AR7210BX User Guide

NOTICE

All instructions, warranties and other collateral documents are subject to change at the sole discretion of Horizon Hobby, LLC. For up-to-date product literature, visit horizonhobby.com and click on the support tab for this product.

Meaning of Special Language

The following terms are used throughout the product literature to indicate various levels of potential harm when operating this product:

NOTICE: Procedures, which if not properly followed, create a possibility of physical property damage AND a little or no possibility of injury.

CAUTION: Procedures, which if not properly followed, create the probability of physical property damage AND a possibility of serious injury.

WARNING: Procedures, which if not properly followed, create the probability of property damage, collateral damage, serious injury or death OR create a high probability of superficial injury.

WARNING: Read the ENTIRE instruction manual to become familiar with the features of the product before operating. Failure to operate the product correctly can result in damage to the product, personal property and cause serious injury. This is a sophisticated hobby product and NOT a toy. It must be operated with caution and common sense and requires some basic mechanical ability. Failure to operate this Product in a safe and responsible manner could result in injury or damage to the product or other property. This product is not intended for use by children without direct adult supervision. Do not attempt disassembly, use with incompatible components or augment product in any way without the approval of Horizon Hobby, LLC. This manual contains instructions for safety, operation and maintenance. It is essential to read and follow all the instructions and warnings in the manual, prior to assembly, setup or use, in order to operate correctly and avoid damage or serious injury.

Age Recommendation: Not for children under 14 years. This is not a toy.

WARNING AGAINST COUNTERFEIT PRODUCTS

Thank you for purchasing a genuine Spektrum product. Always purchase from a Horizon Hobby, LLC. authorized dealer to ensure authentic high-quality Spektrum product. Horizon Hobby, LLC. disclaims all support and warranty with regards, but not limited to, compatibility and performance of counterfeit products or products claiming compatibility with DSM or Spektrum technology.

IMPORTANT: When using the Spektrum AR7210BX with larger helicopters (500-size and larger): It is necessary that you connect a DSMX remote receiver (not included) to the Spektrum AR7210BX before binding. See “Receiver Installation” for more information.

CAUTION: DO NOT use DSM2 remote receivers with the Spektrum AR7210BX. Doing so will cause the helicopter to crash, resulting in property damage and injury.

WARRANTY REGISTRATION

Visit www.spektrumrc.com/registration today to register your product.

Introduction

Dear Customer:

The Spektrum AR7210BX combines the proven BEASTX® flybarless technology with a Spektrum™ high-speed 2048 receiver. This combination provides the ultimate in performance and simple installation. The Spektrum AR7210BX is perfect for ALL sizes of flybarless helicopters. Using an optional DSMX® remote receiver adds necessary path diversity for even the largest electric, glow, gas and turbine-powered helicopters.The Spektrum AR7210BX is compatible with all Spektrum and JR® aircraft radios that support DSM2® and DSMX® technology.

The Spektrum AR7210BX provides maximum agility and precision for intermediate 3D and professional pilots.

With the Spektrum AR7210BX you have purchased an electronic control system that continuously detects and controls the attitude of your helicopter and the control commands from the pilot. As a result, the system is constantly aware of how the drive system will be used. The Spektrum AR7210BX features an RPM Governor system that uses this advantage to control the motor RPM. Contrary to conventional motor control systems that only monitor motor speed, the Spektrum AR7210BX can react sooner to speed changes. A separate governor system is no longer required for nitro helicopters and electric models can be used with a simple, inexpensive speed controller without additional features such as soft start or governor mode. The desired rotor speed is specified via the transmitter and Spektrum AR7210BX controls the throttle servo or speed controller accordingly, so that the predetermined head speed is maintained from takeoff to landing. The Spektrum AR7210BX offers an integrated soft start for spooling up the rotor before takeoff and a quick start to regain head speed in a controlled manner when practicing autorotation maneuvers. The system is suitable for both electric and nitro/gas helicopters. Using the proven “Easy Setup” concept no additional equipment is required for programming (apart from your transmitter) and the initial setup completes within minutes.

Furthermore, the Spektrum AR7210BX has an optional integrated artificial horizon through the use of SAFE® technology. This ensures that Spektrum AR7210BX can determine the absolute position in space of the helicopter on the roll and pitch axis, regardless of the position in which the helicopter is currently located. SAFE® technology can be used with five different modes:

- Bail Out Rescue Mode with Collective Pitch
- Bail Out Rescue Mode without Collective Pitch
- 3D – Mode with Collective Pitch
- 3D – Mode without Collective Pitch
- Flight Trainer Mode

The optional SAFE® technology provides an additional margin for recovery while you are learning new maneuvers and significantly reduces the probability of crashing. If SAFE® technology is switched on during flight, the helicopter will be oriented horizontally, depending on the selected mode the helicopter can be brought to a safe position with the press of a button, i.e. if the pilot becomes disoriented.

SAFE® is not included in the AR7210BX, but is available at additional cost through the StudioX software.

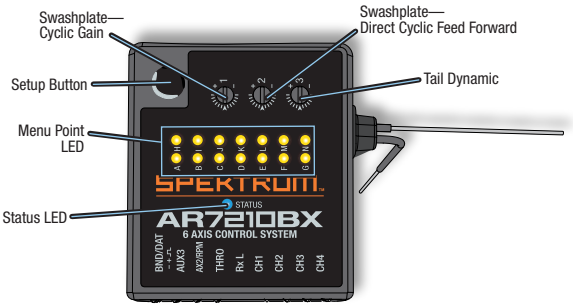
Your Spektrum Team

Box Contents
Spektrum AR7210BX
Bind Plug
Mounting tape
Adjustment tool
Instruction Manual
Program Guide

Optional Parts
DSMX Remote Receiver (SPM9645)
USB interface (SPMA3030)
Gas/Nitro RPM Sensor (SPM9560)

Preflight Safety Precautions and Checklist

- Read all safety precautions and literature prior to use of this product.
- Always ensure the receiver and transmitter are properly bound before flight.
- Always ensure batteries are fully charged and have proper capacity for the flight time you intend.
- Always exit programming mode before flying.
- Always use the included mounting tape and ensure it is properly mounted and in good condition before each flight.
- Power your transmitter on first and then the receiver.
- Always allow the Spektrum AR7210BX to initialize before flight.
- Confirm the cyclic and tail rotor servos do not bind at the full range of the throw.
- Perform a control test, ensuring controls move in correct directions.



Features

- Integrated BEASTX flybarless technology and Spektrum receiver
- Optional DSMX remote receiver capable
- SmartSafe™ failsafe system
- Flight Log and Telemetry compatible (optional)
- 2048 Resolution
- High-speed 11ms operation when used with capable transmitters

Applications

- All size electric, nitro/gas and turbine flybarless 3D helicopters
- Scale flybarless helicopters (multiblade compatible)

CAUTION: Do not use with flybar helicopters or airplanes.

WARNING: For first-time use or when making mechanical changes that involve throw, always ensure you reset the servo limits to prevent binding. Not doing so will cause the helicopter to crash, resulting in property damage and injury.

Specifications

Type: DSM® receiver and BEASTX® flybarless technology
Channels: 6–9 (8 channels are available, however, Channel 5 is only used as an internal gain channel for the tail gyro/operating SAFE®).
Modulation: DSM2, DSMX
Main Receiver Dimensions: 36mm x 28mm x 13 mm/1.42 in x 1.1 in x .51 in (Length x Width x Height)
Main Receiver Weight: 0.66 oz (18.6 g)
Voltage Range: 3.5 to 8.5V
Resolution: 2048
Frame Rate: 11ms
Compatibility: All DSM2 and DSMX aircraft transmitters and module systems

SPEKTRUM™ AR7210BX Power System Requirements

All flybarless gyro systems require uninterrupted power.

During even a short power interruption/brownout, the flybarless unit must reboot and reinitialize.

CAUTION: If a power interruption/brownout occurs during flight, a crash will occur. It is your responsibility to ensure the Spektrum AR7210BX has sufficient power without interruption.

Some of the power system components that affect the ability to properly deliver adequate power include:

- The switch harness, battery leads, servo leads, regulators etc.
- Receiver battery pack (number of cells, capacity, cell type, state of charge)
- The ESC's BEC capability to deliver current to the receiver when load is placed on the servos. This is the number one cause of power interruptions in electric helicopters.

The Spektrum AR7210BX has a minimum operational voltage of 3.5 volts. Test the power system according to these guidelines:

Recommended Power System Test Guidelines

Perform the following test with a voltmeter. The Spektrum Flight Log or Telemetry Modules (TM1000/TM1100) work well for this test.

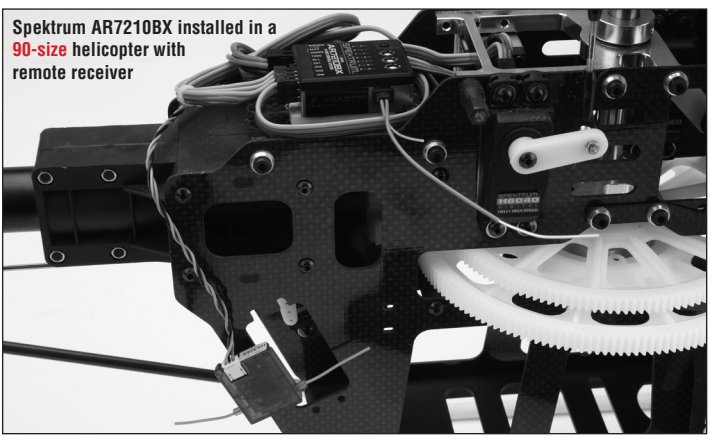
Plug the Flight Log into an open channel port in the receiver and, with the system on, load the servos by applying pressure to the swashplate with your hand for 3 minutes. Monitor the voltage at the receiver. It is important to load the swashplate for 3 minutes. If a voltage regulator becomes hot, it can lose its ability to supply current. An alternate method is to power on the system and rapidly move the control sticks (stir the sticks) with no load on the servos for 3 minutes. The voltage should remain above 4.8 volts in both cases.

Antenna Polarization

For optimum RF link performance, mount the antennas in an orientation that allows for the best possible signal reception when the helicopter is in all possible attitudes and positions. Orient the internal receiver antennas perpendicular to each other (see Receiver Installation).

When using a DSMX remote receiver—Use double-sided foam tape to mount the remote receiver so that the antenna is perpendicular to the longer main receiver antenna. The remote receiver antenna must be at least 2 inches away from the main receiver's antenna. The Spektrum AR7210BX is compatible with all DSM2 and DSMX transmitters, even when using the optional DSMX remote receiver.

