroll down the menu or decrease the value.
- ESC** Exit without saving and return to the menu.
- ENT** Select an item or save the change, hold it for 2 seconds can reset the item to its default value.

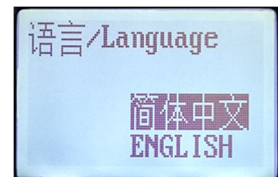


10.2. METHOD OF USE

When the gyro is ready, connect the card to the external LED module using the black data cable. The card will start up and read the settings from the gyro automatically. Press [ESC] button can let you reload the data again, after a reloading the current settings will be overwritten.

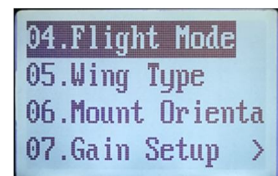
10.3. LANGUAGE SELECTION

The program supports Chinese and English languages. You can select the language in the system menu. Press and hold the [ENT] button while plugging the card can also bring you to the language selection screen.



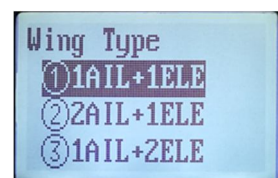
10.4. MENU OPERATION

By pressing the [UP/+] or [DN/-] button, you can select the functions in a menu. Press [ENT] to enter the selected item. When a second-level menu exists, the symbol ">" will appear on the right of the corresponding items.



10.5. OPTION SELECTION

When you are in a function, press [UP/+] or [DN/-] to switch to different options. Press [ENT] to confirm or [ESC] to cancel. The unconfirmed item will keep flashing until the [ENT] button is pressed.



10.6. VALUE MODIFICATION

When you are in a function, press [UP/+] or [DN/-] to select the parameter that you want to modify, press [ENT] to enter edit mode. In edit mode, the value will keep flashing, you can change its value by pressing [UP/+] or [DN/-]. Press [ENT] to confirm or [ESC] to cancel. Press and hold the [ENT] button more than 2 seconds can restore the parameter to its default setting.



10.7. FUNCTION LIST (v3.5)

01. Switch Type	Choose the type of the flight mode control switch, 3-position or 6-position.		
02. Flight Mode	Preset the flight mode for each position of the switch, when 3-position switch type is selected, the options of POS-4, POS-5 and POS-6 will be unavailable. 【OFF】 Gyro-Off Mode, 【NORM】 Normal Mode, 【LOCK】 Atti-Lock Mode, 【TRAN】 Trainer Mode, 【LEVL】 Auto-Level Mode, 【HOVR】 Auto-Hover Mode		
03. Wing Type	Choose the wing type of your plane, 1AIL+1ELE, 2AIL+1ELE, 1AIL+2ELE, 2AIL+2ELE, Flying-wing (Delta-wing), 1AIL+VTail, 2AIL+VTail.		
04. Mount Orientation	Choose the mounting orientation of the gyro. 【Flat】 face up, socket pointing to rear, 【Flat Inverted】 face down, socket pointing to rear, 【Upright】 [DATA] up, socket pointing to rear, 【Upright Inverted】 [DATA] down, socket pointing to rear.		
05. Gain Setup	01. Basic Gain	Set the basic gain for aileron, elevator and rudder from 0 to 100%.	
	02. Lock Gain	Set the lock gain for aileron, elevator and rudder from 0 to 100%.	
	03. Atti Gain	Set the attitude gain for roll (aileron) and pitch (elevator) channels from 0 to 100%.	
	04. Level Gain	Set the auto-level gain for roll (aileron) and pitch (elevator) channels from 0 to 100%.	
	05. Hover Gain	Set the auto-hover gain for yaw (rudder) and pitch (elevator) channels from 0 to 100%.	
	06. Response	Set the response gain for aileron, elevator and rudder from 0 to 100%.	
06. Gyro Setup	01. Gyro On-Off	Enable or disable the gyro for aileron, elevator and rudder.	
	02. Gyro Reverse	Reverse the gyro direction for aileron, elevator and rudder.	
	03. Max Tilt Angle	Set the max allowed tilt angle on roll and pitch axes for trainer mode from 30° to 90°.	
07. Radio Setup	01. Receiver Type	Choose your receiver type then restart the gyro to make the new setting take effect.	
	02. Stick Reverse	Reverse the stick direction for aileron, elevator, rudder, aileron2, elevator2, master gain and flight mode.	
	03. Stick Rate	01.GyroOff Mode	Set the stick rate of aileron, elevator and rudder for Gyro-Off mode, from 0% to 150%.
		02.Normal Mode	Set the stick rate of aileron, elevator and rudder for Normal mode, from 0% to 150%.
		03.AttiLock Mode	Set the stick rate of aileron, elevator and rudder for Atti-Lock mode, from 0% to 150%.
		04.Trainer Mode	Set the stick rate of aileron, elevator and rudder for Trainer mode, from 0% to 150%.
		05.AutoLevel Mode	Set the stick rate of aileron, elevator and rudder for Auto-Level mode, from 0% to 150%.
		06.AutoHover Mode	Set the stick rate of aileron, elevator and rudder for Auto-Hover mode, from 0% to 150%.
	04. Stick Expo	01.GyroOff Mode	Set the EXP of aileron, elevator and rudder for Gyro-Off mode, from -100% to +100%.
		02.Normal Mode	Set the EXP of aileron, elevator and rudder for Normal mode, from -100% to +100%.
		03.AttiLock Mode	Set the EXP of aileron, elevator and rudder for Atti-Lock mode, from -100% to +100%.
		04.Trainer Mode	Set the EXP of aileron, elevator and rudder for Trainer mode, from -100% to +100%.