Spektrum AR7210BX installed in a 270-size helicopter

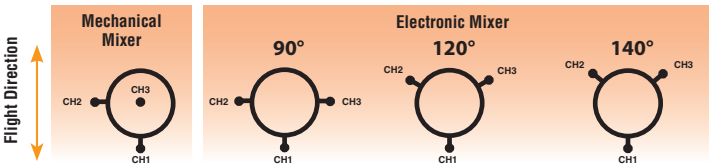


Spektrum AR7210BX installed in a 90-size helicopter with remote receiver

Servo Connections and Auxiliary Channels

Servo Selection

Select servos that are adequate for flybarless operation. The servos must have high torque in addition to being fast and precise. A poor servo-rotor blade combination will cause several issues including oscillation while hovering and unwanted reaction in fast forward flight. Connect all servos to the Spektrum AR7210BX. Refer to the diagram below for your particular helicopter's cyclic servos.



Auxiliary Channel

Do not attach the servo horns for now to prevent servo binding when powering the system for the first time. Channel 5 is internal to the receiver used for tail gain/operating SAFE® technology. At Aux2 and Aux3 ports you may connect additional servos or functions, i.e. retract landing gear or position lights.

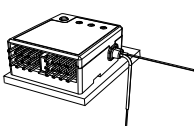
NOTICE: The Aux2 port is not available for additional functions when using the RPM Governor function.

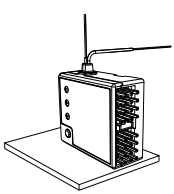
Preparing the Transmitter for Flybarless Operation

1. Create a new model in your transmitter's model memory.
2. Be sure all trims/sub-trims are disabled (zeroed) and all servo travel values are 100%.
3. Set your transmitter's swash type to mechanical mixing (1 Servo normal). Never enable any swash plate or rudder mixing function in the transmitter. This is handled by the Spektrum AR7210BX.
4. Do not adjust the pitch curve at this time. During setup, the pitch curve must be linear from 0% to 100%.
5. Again, make sure that there are no mixing functions active (for example "tail curve").

Receiver Installation

Attach the Spektrum AR7210BX receiver using one of the provided mounting tape pieces. The Spektrum AR7210BX must be in a low vibration position, such as the receiver or gyro platform. The mounting platform must be perpendicular to the main shaft. Helicopters generally have enough room on the frame to separate the main feeder antenna from the optional remote receiver. If necessary, make a mount using clear plastic to attach the remote receiver. Do not place the antenna tips directly on the carbon fiber.





The Spektrum AR7210BX can be attached flat, upright or inverted under the helicopter. The servo connector pins must always point toward the front or rear of the helicopter. Make sure the edges of the Spektrum AR7210BX are all parallel with the corresponding axes of the helicopter.

Y-Harnesses and Servo Extensions

Do not use amplified Y-harnesses or amplified servo extensions with Spektrum equipment. Use only standard non-amplified Y-harnesses and servo extensions. When converting existing models to Spektrum devices, replace all amplified Y-harnesses and servo extensions.

SmartSafe™ Failsafe

SmartSafe is a safety feature on the throttle channel only that offers the following benefits:

- Prevents electric motors from operating when the receiver only is turned on (no transmitter signal present)
- Prevents the speed controller from arming until the throttle is moved to low throttle position after connection is made
- Powers off electric motors and reduces gas/glow engines to idle if signal is lost (Must bind the receiver at throttle off or idle position)
- If throttle is at any position other than low, the ESC won't arm

SmartSafe sets the throttle to the position it was in during the binding process (normally low throttle or idle).

How To Program

SmartSafe is automatically set when the system is bound. It's important to have the throttle stick in the low position to store low throttle during binding.

To Test

Electric helicopters: Remove the pinion gear from the motor before testing.
Gas or glow helicopters: Test the servo positions with the engine off.
Confirm the failsafe setting is correct by turning off the transmitter. The throttle should go to the preset low throttle position. All other channels should hold the last commanded position.

Range Testing

Before each flying session, and especially with a new model, perform a range check. All Spektrum aircraft transmitters incorporate a range testing system which, when activated, reduces the output power, allowing a range check.

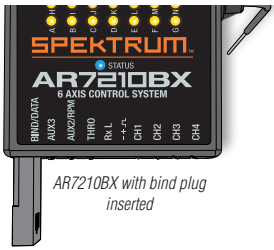
1. With the model on the ground and the motor/engine off, stand 30 paces (approx. 90 feet/28 meters) away from the model.
2. Face the model with the transmitter in your normal flying position and place your transmitter into Range Check Mode. This causes reduced power output from the transmitter.
3. You should have total control of the model in range test mode at 30 paces.
4. If control issues exist, call the Horizon Product Support office.

Binding

You must bind the receiver to the transmitter before the receiver will operate. Binding is the process of programming the receiver to recognize the GUID (Globally Unique Identifier) code of a single specific transmitter.

To bind a Spektrum AR7210BX to a DSM2 or DSMX transmitter:

1. Insert the bind plug in the BIND/DAT port on the receiver. Connect the receiver battery to any of the other ports. When using a heli with an ESC that powers the receiver, connect the controller to THRO port.
2. Power on the receiver. The H LED on the Spektrum AR7210BX and external remote receiver (if connected) should be flashing, indicating the receiver is in bind mode.
3. Move the throttle stick to desired failsafe position (throttle low).
4. Follow the procedures of your specific transmitter to enter **Bind Mode**. The system will connect within a few seconds. Once connected, the H LED will turn off and the Spektrum AR7210BX will start the initialization process.
5. Remove the bind plug from the BIND/DAT port on the receiver and store the bind plug in a convenient place.



AR7210BX with bind plug inserted

NOTICE: Remove the bind plug to prevent the system from entering bind mode the next time the power is turned on.

Setup Procedure

First, power on the transmitter. The Spektrum AR7210BX initializes when the receiver is powered on. Do not move the Spektrum AR7210BX or the helicopter while the receiver is initializing.

Receiver Initialization Cycle

1. LEDs H through N cycle to initialize the receiver inputs.
2. LEDs A through G cycle to calibrate the sensors.
3. The swashplate jumps twice and the Status LED turns solid after initialization. This indicates the active tail gyro mode.

Status-LED

Purple Solid	Tail gyro is in Normal-Rate mode
Blue Solid	Tail gyro is in Heading Lock mode

NOTICE: If using SAFE® technology, the system will show the active SAFE® technology status for 8 seconds. During this time the Status LED will light up red.

Status-LED

Red Solid	Menu LEDs indicating current SAFE® status and gain
Blue Solid	Tail gyro is in Heading Lock mode

4. One of the LEDs A through N will light for 8 seconds to show the amount of tail gain or the current SAFE status and gain. A = 0% to N = 100%.

Accessing Menu Levels

From flight-ready mode (Ⓐ through Ⓝ LEDs off) you can access two different Menu Levels — Setup Menu and Parameter Menu. You can only access one Menu Level at a time.

Setup Menu—Access all basic settings for helicopter setup.

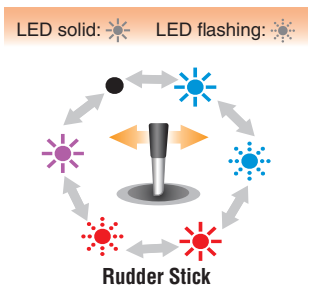
To access the Setup Menu: Press and hold the setup button until LED Ⓐ stops flashing and lights up solid.

Parameter Menu—Access settings to adjust the helicopter's flight characteristics. The Parameter Menu is used between flights.

To access the Parameter Menu: Press the setup button until LED Ⓐ flashes rapidly. Release the setup button when LED Ⓐ flashes.

Selection Within Menu Points

Each menu level consists of several menu points. At most of the menu points the Status LED indicates menu point options. The options are:



Move the rudder stick left to move counterclockwise through the options. Move the rudder stick right to move clockwise through the options. The available options depend on the menu point.

Switching to the Next Menu Point

The currently active menu point is indicated by the yellow menu LED row. Each menu point allows you to adjust a specific setting. When entering one of the Menu Levels you will start with menu point Ⓐ of the Menu Level. When you have adjusted the menu point quickly press the setup button to move to the next menu point. Quickly press the setup button if you want to skip menu points. Do not move the transmitter sticks when you are at a menu point you want to skip.

Exiting the Menu

When the last menu point of each Menu Level is reached, quickly press the setup button to exit the menu. The Spektrum AR7210BX will also automatically exit the menu after 4 minutes of inactivity. The Spektrum AR7210BX will not automatically exit at points Ⓓ, Ⓖ, Ⓘ and Ⓙ to allow time for mechanical helicopter adjustments.

CAUTION: Never fly the helicopter when the Spektrum AR7210BX is in the Setup or Parameter Menu. Gyro control and transmitter stick controls are disabled when the Spektrum AR7210BXis in the Setup or Parameter Menu.

Factory Reset

Unplug all servos and remove the servo horns before resetting the Spektrum AR7210BX.

To erase all Spektrum AR7210BX settings:

At any menu point during the Setup menu (Ⓐ through Ⓝ), press and hold the setup button for at least 10 seconds until LEDs Ⓐ through Ⓝ quickly flash to confirm the reset.

Any previous programming is deleted during a reset and default to factory settings.

CAUTION: Do not attempt to fly the helicopter without doing a complete setup procedure after a reset. If you do not complete the setup, the helicopter will crash, causing property damage and injury.

Setup Menu

Ⓐ Mounting Orientation of the Spektrum AR7210BX

At Setup Menu Point Ⓐ you must select the exact mounting position of the Spektrum AR7210BX in your helicopter. This results in eight possible settings for Setup Menu Point Ⓐ:

Status-LED	Mounting Orientation
OFF	Flat, sticker on top side, socket points in forward flight direction*
Purple Flashing	Vertical, button is on the top, socket points in forward flight direction
Purple Solid	Flat inverted, sticker on bottom side, socket points in forward flight direction
Red Flashing	Vertical inverted, button is on the bottom, socket points in forward flight direction
Red Solid	Flat, sticker on top side, socket points to the tail boom
Blue Flashing	Vertical, button is on the top, socket points to the tail boom
Blue Solid	Flat inverted, sticker on bottom side, socket points to the tail boom
Red/Blue	Vertical inverted, button is on the bottom, socket points to the tail boom

**Factory Setting*

Ⓑ Swashplate Servo Frequency

CAUTION: If you do not know the maximum pulse rate for your servos, do not exceed 50Hz servo frequency. A higher servo frequency can lead to servo failure. Analog servos usually tolerate a maximum of 50Hz. Contact the servo manufacturer if you are unsure of the servo frequency.

Always use the highest servo frequency that the servos can handle for the best performance.

Status-LED	
OFF	User Defined (requires PC software)
Purple Solid	50Hz*
Red Flashing	65Hz
Red Solid	120Hz
Blue Flashing	165Hz
Blue Solid	200Hz*

**Factory Setting*

Press the setup button to save the selection and move to Menu Point Ⓒ.

To see a complete Spektrum servo reference chart, refer to the servo chart on spektrumrc.com.

Ⓒ Tail Servo Center Position/Pulse Length

Almost all tail servos work with 1520µs (micro seconds). There are a few tail servos available that use a different center position pulse length.

Status-LED	Tail servo center position pulse length
OFF	User Defined (requires PC software)
Purple Solid	960µs
Red Solid	760µs
Blue Solid	1520µs*

**Factory Setting*

IMPORTANT: If a pulse length is selected Ⓒ that does not allow a certain tail servo frequency Ⓓ, the frequency is automatically reduced. The center position pulse setting always has priority. A servo can operate without issue at a lower frequency but cannot operate with an incorrect center position pulse length.

Press the setup button to save the selection and move to Menu Point Ⓓ.

Ⓓ Tail Servo Frequency

CAUTION: If you do not know the maximum frequency for your selected tail servo, do not exceed 50Hz. Exceeding the maximum frequency for the tail servo can lead to servo failure.

For best performance, always use a high-quality tail servo capable of at least 270Hz. Depending on the selection chosen in Menu Point Ⓒ, you may not be able to select a frequency above 333Hz.

Status-LED

OFF	User Defined (requires PC software)
Purple Solid	50 Hz*
Red Flashing	165Hz
Red Solid	270Hz
Blue Flashing	333Hz
Blue Solid	560Hz

**Factory Setting*

Attach a servo horn to the tail servo, making sure the tail linkage rod forms a 90° angle with the servo horn. Adjust the tail linkage rod according to your helicopter instruction manual. For most helicopters, the tail pitch slider should be centered on the tail shaft. The tail rotor blades will have a small amount of positive pitch to counter the torque from the main rotor.

IMPORTANT: Menu Point Ⓓ does not have a time limit.
Press the setup button to save the selection and move to Menu Point Ⓔ.

Ⓔ Setting the Tail Servo Endpoints

Adjust the limit of the tail rotor blades to achieve the best throw. The best throw is determined by either the maximum possible control travel of the tail slider or the maximum allowed tail rotor blade angle of attack. Make sure the tail rotor blades move in the correct direction (see your helicopter manual for more information). If the tail rotor blades move in the wrong direction, use your transmitter to reverse the rudder direction.

To adjust the limits:

1. Move the rudder stick in one direction until the servo reaches the maximum endpoint without binding. If you move the servo too far, move the rudder stick in the opposite direction and move the tail pitch slider away from the limit.
2. Release the rudder stick.
3. Once the maximum endpoint is adjusted, do not move the rudder stick.
4. Wait for the Status LED to flash then turn either **Solid Red** or **Solid Blue**, depending on the direction. The servo limit for one direction is saved.
5. Adjust the servo limit in the opposite direction. Move the tail pitch slider to the other maximum endpoint and release the rudder stick.
6. The Status LED flashes, followed by **Solid Purple**, indicating that the servo endpoint adjustment is complete.

IMPORTANT: If the Status LED does not light or lights in an unexpected color, the servo throw is too small. Move the tail linkage ball farther in toward the center of the servo horn.

7. Press the setup button to save the selection and move to Menu Point Ⓕ.

Ⓕ Setting the Tail Sensor Direction

1. Move the helicopter nose to the right. The tail rotor blades will move in the same direction as left rudder input. If the tail rotor blades move in the wrong direction, reverse the sensor direction.
2. Move the rudder stick once in any direction. The Status LED will change color.

Status-LED

Red Solid	Normal*
Blue Solid	Reversed

**Factory Setting*

3. Repeat Steps 1 and 2.
4. Press the setup button to save the selection and move to Menu Point Ⓖ.

Ⓖ Adjusting the Swashplate Servo Centering

Menu Point Ⓖ electronically adjusts the center point of the cyclic servos.
With all swashplate servos connected, the servos are now operating in their mechanical center position or “reference position.” The Status LED is OFF.

1. Install the servo horns on the servos so the horns form an angle close to 90° with the linkage rod. The angle will not be a perfect 90°.
2. Move the rudder stick once to select a servo.

Status-LED

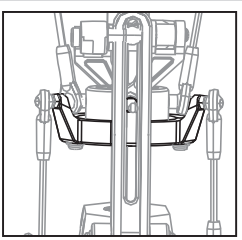
OFF	Swashplate servos at reference position
Purple Solid	CH1 servo center adjust
Red Solid	CH2 servo center adjust
Blue Solid	CH3 servo center adjust

3. Move the elevator stick forward and back to adjust the center position.
4. Move the rudder stick to select the next servo. Complete Steps 2 and 3 for each servo.

IMPORTANT: Menu Point Ⓖ does not have a time limit.

NOTICE: You can switch between the servo trimmings as often as you like. Note that only the servo positions you see when trimming is active are important. So even if the servo horns are perfectly aligned at Status-LED off, you have to check and adjust the center positions. Status-LED off has no further functionality despite from finding the true center position of the servo for installing the servo horn. It will neither affect your servo trimming nor will these positions be used later.

5. While one servo is still selected adjust the cyclic/swashplate linkage, adjust the cyclic/swashplate linkage rods according to your helicopter manual. The swashplate should be centered and the main blades should have 0° of pitch. Always make rod length adjustments from the bottom (servos) to the top (blade grips).
6. Press the setup button to save the selection and move to Menu Point Ⓗ.



H Swashplate Mixer

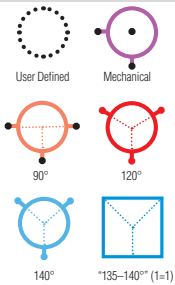
1. Select the electronic swashplate mixer required for your helicopter or choose “mechanical” if the helicopter uses a mechanical mixer. The Spektrum AR7210BX supports 90°, 120° and 135–140° swashplates. You can also use any swashplate geometry by selecting User Defined (PC software required). Refer to your helicopter manual for more information on CCPM.

CAUTION: NEVER use your transmitter’s electronic swashplate mixing. All CCPM mixing is done by the Spektrum AR7210BX.

Status-LED

OFF	User Defined
Purple Solid	Mechanical
Red Flashing	90°
Red Solid	120°*
Blue Flashing	140°
Blue Solid	135°/140° (1=1)

**Factory Setting*



2. Press the setup button to save the selection and move to Menu Point I.

I Setting the Swashplate Servo Directions

Menu Point I ensures the swashplate servos are moving correctly. Note that the proper aileron, elevator and collective pitch direction (right/left, up/down) will be corrected later using the servo reversing setting in the transmitter. At first try each of the four possible combinations until the swashplate moves as described.

IMPORTANT: The direction of swashplate movement (e.g. Swashplate moving up when it should move down) is not important at this time. You will adjust the swashplate direction when the servos are moving together.

1. Move the collective pitch stick and observe the swashplate movement. The swashplate servos should all move together to raise or lower the swashplate.
2. If the swashplate is not horizontal when it moves, try a different servo combination by moving the rudder stick.
3. Repeat Steps 1 and 2 until the servos are all moving the swashplate up and down together.
4. Verify the swashplate is moving correctly in all directions. (Refer to your helicopter manual).
5. If the swashplate is moving in the wrong direction (e.g. The swashplate is moving up when it should move down), use the servo reverse feature in your transmitter to reverse the channel that controls the appropriate function. Do not change the servo directions of AR7210BX anymore.

Status-LED	CH1	CH2	CH3
OFF	Normal	Reverse	Reverse
Purple Solid	Normal*	Normal*	Reverse*
Red Solid	Normal	Reverse	Normal
Blue Solid	Normal	Normal	Normal

*Factory Setting

IMPORTANT: Menu Point ❶ does not have a time limit. If the servos are still not reacting properly after using servo reverse, make sure the servos are connected to the proper receiver channels. Also, make sure any servo mixing in your transmitter is turned off.

6. Press the setup button to save the selection and move to Menu Point ❿.

❿ Teaching the Cyclic Pitch Geometry

CAUTION: Do not touch any stick on your transmitter when entering Menu Point ❿. This will cause unwanted flight behavior.

1. Move the rotor blades so that they are parallel to the tail boom.
2. Attach a pitch gauge to a rotor blade. The swashplate should be in the neutral position and the blade should have 0° of pitch. If the swashplate is not neutral with 0° of blade pitch, repeat Menu Point ❼ before proceeding.
3. Move the aileron stick left or right until the pitch gauge has exactly 6° of cyclic pitch. Then release the aileron stick.
4. If the pitch gauge has more than 6° of cyclic pitch, move the aileron stick in the opposite direction until the pitch gauge is at 6°.

IMPORTANT: The Status LED should light up **Blue** at 6° of cyclic pitch. If the Status LED is **Red**, **Purple** or **OFF**, you must change the mechanical setup of the helicopter. Otherwise the system may not perform well and you may loose control of the helicopter. You can use:

a) Shorter servo horns
b) Shorter linkage balls on the inner swashplate ring or
c) Longer blade grip linkage levers

5. Press the setup button once to save the cyclic pitch adjustment and move to Setup Menu Point ⓫.

Ⓚ Collective Pitch Range and Endpoints

At Setup Menu Point Ⓚ, you adjust the maximum desired negative and positive collective pitch and teach the AR7210BX the pitch directions.

By moving the rudder stick, you can reverse the internal collective pitch direction. The current pitch direction is indicated by the color of the Status-LED at Setup Menu Point Ⓚ.

IMPORTANT: This setting is very crucial for proper function of SAFE® technology. Check the setting before flight.

1. Push the throttle stick forward to full positive. By moving the aileron stick left or right, you increase or reduce the collective pitch angle so that it corresponds to the desired maximum angle. Make sure the throttle stick stays forward when adjusting the pitch. To confirm that the new value has been set, the Status-LED will flash in the appropriate color.
2. If you have set the maximum (or minimum) collective pitch angle, move the throttle stick all the way down and again adjust the collective pitch to the desired pitch angle by using the aileron stick, this time keeping the throttle stick to full negative.
3. Check the internal collective pitch direction. The current pitch direction is indicated by the color of the Status-LED. When the throttle stick is set to positive collective pitch, the Status-LED must light up **Blue**; when the stick is set to negative pitch, the Status-LED must light in **Red**. The crucial factor is the actual pitch angle of the rotor blades, not the direction of the throttle stick. If the display of colors is inversed, i.e. the Status-LED lights **Blue** when pitch is negative and lights **Red** if pitch is positive, the directions can be interchanged by moving the rudder stick once in any direction. Verify this setting several times, as the setting is very important for proper function of SAFE® technology.

IMPORTANT: Do not use any pitch curves in your transmitter during these adjustments. For later flights, you can adjust your pitch curves as desired. Setup Menu Point Ⓚ serves to teach Spektrum AR7210BX the maximum pitch range and the endpoints of the throttle stick.

IMPORTANT: At this point, verify that the demanded collective pitch direction on the transmitter is in the correct direction for the model. Otherwise use your transmitter's servo reversing function for the collective pitch channel to correct this as already described in the section about Setup Menu Point Ⓘ.

4. Press the button to save the configuration and to proceed to Setup Menu Point Ⓛ.

Ⓛ Adjusting the Cyclic Swashplate Limit

Menu Point Ⓛ adjusts the maximum possible tilting of the swashplate for aileron and elevator. The deflection is limited in a circular path, similar to a cyclic ring function, preventing swashplate binding at full aileron and elevator travel.