		05.AutoLevel Mode	Set the EXP of aileron, elevator and rudder for Auto-Level mode, from -100% to +100%.
		06.AutoHover Mode	Set the EXP of aileron, elevator and rudder for Auto-Hover mode, from -100% to +100%.
	05. Channel Assignment	Assign the channel number for each channel when using a PPM or S.Bus single-line receiver. Choose 'None' for those channels you don't want to use.	
08. Servo Setup	01. Sub Trim	Set the center position of the servos, from -125 to +125.	
	02. Travel Limit	Set the maximum travel limits for each side of the servos, from 0 to 150%.	
	03. Servo Trimming	Adjust the center position of the servos using the transmitter, press [ENT] to exit.	
	04. Travel Limiting	Adjust the travel limits of the servos using the transmitter, press [ENT] to exit.	
09. Level Offset	01. Manual Offset	Set the level offset in roll and pitch direction, from -25 to +25° with the step of 0.2 degree.	
	02. Auto Calibration...	Perform an auto level calibration.	
10. Hover Offset	01. Manual Offset	Set the hover offset in yaw and pitch direction, from -25 to +25° with the step of 0.2 degree.	
	02. Auto Calibration...	Perform an auto hover calibration.	
11.Advanced Setting	01. Stick Deadband	Adjustment range: 0%~20%, the default is 5%.	
	02. Stick Filter	Set the cut-off frequency of the low pass filter for the stick inputs. The default is 20Hz, set to zero to disable the filter.	
	03. Gyro Hardware LPF	Set the cut-off frequency of the built-in hardware low pass filter of the gyro sensor. The default is DLPF_42Hz.	
	04. Gyro Soft LPF	Set the cut-off frequency of the software low pass filter for the gyro. The default is 90Hz. Set to zero to disable the filter.	
	05. Accel Soft LPF	Set the cut-off frequency of the software low pass filter for the accelerometer. The default is 5Hz. Set to zero to disable the filter.	
	06. Servo Frequency	Set the servo working frequency. The analog servos can only work with 50Hz.	
	07. Gain Level	Change the level of the basic gain, the default is "Medium".	
12. System Menu	01. Data Save	Save the current settings to the memory of the program card.	
	02. Data Load	Load settings from the memory of the program card.	
	03. Language	Change the language of the program card.	
	04. Device Info.	Check the device name, firmware version and data version of the unit.	
	05. Card Info.	Check the firmware version of the program card.	
	06. Data Reset	Restore the settings of the unit to factory default.	

11. SPECIFICATIONS

Main Controller	32-bit MCU
Sensors	High-precision 3-axis gyroscope and 3-axis accelerometer
Gyroscope Scale Range	$\pm 2000\text{dps}$
Accelerometer Scale Range	$\pm 4\text{g}$
PWM	920uS ~ 2120uS with 1520uS center length / 50~333Hz
Input Voltage	4.8V~8.4V
Operating Temperature	-10°C~50°C
Size	43×27×14mm
Weight	10g (excluding wires)

* VOLTAGE PROTECTOR

It's recommended to use the supplied 3300uF/16V capacitor to get a more stable and secure working voltage for the gyro. The capacitor can be plugged onto any one of the free input or output sockets of the gyro or the receiver.



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