1. Carefully move the sticks for aileron, elevator and pitch elevator and pitch to all maximum endpoints simultaneously. Watch for binding or lack of movement in the swashplate, linkage rods and servos.
2. Move the rudder stick right or left to increase or decrease the aileron and elevator throw limiter. Always try to achieve the maximum possible cyclic throw without causing binding at any servo position.
3. The Status-LED should still be **Blue** when the swashplate is at the maximum limit. If the Status-LED is **Purple** or **OFF**, you must mechanically adjust the helicopter to increase the available throw.

IMPORTANT: If you make any modifications to Menu Points Ⓖ, Ⓙ or Ⓚ in the future, you must repeat Menu Point Ⓛ again.

4. Press the setup button to save the selection and move to Menu Point Ⓜ.

Ⓜ Setting the Swashplate Sensor Directions

1. Tilt the helicopter forward. The swashplate should tilt backward.
2. Tilt the helicopter backward. The swashplate should tilt forward.
3. Roll the helicopter left. The swashplate should roll right.
4. Roll the helicopter right. The swashplate should roll left.
5. If the swashplate does not move in the correct direction, reverse the sensor direction by moving the rudder stick to select one of the four following options:

Status-LED	Elevator	Aileron
OFF	Reversed	Reversed
Purple Solid	Reversed	Normal
Red Solid	Normal	Reversed
Blue Solid	Normal*	Normal*

**Factory Setting*

6. Repeat Step 5 until both sensors are working in the correct direction.
7. Press the setup button to save the selection and move to Menu Point Ⓝ.

Ⓝ RPM Governor — Operation modes

At Menu Point Ⓝ you can choose from three options:

- **Deactivated** — the RPM Governor is not used. All control commands on the throttle channel will be passed to **[THRO]** output directly.
- **Electric** — select this option if your helicopter is powered by an electric motor and an electric speed controller is plugged into **[THRO]** output of the Spektrum AR7210BX. Spektrum AR7210BX reads the RPM signal from the speed controller or a phase sensor and controls the rotor speed accordingly.

NOTICE: The ESC must not be operated in a (heli specific) Governor Mode. The ESC must process the incomming throttle signals and control the motor as direct and unfiltered as possible.

- **Nitro** — with this option, the Spektrum AR7210BX can govern the rotor RPM of a helicopter with nitro or gas engine. For this, the Spektrum AR7210BX controls the throttle servo which is connected to **[THRO]** output and that controls the carburetor of the engine. The motor RPM will be read from a magnetic or optical sensor that captures the RPM from the crankshaft of the motor, the clutch bell or the main gear.

Choose by moving the rudder stick in one direction until the LED indicates the desired color and state:

If the RPM Governor is "deactivated," the Spektrum AR7210BX will exit the Setup Menu if you quickly press the button. If you have chosen to activate the governor, pressing the button will lead to Governor Menu Point Ⓐ.

Status-LED	Operation Mode
OFF	Deactivated*
Red Solid	Electric
Blue Solid	Nitro

**Factory Setting*

Governor Menu

If the RPM Governor is activated at Setup Menu Point Ⓝ (setting "electric" or "nitro") then you can access the Governor Menu immediately. Here, various helicopter-specific information must be provided, necessary for RPM Governor functionality. The transmitter will be prepared for use with the RPM Governor function. At Menu Point Ⓐ, a function test for the RPM sensor is performed.

CAUTION: Always keep a safe distance in all directions around your model to avoid collision or injury. Pay attention to your own safety and the safety of other people and property in your vicinity when using our product. When using helicopters with nitro/gas engines make sure that the motor will not start when making adjustments to the system. When using a gas engine always keep the ignition system deactivated. For electric helicopters remove the motor pinion from the main gear during initial setup. Never touch the motor when it's running. Always keep a save distance to all rotating parts of the helicopter.

Ⓐ Function Test for RPM Sensor

In order to use the Spektrum AR7210BX Governor, the system must be able to detect the motor speed with the help of a RPM sensor that must be attached to the sensor input of Spektrum AR7210BX. For models with nitro/gas engines, usually sensors are used that determine the speed signal magnetically or optically. These sensors are mounted next to the crankshaft or clutch bell and register the number of engine revolutions here.

For electric motors, the motor speed can be determined electronically. For this purpose, a phase sensor (e.g. BXA76013) is connected to one or two of the motor phases. Some electronic speed controllers (ESCs) offer a direct signal output for the RPM signal so that no additional sensor is required.

To see how the sensor is mounted in detail, please refer to the instruction manual from your sensor or helicopter. The wire with the RPM signal is connected to the **[AUX2|RPM]** input pin of Spektrum AR7210BX.

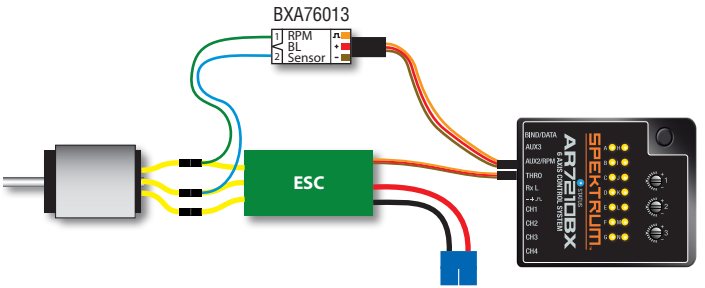
NOTICE: The supply voltage corresponds to your receiver power supply voltage.

Here are some installation and connection examples. As described, virtually all kinds of RPM sensors may be used which transmit the motor RPM as periodic low-high signal. Unfortunately it is impossible to try and enumerate all types. Consult your dealer about whether a particular sensor can be used in conjunction with Spektrum AR7210BX.

Electric Drive System with External Phase Sensor

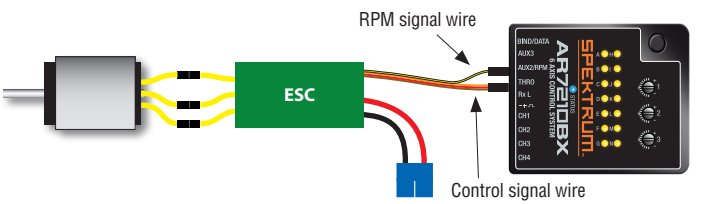
Connect the motor wires of the phase sensor with any two phases of the electric motor. We recommend soldering those wires to the plugs of the ESC. For maintenance purposes, it is easier to remove the motor from the model later. In some cases, a single phase wire is sufficient. Usually this is the case when the ESC powers the system with a BEC thus there is no galvanic isolation between motor and receiver circuit. However, we recommend using both wires, ensuring that the sensor provides an interference-free signal.

The ESC is plugged into the **[THRO]** output.

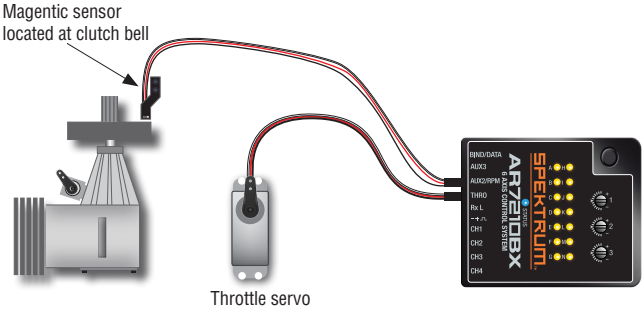


Electric Drive System with RPM Signal Output from the ESC

The ESC's signal input wire is plugged into the output **[THRO]** as usual.



Combustion Drive System (Nitro/Gas)



Menu Point Ⓐ verifies (1) the RPM sensor is functioning properly, (2) the RPM sensor wire is connected correctly and (3) if there is a usable RPM signal. **Caution: at this menu point the throttle channel is unlocked.** This means you have full control over the throttle output **[THRO]** with your transmitter to control the speed controller or throttle servo.

Electric Model — For safety, remove the rotor blades from the model. Give some throttle so that the motor starts to rotate and the phase sensor or the ESC outputs a RPM signal. Once the motor starts, the Status-LED on the Spektrum AR7210BX lights up **Red**.

WARNING: Use extreme caution when performing the Governor Function Test. Never touch the motor when it's running. Keep all hair, hands and dangling or loose items away from rotating parts.

Nitro/Gas Powered Model — You can rotate the clutch or engine crankshaft by hand until the signal generator (magnet or similar) passes the sensor. When the signal generator is within the detection range of the sensor, the Status-LED lights up **Blue**.

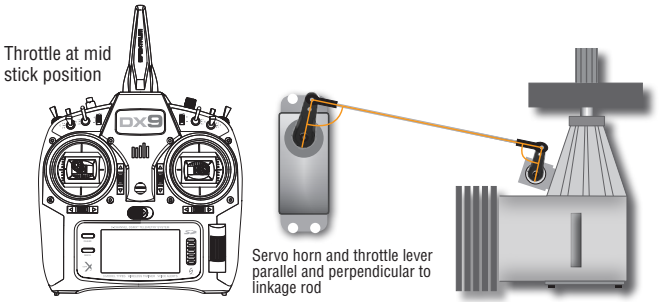
If the Status-LED on the Spektrum AR7210BX does not light up as described:

- double check the wiring
- verify the sensor's power wires are of correct polarity
- if you have a magnetic sensor, verify the magnets are installed with the correct polarity
- using a crankshaft sensor, verify the sensor is mounted correctly

In addition to the sensor's function control, check the throw setting for the throttle servo in the transmitter and adjust using the following steps:

1. Set the throttle to mid-stick position and attach the servo horn, so that the throttle linkage is at a 90° angle to the servo horn.
2. Adjust the linkage length according to your helicopter's instructions, so that it is positioned perpendicular to the linkage lever at the carburetor.
3. Adjust the lever at the carburetor so that it is halfway open noting the markings on the carburetor.
4. Move the throttle stick to full throttle and adjust the servo travel in the transmitter accordingly, so that the full throttle position is reached without binding.

5. Move both throttle stick and throttle trim on the transmitter to the “motor off” position. Adjust the servo travel in that direction until the carburetor is closed. If the servo travel must be greatly reduced in both directions, it is recommended that the linkage ball on the servo arm is mounted further in so that the servo can be moved over a wider range. For more information, refer to your helicopter’s instruction manual.



With an electric model, the control range of throttle is crucial. Usually here the throttle endpoints of the transmitter are fixed by an initial programming of the speed controller. But some ESCs require adjusting the servo throw of the throttle channel in the transmitter, so that the throttle range matches the specifications of the ESC. At Menu Point Ⓐ you can verify this setting. Carefully apply some throttle. The motor should start to turn immediately if you move the stick just a little bit and full speed is reached when the stick reaches full throttle position. If the motor turns much earlier at the maximum possible speed or only starts to turn at a very high stick deflection decrease the travel of throttle channel in the transmitter or repeat the programming of the ESC. The Spektrum AR7210BX RPM Governor can operate correctly, the motor speed should increase as linearly as possible when the stick is moved and there should be no range where the motor speed does not change.

WARNING: Electric motors rotate at high speeds. Always keep a safe distance from rotating parts or personal injury may result.

Some motors may not be operated without load. In this case, only let the motor run for a short time or let the motor stay attached to the main gear and only remove the main and tail rotor blades.

When in doubt, skip the function test or throw adjust of the throttle stick.

Press the button to save the configuration and to proceed to Menu Point Ⓑ.

Ⓑ Motor Off/Idle Position

Menu Point Ⓑ is used to set the lowest throttle position.

CAUTION: Output **[THRO]** can be directly controlled by the throttle stick.

Electric Model

1. Move the throttle stick to low throttle, just until motor stops. If the stick throw has been correctly adjusted as described at Menu Point Ⓐ (or the ESC has been programmed to the stick throws), the necessary throttle position should be achieved at the lowest position of the throttle stick. Some speed controllers provide a special mode that allows for a quick start-up in case of aborting an autorotation landing. Here you have a larger area between the actual "motor off" position of the speed controller and the point at which the motor actually starts. Also there are speed controllers which will not initialize if the lowest stick position is very close to the motor starting point, so these require more stick throw in the transmitter to maintain some "dead zone." In both cases, move the throttle stick just as high as the motor will start in the next step, so that Spektrum AR7210BX can determine the effective throttle range correctly.
2. Set the low throttle position, ensuring the Status-LED lights up **Blue**. This means that a new valid throttle position has been detected. If the Status-LED lights up **Red**, then the throttle stick is too close to the center position and not optimal. Check the setting of the transmitter and the ESC programming or re-adjust throttle servo, carburetor position and throttle linkage rod.

Nitro/Gas Powered Model

1. Bring the throttle stick to the idle position or a slightly increased idle position (not "motor off"), so the Spektrum AR7210BX can determine the effective throttle range in the next step. Using the RPM Governor without an auxiliary channel to control the RPM Governor, this position will be used as idle position when performing an autorotation maneuver. Set the throttle as high as necessary so the motor will idle and will continue to run when performing the autorotation.
2. Set the low throttle position, ensuring the Status-LED lights up **Blue**. This means that a new valid throttle position has been detected. If the Status-LED lights up **Red,** then the throttle stick is too close to the center position and not optimal. Check the setting of the transmitter and the ESC programming or re-adjust throttle servo, carburetor position and throttle linkage rod.

When entering Menu Point Ⓑ, the Status-LED is **OFF**. As long as you do not move the throttle stick, the currently stored position will not be changed. So you can skip Menu Point Ⓑ by pressing the button without changing the throttle position when performing subsequent adjustments in Setup menu or Governor menu. You must move the throttle stick at Menu Point Ⓑ at least once to change the current throttle position.

Press the button to save the configuration and to proceed to Menu Point Ⓒ.

Ⓒ Full Throttle Position

At Menu Point Ⓒ, you have to set full throttle position of your ESC or throttle servo. **Here the output [THRO] can be only controlled by the throttle stick when the RPM Governor type is set to "nitro."** In "electric" mode the throttle output will stay locked to your low throttle value. You can set the full throttle position without the motor running high. Otherwise there is no difference between the modes "electric" and "nitro."

Move the throttle stick to full throttle. The Status-LED lights up **Blue**. This means that a new valid throttle position has been detected. If the Status-LED lights up in **Red**, the distance between the lowest throttle position and the full throttle position is too small. Since this will have a negative effect on the control behavior of the system, this throttle position cannot be used. In this case, check the setting of the transmitter and the programming of the ESC or readjust throttle servo, carburetor position and throttle linkage rod. If necessary, set the lowest throttle position at Menu Point Ⓑ again.

Similar to Menu Point Ⓑ the Status-LED is **OFF** when entering Menu Point Ⓒ. As long as you do not move the throttle stick, the currently stored position will not change. Press the button to skip Menu Point Ⓒ without changing the throttle position when performing subsequent adjustments in Setup menu or Governor menu. You need to move the throttle stick at Menu Point Ⓒ at least once to change the current full throttle position.

Press the button to save the configuration and to proceed to Menu Point Ⓓ.

Ⓓ Adjusting throttle curves in the transmitter

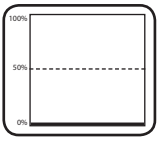
Similar to Menu Point Ⓐ, Menu Point Ⓓ only serves to give you some status information. At Menu Point Ⓓ the different activation points of the RPM Governor will display based on color and state of the Status-LED. You can prepare your transmitter for use with the RPM Governor function. The information conveyed by the Status-LED is basically the same in every Governor operation mode. However, the setup of the transmitter will be slightly different, depending on whether the mode "electric" or "nitro" is used.

Electric

In "electric" mode, the ESC is no longer controlled by the pilot via the transmitter. The Spektrum AR7210BX takes over full control of the ESC. With the transmitter you only specifiy the desired rotor RPM you want the helicopter to maintain. When setting an RPM higher than zero, the Spektrum AR7210BX will speed up the rotor smoothly and ensure that the rotor RPM is kept constant throughout the flight. To practice autorotation landings, you can keep the Spektrum AR7210BX in a special mode, which causes the ESC to be switched off during the maneuver but speed up the rotor RPM faster when aborting the autorotation (faster than with the initial soft start).

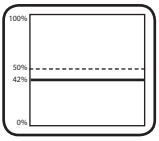
The rotor RPM is set via the transmitter's throttle channel. You may use the transmitter's throttle curves for instance, so you can switch the motor on and off and simulate different speeds using the flight mode system of the transmitter. Instead of curves, you only have to set horizontal lines so that the rotor RPM value does not depend on the throttle stick position but is fixed in each flight mode. The flight mode switch then acts as a switch that switches between different speed settings.

Normal flight mode
- Motor off
- Throttle is 0% over the entire range



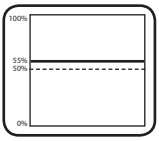
Status-LED **OFF**

Idle up 1
- RPM Governor enabled
- 1680 RPM = 42% throttle



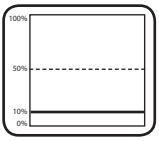
Status-LED **Red**

Idle up 2
- RPM Governor enabled
- 2200 RPM = 55% throttle



Status-LED **Red**

Autorotation
- RPM Governor on standby
- Motor off



Status-LED **Blue**

In “electric” mode, the adjustable throttle range is 3400 RPM. The lowest rotor speed that can be set is 600 RPM, the maximum speed is 4000 RPM. To enable autorotation bail out mode the throttle must be set to a value between 5% and 15%.

Throttle Position	Rotor RPM*	Status-LED
100%	4000	Purple Solid
95%	3800	Red Solid
90%	3600	
85%	3400	
80%	3200	
75%	3000	
70%	2800	
65%	2600	
60%	2400	
55%	2200	
50%	2000	
45%	1800	
40%	1600	
35%	1400	
30%	1200	
25%	1000	
20%	800	
15%	600	
10%	Motor off/ Autorotation	Blue Solid
5%		
0%	Motor off	OFF

**The list is not exhaustive. Intermediate values result accordingly.*

Nitro

In “nitro” mode, the throttle servo can be controlled via the throttle channel of the remote control as long as the RPM Governor is switched off. Only when the RPM Governor is switched on this will take over control of the throttle servo to spool up the rotor to the desired speed (if this is not yet reached) and ensure that the rotor speed is maintained during the flight. The manual throttle control is necessary to start and warm up the motor as well as to stop the motor after flight. Also some model motors react very sensitive in the lower throttle sector and abrupt engagement can cause the motor to quit, i.e. when the clutch is not fully engaged and/or the rotor is not yet turning. In this case, manual throttle control can be advantageous as the pilot can run the motor to speed by hand before control is passed over to the RPM Governor.

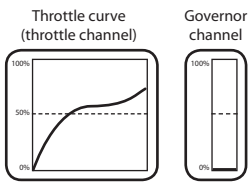
Depending on whether an auxiliary channel was assigned to control the RPM Governor in the Channel Assignment Menu or not, the RPM Governor is either controlled separately via this channel or you can control both RPM Governor and throttle servo alone by using the throttle channel of the transmitter. In general, the adjustable throttle range in “nitro” mode is 2400 RPM. The lowest head speed to govern is 600 RPM, the maximum head speed is 3000 RPM.

Nitro Governor with Auxiliary Channel

If a separate control channel is used for the RPM Governor, the throttle servo can be controlled as usual via throttle channel and throttle curves of the transmitter. By switching the separate control channel in different positions, the RPM Governor can be activated and the desired rotor RPM can be preset. Note that for safety reason the throttle channel has priority over the RPM Governor when the output is below 25%. So you can always control the lower throttle servo positions by hand, even if the RPM Governor is already switched on. Then when the throttle is raised above 25% the RPM Governor intervenes and spools up the rotor. Also when you want to bring the throttle servo to idle position for autorotation or to shut off the engine you can always do this, regardsless of how the RPM Governor is switched. The Spektrum AR7210BX will be set to autorotation bail out mode if the RPM Governor is switched on and the throttle channel is brought below 25%. When throttle is increased again, the RPM Governor will speed up the rotor faster than on initial spool up! Therefore, if you make a stopover and the rotor is completely stopped, the RPM Governor must be completely disabled once by using the separate control channel. So the RPM Governor is reset and will perform an initial startup again. Otherwise if autorotation mode would still be active, the helicopter may tip over due to the abrupt speed up (this does not apply if you set the bail out spool up rate at Parameter Menu Point K as high as the initial spool up rate).

Normal flight mode

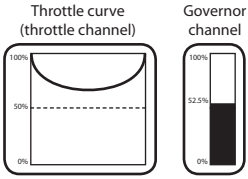
- Throttle curve controls throttle
- RPM Governor off



Status-LED **OFF**

Idle up 1

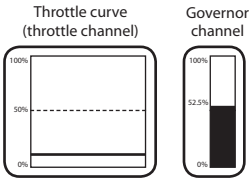
- RPM Governor on
- 1800 RPM = 52.5%
- Throttle must stay above 25%. V-curve used as backup, in case the governor gets deactivated in this flight mode



Status-LED **Red**

Autorotation

- RPM Governor on standby
- Increased idle position
- Maximum 25% throttle



Status-LED **Blue**

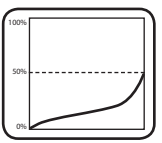
Throttle Position		Rotor RPM*	Governor Channel
100%	**Manual control/ RPM control**	3000	100
95%		2874	90
90%		2747	80
85%		2621	70
80%		2495	60
75%		2368	50
70%		2242	40
65%		2116	30
60%		1989	20
55%		1863	10
50%		1737	0
45%		1611	-10
40%		1484	-20
35%		1358	-30
30%		1232	-40
25%		1105	-50
20%	**Manual control/ Autorotation**	979	-60
15%		853	-70
10%		726	-80
5%		600	-90
0%		aus	-100

**The list is not exhaustive. Intermediate values result accordingly.*

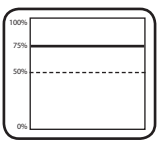
Nitro Governor with Throttle Channel Only

If you do not use a separate control channel for the RPM Governor, throttle servo and RPM Governor are solely controlled by the throttle channel. The control range of the throttle channel is divided into two parts; below the center position, the throttle servo is controlled manually by the throttle channel. The RPM Governor is switched off and the servo output range is doubled, so that the throttle servo can be moved over the entire range. Once the throttle channel is moved (switched) to the upper area, the RPM Governor will activate, spool up the rotor and try to hold the preset RPM. Similar to the above description for electric models, you make the throttle curve a horizontal line, so that regardless of the position of the throttle stick, the Spektrum AR7210BX will always see the same throttle value and so the preset RPM will stay the same. So at least two flight phases are necessary: (1) that the throttle curve goes only up to the middle and in which the motor can be controlled by hand, i.e. for starting the motor and (2) a flight phase that activates the RPM Governor and the throttle curve is used to preset the desired rotor head speed.

Normal flight mode
- RPM Governor off
- Throttle stick controls throttle servo

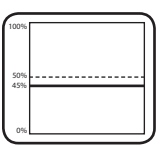


Idle up 1
- RPM Governor on
- 1800 RPM = 75%



A third flight mode may be used for autorotation: Here the throttle channel is constantly set to a value close below center position (between 40% and 50%). When you switch to this flight mode once the governor was active, the throttle servo will move to idle set at Menu Point Ⓑ. When switching back to governor mode, i.e. when you want to bail out from autorotation, the rotor will spool up at an increased rate (this does not apply if you set the bail out spool up rate at Parameter Menu Point Ⓚ as high as the initial spool up rate). Alternatively, if it is switched back to the flight phase with manual control and throttle is moved below 40%, autorotation mode is canceled and the next time you switch on the RPM Governor, the rotor spools up slowly.

Autorotation*
- RPM Governor on standby
- Increased idle position



**Only effective when RPM Governor was active before*

Throttle Position	Rotor RPM*	Status-LED
100%	3000	Purple Solid
95%	2760	Red Solid
90%	2520	
85%	2280	
80%	2040	
75%	1800	
70%	1560	
65%	1320	
60%	1080	
55%	840	
50%	600	
45%	Manual control/ Autorotation	Blue Solid
40%		
35%	Manual control	OFF
30%		
25%		
20%		
15%		
10%		
5%		
0%		

**The list is not exhaustive. Intermediate values result accordingly.*

When the transmitter setup is finished and the Status LED lights up in the colors as described when switching between the different flight modes, switch to motor off position on the transmitter. Then briefly push the button to proceed to Menu Point Ⓔ.

Ⓔ Divider for RPM Input Signal

Electric Motors

The RPM sensor signal usually consists of the (electric) field speed. In order to obtain the actual motor speed, divide the field speed by half the number of motor poles. Using a 2-pole motor, the measured speed corresponds to the motor speed. With a 10-pole motor, the field speed is five times higher than the actual speed, so the measured speed must be divided by five.

Nitro/Gas Motors

The measured speed of the sensor may be higher than the actual speed. For example, when a magnetic sensor is installed and more than one magnet is used for measuring the rotational speed, the RPM output is multiplied by the number of magnets. So when two sensor magnets are used, the RPM signal from the sensor is twice the engine revolution.

At Menu Point Ⓔ, you must specifiy the factor by how much the incoming RPM signal must be divided to get the actual motor RPM. The currently selected division factor is represented by the color of the Status-LED. Use the rudder stick to switch between options.

Status-LED	Divider
OFF	**no division** (2 motor poles or 1 magnet**)
Purple Flashing	**2** (4 motor poles or 2 magnets**)
Purple Solid	**3** (6 motor poles)
Red Flashing	**4*** (8 motor poles)
Red Solid	**5** (10 motor poles)
Blue Flashing	**6** (12 motor poles)
Blue Solid	**7** (14 motor poles)

*Factory Setting
** magnets used as signal generator for nitro helis

The motor poles of an electric motor can be determined by counting the number of magnets built into the motor housing. Each magnet corresponds to one magnetic pole. Note that on some motors, pairs of magnets are used rather than one single large magnet. These pairs together form just one magnetic pole. Refer to your motor datasheet or consult your local dealer.

To determine the number of magnets that are used for a magnetic RPM sensor in a nitro helicopter, you can use Menu Point Ⓐ. Each time a magnet passes the sensor, the Status-LED lights up **Blue**, i.e. when you turn the clutch bell by hand. Count how often the Status-LED lights up during a single rotation. Then this is the divider you have to set a Menu Point Ⓔ.

Press the button to save the configuration and to proceed to Menu Point Ⓕ.

Ⓕ Ⓖ Ⓗ Divider for Main Gear Ratio

The RPM Governor of the Spektrum AR7210BX calculates with the rotor head speed of the helicopter. So (as shown at Menu Point Ⓓ) you can set the desired head speed very easily and the Spektrum AR7210BX will try to maintain this head speed. Thus, the detected rotation speed of the motor can be converted into rotor head speed. Specify the main gear ratio of the helicopter at Menu Points Ⓕ, Ⓖ and Ⓗ. Menu Point Ⓕ sets the number of gear ratio before the decimal point. Menu Points Ⓖ and Ⓗ specify the first two decimal places. Compare the following table and set the Status-LED to the corresponding color and condition at each Menu Point so the desired gear ratio will result as a combination of all three menu points. The ratio can be adjusted in increments of 0.05. Choose the ratio that is the closest for your helicopter and set the menu points one after the other.

The gear ratio should be specified in the instruction manual for your helicopter. Especially with electric models it will vary depending on the motor pinion used. For helicopters with a single-stage gear drive the reduction can be calculated by dividing the number of pinion teeth from the main gear tooth count.
Example: BLADE 360CFX – Main gear 136 teeth / 12 tooth pinion. Gear ratio ca. 11,35:1.
Ⓕ – Status-LED solid red, Ⓖ – Status-LED purple flashing, Ⓗ – Status-LED red flashing.

To proceed to the each menu point press the button. After Menu Point Ⓗ the initial setup is finished and the button press will lead back to operation mode.

Main gear ratio - X.YZ : 1

Menu Point Ⓕ

Status-LED	X
OFF	User Defined
Purple Flashing	8
Purple Solid	9*
Red Flashing	10
Red Solid	11
Blue Flashing	12
Blue Solid	13
Red/Blue	14

**Factory Setting*

Setting the option “user defined” at Menu Point Ⓕ, you can choose a custom gear ratio that can be edited using StudioX software and the optional USB2SYS interface. This allows you to choose ratios smaller than 8.00:1 or greater than 14.95:1 or that are not a multiplier of 0.05.

In this case, the Menu Points Ⓖ and Ⓗ will be skipped when the setup button is quickly pressed at Menu Point Ⓕ.

Menu Point Ⓖ Status-LED	YZ	Menu Point Ⓗ Status-LED
OFF	.00	OFF
OFF	.05	Purple Flashing
OFF	.10	Purple Solid
OFF	.15	Red Flashing
Purple Flashing	.20	OFF
Purple Flashing	.25	Purple Flashing
Purple Flashing	.30	Purple Solid
Purple Flashing	.35	Red Flashing
Purple Solid	.40	OFF
Purple Solid	.45	Purple Flashing
Purple Solid	.50*	Purple Solid
Purple Solid	.55	Red Flashing
Red Flashing	.60	OFF
Red Flashing	.65	Purple Flashing
Red Flashing	.70	Purple
Red Flashing	.75	Red Flashing
Red	.80	OFF
Red	.85	Purple Flashing
Red	.90	Purple Solid
Red	.95	Red Flashing

**Factory Setting*

Using the RPM Governor

If you had to change low throttle position during Governor Setup procedure, repeat the binding procedure as described on page 9 to reset throttle failsafe position (low throttle position).

As described under Governor Menu Point Ⓓ, set your throttle curves or the auxiliary channel in the various flight modes so the desired head speed will be approached and observed. Keep in mind that the head speed should not be higher than 80% of the maximum head speed possible with this motor and gear ratio. If the chosen head speed is too high, the RPM Governor will constantly give full throttle input and no effective govering will be possible because there is not enough room left to open the throttle for compensation of rotor head load.

Nitro Helicopters — Always ensure that the RPM Governor is disabled when you start the model. Otherwise the RPM Governor will drive the throttle servo up to full throttle and hold as it tries to reach the demanded head speed.

IMPORTANT: Always check the throttle servo position before starting the engine.

Some transmitters offer a special setting allowing an automatic switch between the auxiliary governor channel and the flight mode switch. The motor can start in the **first flight mode**; you can spool up the rotor by applying manual throttle and hover the helicopter. With the **second flight mode**, the throttle curve is switched to a "V"-shaped curve and the RPM Governor is turned by the auxiliary channel. In this case, ensure that the two throttle curves overlap in the point at which the transfer between the two flight modes takes place. Otherwise the throttle servo will make a jump before the RPM Governor takes control as you still may be in manual mode for a short time. So in this operation, it is not possible to activate the RPM governor from the get go and let the rotor spool up autonomously. If you want this, you must activate the RPM Governor before switching to your second flight mode!

The First Flight

After powering on the receiver, wait for the Spektrum AR7210BX to initialize completely (Short movement of swashplate servos and Status LED is **Solid Blue** or **Solid Purple**).

IT IS NECESSARY for the helicopter to be horizontal. Do not move the helicopter during the initialization.

CAUTION: Always complete a control direction test with the transmitter and make sure the sensors are correcting in the proper directions when you tilt, roll and yaw the helicopter by hand.

It is normal for the swashplate to slowly move back to its original position after a stick input and for the servos to not move at the same speed as your control sticks.

When using a flybarless rotor head, you are controlling rotational rates while the Spektrum AR7210BX controls the servos. You are not directly controlling the servos with the transmitter.

When you have performed the basic heli setup in the Setup Menu your heli is almost ready to fly. The AR7210BX includes a tail gyro system. This system is controlled using the GEAR channel. Make sure the gyro gain is setup correctly before first fight (see Dials and Tail gyro gain). Verify the dials on top of the device are in center position for the first flight. You may adjust them later if necessary.

Heading Lock Mode: It is normal for the tail servo to:

1. Stay in its end position after a tail stick input or tail movement.
2. Not react immediately to a stick input.
3. Move to the endpoints with small stick inputs.

CAUTION: Remove main and tail rotor blades before the first flight. Allow the motor/engine to run at all speeds. Watch for the swashplate to automatically tilt in one direction or begin to twitch at a specific speed. These are signs that the helicopter has mechanical vibration that will disturb the Spektrum AR7210BX sensors.

Correct any sources of mechanical vibration before the first flight.
Just before lift off, make sure the swashplate is horizontal and the tail pitch slider is near centered.

Avoid excessive steering during lift off, otherwise the helicopter may tip over and crash!
Give direct collective pitch input to quickly lift the helicopter into the air. This will require some practice if you do not have experience with flybarless helicopters.

Dials and Tail Gyro Gain

To adjust the dials: Only use the original Spektrum AR7210BX adjustment tool to prevent damage to the dials. Do not turn the dials past their end points or damage will occur.

Dial 1: Swashplate—Cyclic Gain

Turn Dial 1 clockwise to increase the swashplate gain.

The factory setting for Dial 1 is horizontal (50% swashplate gain). Use the factory setting for your first flights. This setting is ideal for 450 class helicopters. If you are flying larger helicopters it may be necessary to slightly increase the cyclic gain positions.

The higher the gain, the more aggressively the helicopter will stop after cyclic movement and the helicopter will be more stable in the air.

Cyclic Gain Too High	Helicopter tends to oscillate on the elevator axis.
Cyclic Gain Too Low	The helicopter does not stop nor does it move precisely; tends to have a life on its own. In fast forward flight, it may dive down or rear up suddenly.

Dial 2: Swashplate—Direct Cyclic Feed Forward

Turn Dial 2 clockwise to increase the swashplate's direct cyclic stick feed forward.

The direct cyclic stick feed is the part of the stick input going directly to the servos. When correctly adjusted, the direct stick feed allows the control loop to make small corrections and work more efficiently.

Factory setting for Dial 2 is horizontal.

Direct Cyclic Feed Forward Too High	This causes over-control in your cyclic input. When set too high, the control loop overshoots and needs a steer back correction. This causes pitch backs (bobbles) on cyclic stops and imprecise fast forward flight.
Direct Cyclic Feed Forward Too Low	The helicopter will feel softer, slower and less direct.

Increasing the direct cyclic feed forward will cause more cyclic stick input to go directly to the aileron and elevator on the swashplate giving a more responsive feel. Decreasing the direct stick feed forward does the opposite.

The optimal setting depends on many factors, including blades, servos, head speed, size and mass of the helicopter.

IMPORTANT: The direct cyclic feed forward does not affect the maximum rate of rotation. If the helicopter rotates too slowly:

1. Check the swashplate limiter settings in Setup Menu Point **L**
2a. Change the control behavior in Parameter Menu Point **B** or
2b. Increase the servo travels or dual rate in your transmitter

Dial 3: Tail Dynamic

Turn Dial 3 clockwise to increase the tail dynamic or counterclockwise to decrease the tail dynamic.

Factory setting for Dial 3 is horizontal

Make sure the maximum possible tail gyro gain has already been determined before adjusting the tail dynamic.

The tail should stop perfectly, to the point without making any flapping noises. Increasing the Tail Dynamic will lead to harder stopping behavior and more aggressive response to tail stick inputs.

Tail Dynamic Too High	The tail will bounce back shortly after a hard stop and will respond delayed to stick inputs when making fast direction changes.
Tail Dynamic Too Low	Stopping and response to stick inputs might be too soft.

Transmitter Adjustment: Tail Gyro Gain

Tail gain can be adjusted using the transmitter's gear channel. Most transmitters have a gyro screen that allows gyro adjustments. It is important that the gyro function is assigned to the gear channel in the transmitter.

Status-LED

Purple Solid	Rate Mode
Blue Solid	Heading Lock Mode

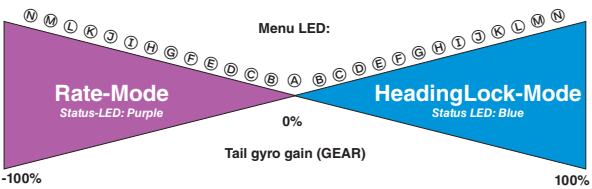
The color of the Status LED indicates the selected mode when the Spektrum AR7210BX is ready for operation.

When the gain channel is centered, LED Ⓐ = 0% gain. The maximum adjustable tail gain is 100% in both modes (LED Ⓝ = 100%). One of the LEDs Ⓐ through Ⓝ will light for 8 seconds to show the amount of tail gain. Ⓐ = 0% to Ⓝ=100%.

For the first flights, do not use a gain higher than Ⓕ or Ⓖ in Heading Lock Mode.

To find the optimal gain:

1. Start with a low gain value where the tail will feel very weak.
2. Increase the gain step by step until the tail feels more precise and holds better on sudden pitch inputs.
3. If the gain is too high, "wagging" will appear in fast forward or backward flight.



IMPORTANT: The tail gyro can't be operated in Rate-Mode when SAFE® technology is used with Combined Switch Channel, see below. Here switching the GEAR channel to negative side will activate SAFE® technology.

Parameter Menu

To enter the Parameter Menu:

1. When the Spektrum AR7210BX is ready for flight, press and hold the setup button until the LED flashes next to Menu Point Ⓐ.
2. Release the setup button.
3. Press the setup button once to move to the next menu point.
4. Press the setup button once at at the last Menu Point to exit the Parameter Menu.

It is possible to skip menu points. Do not move the transmitter sticks when you are in a menu point you want to skip. Quickly press the setup button again to move past the menu point you want to skip.

CAUTION: Never fly the helicopter when the Spektrum AR7210BX is in the Setup or Parameter Menu. Gyro control and transmitter stick controls are disabled when the Spektrum AR7210BX is in the Setup or Parameter Menu.

Ⓐ Quick Trim

NOTICE: Never use transmitter trims with the Spektrum AR7210BX.

The Spektrum AR7210BX will interpret the trim as a control command, NOT as servo trim. There is one exception: The rudder servo can be trimmed on the remote control when the tail gyro is operated in Normal-Rate mode. Note, however, that this trimming should only be temporary as the AR7210BX calibrates the stick center positions during every initialization process. Thus, on the next flight the servo would be back on center position despite trimming in the transmitter.

The first menu point of the Parameter Menu gives you the possibility to easily adjust your servo center trim on the flying field as for instance your helicopter does slowly drift in hovering flight or when it doesn't climb out straight on collective pitch inputs.

Swashplate Servos
Parameter Menu Point Ⓐ adjusts both the aileron and elevator servo centers without regard to the individual servos.

To adjust the aileron and elevator servo centers:

1. Move the aileron or elevator stick in the desired direction.
2. Repeatedly move the stick or hold the stick to move several trim steps at once.
3. To delete the trimming, move the tail stick in any direction.

IMPORTANT: Unlike digital trims in the transmitter, Menu Point Ⓐ is not a separate trim function. If the new center position is saved once in Parameter Menu Point Ⓐ, it will also change the servo center position in Setup Menu Point Ⓒ.

Once the center position is saved in Menu Point Ⓐ, it is no longer possible to delete the trimming.

Rudder Servo

If the tail gyro is operated in Normal-Rate mode, the rudder servo must often be trimmed precisely so that the tail rotor produces just enough thrust to counteract the rotor torque in hovering flight. Otherwise the helicopter would constantly drift into one or another direction on its vertical axis as the gyro only dampens sudden movements but does not control the tail rotor's absolute position.

To trim the rudder servo proceed as follows: Switch the tail gyro to Normal-Rate mode and fly the helicopter. By using the digital trim function of your transmitter, trim the rudder servo so that the helicopter does not drift in hovering flight. Land the helicopter and immediately open Parameter menu point A by briefly pressing the setup button once. To take the tail trim value from the transmitter once again press the button and this time hold it for at least 2 seconds (if you briefly press the button only, you would skip to Menu Point Ⓑ). You can see the rudder servo move to the new center position and the Status-LED will flash for some moment to signalize the position has been set. Now reset the digital trim of your transmitter back to zero.

NOTICE: Only rudder trim values are accepted when the gyro is set to Normal-Rate mode. When you land after the trim flight and open Parameter Menu Point Ⓐ make sure that you do not change the gyro mode and/or trimming of the transmitter by accident, e.g. when using a flight mode switch in the transmitter.

If the tail gyro solely is operated in HeadingLock mode, trimming the rudder servo is not required under normal circumstances. Here the gyro actively controls the rate of rotation whereby drifting is excluded on the vertical axis. In unfavorable mechanical conditions it may be helpful to fly the heli in Normal-Rate mode once and to trim the rudder servo accordingly, so that the mechanical throw is balanced more equally.

The trimming of the rudder servo will be deleted when the tail rotor endpoints are readjusted at Setup Menu Point Ⓔ.

Press the setup button once to move to Parameter Menu Point Ⓑ.

Ⓑ Control Behavior

Menu Point Ⓑ allows you to select between different control behaviors for your helicopter, including the maximum rotation rate and exponential.

Factory setting is "Sport," which should be suitable for most pilots.

"Normal" has a decreased rotation rate for cyclic and tail controls, as well as increased exponential. When you are comfortable flying in "Normal," find your personal preference by increasing the Control Behavior one option at a time.

To use your own transmitter settings instead of the presets, select Status LED: **Blue Solid**.

Status-LED	Control Behavior
OFF	User Defined
Purple Solid	Normal
Red Flashing	Sport*
Red Solid	Pro
Blue Flashing	Extreme
Blue Solid	Transmitter

**Factory Setting*

If you select one of the preset Control Behaviors, it is not recommended that you use Exponential and/or Dual Rates in your transmitter. However, slightly increasing servo travel in your transmitter should not cause any problems with the Control Behaviors.

The option “User Defined” allows you to define your own settings using the optional PC Software.

Press the setup button once to move to Parameter Menu Point **C**.

C Swashplate — Pitching Up Compensation

1. While in fast forward flight, apply sudden collective pitch inputs. The helicopter should remain in its horizontal path during climb and descend.
2. If the nose of the helicopter pitches up and down, increase the Pitch Up Compensation.
3. If the value is too high, the helicopter may feel sluggish. Try to find the lowest suitable setting.
4. If the helicopter still pitches up at the highest value, increase the swashplate gain (Dial 1).
5. If the helicopter continues to pitch up after increasing the swashplate gain, you may need to use faster and stronger servos or blades designed for flybarless helicopters.

Status-LED	Pitching Up Behavior
OFF	User Defined
Purple Solid	Very Low
Red Flashing	Low
Red Solid	Medium*
Blue Flashing	High
Blue Solid	Very High

**Factory Setting*

The option “User Defined” allows you to define your own settings using the optional PC Software.

Press the setup button once to move to Parameter Menu Point **D**.

Ⓓ Rudder Rate Consistency

The setting of Menu Point Ⓓ determines how constant the tail gyro will maintain the rotation rate from the rudder stick when operated in HeadingLock Mode:

1. Start with Rate Consistency set to low or very low and maximize the tail gain in your transmitter.
2. Increase the Rate Consistency in the Spektrum AR7210BX until the desired result is achieved.

Rate Consistency Too Low	Pirouettes are inconsistent in fast forward flight or in crosswind conditions.
Rate Consistency Too High	Fast tail-direction changes are more difficult to control. The tail may also move gently while hovering or flying around and will bounce back when stopping the rotation.

When the appropriate setting is determined, it is usually necessary to re-adjust the tail gyro gain in the transmitter.

Status-LED	Rudder Rate Consistency
OFF	User Defined
Purple Solid	Very Low
Red Flashing	Low
Red Solid	Medium*
Blue Flashing	High
Blue Solid	Very High

**Factory Setting*

IMPORTANT: If the tail pirouettes and stops unevenly in both directions, set the tail gyro to Rate-Mode. Test whether the tail will drift in a particular direction during hover. If it does, adjust the tail link rod length so the tail rotor blades have the required compensation for pitch or trim the rudder servo as described for Parameter Menu Point Ⓐ. If you adjust the tail link rod length, you must reset the tail rotor limits (Setup Menu Point Ⓔ).

The option “User Defined” allows you to define your own settings using the optional PC Software.

Press the setup button once to move to Parameter Menu Point Ⓔ.

Ⓔ Stick Deadband

Stick deadband is the range around the very center of the stick where the Spektrum AR7210BX will not react. Depending on the calibration of the transmitter, the sticks may not be in the exact same center position each time they return to center. This can cause unwanted rotation on the axis of stick movement and unwanted servo movement even when the heli is standing still on the ground.

Stick Deadband Set Too Low	It is difficult to find a stick position where no input is sent to the Spektrum AR7210BX. This can cause the helicopter to tip over on takeoff or will make the helicopter difficult to control in flight.
Stick Deadband Set Too High	You will feel a large range of stick movement where you have no control. This can lead to difficult precision hovering.

Status-LED	Stick Deadband
OFF	User Defined
Purple Solid	1
Red Flashing	2*
Red Solid	3
Blue Flashing	4
Blue Solid	5

**Factory Setting*

The option “User Defined” allows you to define your own settings using the optional PC Software.

Press the setup button once to move to Parameter Menu Point Ⓕ.

Ⓕ Tail—RevoMIX

The Spektrum AR7210BX can pre-compensate for torque variations on the tail before any noticeable change. RevoMIX relieves the tail control loop and improves tail performance on helicopters with insufficient tail authority and/or high powered electric helicopters.

To see the compensation direction:

1. Move the collective pitch, roll and elevator stick at any time. The tail rotor has to deflect to counter the rotor torque. The tail rotor blades deflect the least when the main rotor is at 0° pitch (the point where the main rotor produces the least torque).
2. Pitch positive or negative direction, move the aileron or elevator control. A deflection is added to the tail rotor to counter the torque. The height of the deflection depends on the collective pitch angles in Setup Menu Point Ⓚ.
3. A helicopter with a clockwise rotation main rotor will steer the nose of the helicopter to the right. When control input is given, the tail slider/tail rotor will move slightly in a given direction.
4. Cycle through the options and find the direction that matches your model. You then have four options: Off, Low, High or By Computer.

Status-LED	Torque Precompensation
OFF	User Defined
Purple Solid	Off*
Red Flashing	Low—Normal Direction
Red Solid	High—Normal Direction
Blue Flashing	Low—Reverse Direction
Blue Solid	High—Reverse Direction

**Factory setting*

The option “User Defined” allows you to define your own settings using the optional PC Software.

Press the setup button once to move to Menu Point Ⓖ.

Ⓖ Cyclic Response

Menu Point Ⓖ adjusts how aggressively the Spektrum AR7210BX responds to cyclic commands (roll and pitch). Adjusting the cyclic response can reduce the linear control feeling of flybarless systems and make the helicopter response feel more or less aggressive.

The factory setting is "Normal." To use the cyclic response feature, select "Slightly Increased" from the options. Gradually increase the cyclic response until you reach the desired level.

Cyclic Response Too High: Results in uncontrollable, inaccurate rotation and deteriorated stopping behavior.

The maximum amount of cyclic response is determined by many factors, including: heli size, swashplate servos, main rotor blades, head speed, servo power supply and helicopter setup. The option "User Defined" allows you to define your own settings using the optional PC Software.

Status-LED	Cyclic Response
OFF	User Defined
Purple Solid	Normal*
Red Flashing	Slightly Increased
Red Solid	Increased
Blue Flashing	High
Blue Solid	Very High

**Factory setting*

Press the setup button once to move to Menu Point Ⓗ.

Ⓗ Pitch Boost

Pitch boost is useful in 3D aerobatics when rapid pitch changes are necessary for certain flight maneuvers. Additional collective pitch will be added as you move the pitch stick faster. Pitch boost will not exceed the maximum pitch value set in Setup Menu Point Ⓚ. Start from the "low" setting and gradually increase to the desired level.

The maximum amount of pitch boost is determined by many factors, including: maximum pitch values, pitch curve, swashplate servos, main rotor blades and head speed.

Pitch Boost Setting Too High: Can cause the rotor blades to stall when you input fast pitch commands. The collective pitch will feel slow, the opposite of the desired effect.

Status-LED	Pitch Boost
OFF	User Defined
Purple Solid	Off*
Red Flashing	Low
Red Solid	Medium
Blue Flashing	High
Blue Solid	Very High

*Factory setting

The option “User Defined” allows you to define your own settings using the optional PC Software.

Press the setup button once to move to Parameter Menu Point ❶.

❶ RPM Governor — Throttle Response

If the **Governor Mode** is “deactivated,” skip through the following **Parameter Menu** points by Pressing the setup button at Menu Points ❶, ❹, and ❻.

Use Menu Point ❶ to change the response of the RPM Governor. This determines how fast and hard the system will open the throttle when the rotor RPM changes. Ideally the response is set as high as possible. If it is too low the main rotor may speed up immediately in unloaded conditions, e.g. when the helicopter is descening and the RPM Governor will only give soft throttle inputs when the head speed decreases. If the response is set too high on the other hand, the throttle may stutter audible and/or the motor RPM will kick in very hard and overshoot after the rotor head was loaded and the RPM decreased. The height of throttle response highly depends on factors such as heli size (blade size), motor power and performance and/or the throttle reponse behavior of the speed controller (when flying an electric heli). If you need to adjust the throttle response, we recommend to start with the lowest value and increase accordingly.

Having a heli with good motor power and/or a fast responding speed controller (on electric helis) typically allows to have high throttle response values (up to “aggressive” setting) which will give very consistent head speed. Helis with not so much power (small nitros, gasser, scale helis) prefer low throttle response settings for a softer throttle management.

Status-LED	Throttle Response
OFF	Slow
Purple Solid	Normal
Red Flashing	Slightly increased*
Red Solid	Increased
Blue Flashing	Fast
Blue Solid	Aggressive

*Factory setting

Press the button to save the configuration and to proceed to Menu Point ❹.

❶ RPM Governor — Initial Spool Up Rate

When activating the RPM Governor this will not apply full throttle immediately but will increase the rotor head speed slowly until the desired preset head speed is reached. At Menu Point ❶ you can determine how quickly this soft start occurs when the RPM Governor is activated initially. The speed is given in number of revolutions by how much the rotor speed is increased per second. The higher the speed the faster your preset head speed will be reached. Please note that the given rates only are indicative. Depending on the response of the speed controller and the inertia of the rotor system it can actually take longer or shorter until the desired speed is reached. Associated with this the speed also determines how gently the rotor will start to turn. If the speed is too high, the rotor blades may fold in during startup because the system enters throttle too abruptly. With nitro helicopters this also may cause the engine to quit because the throttle is opened too fast and too far.

Status-LED	Spool Up Rate
OFF	User Defined
Purple Solid	50 RPM/s
Red Flashing	100 RPM/s
Red Solid	200 RPM/s*
Blue Flashing	300 RPM/s
Blue Solid	400 RPM/s

**Factory setting*

Select “user defined” to choose a custom value that can be edited by using the StudioX software and the optional USB2SYS (SPMA3030 or BTXA76007) interface.

Press the button to save the configuration and to proceed to Menu Point ❷.

Ⓚ RPM Governor — Quick Change Rate

If the RPM Governor is enabled and you increase the preset rotor head speed there will not be an abrupt change but the system will increase the rotor RPM with a given spool up rate that can be set at Menu Point Ⓚ. This rate also determines how fast the rotor head speed will increase when reactivating the RPM Governor after an autorotation maneuver. In this case the normal soft start would take too much time until the rotor has reached full speed and on the other hand it would not be necessary as typically the rotor is still turning at some speed when performing an autorotation.

Status-LED	Quick Change Rate
OFF	User Defined
Purple Solid	same as initial spool up rate
Red Flashing	300 RPM/s
Red Solid	500 RPM/s*
Blue Flashing	700 RPM/s
Blue Solid	900 RPM/s

**Factory setting*

If you don't need the autorotation spool up you can set to **"same as initial spool up rate."** The spool up rate will then be the same as set at Menu Point Ⓙ. So effectively there is no difference if you spool up from an initial state when the RPM Governor gets activated for the first time or when you reactivate the RPM Governor from autorotation.

NOTICE: If the spool up rate is high, always ensure the rotor blade bolts are properly secure or throttle fluctuations may cause damage to the main gear. In nitro helicopters, throttle fluctuations may cause stalling.

Select "user defined" to choose a custom value that can be edited by using the StudioX software and the optional USB2SYS interface.

Press the button to save the configuration and to proceed to Menu Point Ⓛ if SAFE® technology is installed on your device. Otherwise pushing the button will exit the Parameter Menu.

Operating Principles of SAFE® Technology

When SAFE® technology is used in this manual, reference is made to leveling the model, regardless of a particular operating mode (e.g. “Bail out rescue mode,” “3D - Mode” or “Flight trainer mode”).

SAFE® technology can be enabled or disabled via Parameter Menu Point **L** by selecting one of the operating modes as mentioned above. Only if SAFE® technology is enabled, i.e. one of the five operating modes is selected, can SAFE® technology be activated with the transmitter.

The existing channel for the tail gyro gain can be used to switch SAFE® technology on and off when a transmitter with only six channels is used. Alternatively a separate switch channel can be assigned to control SAFE technology if the transmitter has more channels available.

L SAFE® Technology — Operation Mode

At Parameter Menu Point **L** you can choose between five different SAFE® technology operation modes. This is done as usual by selection with the rudder stick. If one of the SAFE® technology operation modes is selected, the SAFE® technology function is active and it can be activated/deactivated in operation by using the assigned transmitter channel for SAFE® technology (see Usage of SAFE® Technology). The “SAFE® technology disabled” option specifies the SAFE® technology is completely disabled and actuating the SAFE® technology channel has no effect (in terms of the SAFE® technology). The assignment to the colors of the Status-LED is as follows:

Status-LED	SAFE® Technology Operation Mode
OFF	SAFE® technology disabled*
Purple Flashing	Bail out rescue mode
Purple Solid	Bail out rescue mode with collective pitch
Red Flashing	3D — Mode
Red Solid	3D — Mode with collective pitch
Blue Solid	Flight trainer mode

**Factory setting*

First, enable SAFE® technology when all initial settings in Setup menu and Receiver menu have been performed. Otherwise the servos may drive to the mechanical full stop, start binding and may get damaged, e.g. when SAFE® technology gets activated when leaving the menu and the system starts to try moving the heli.

Bail Out Rescue Mode

This operation mode can be used if the pilot becomes disoriented and would like to save the helicopter from crashing. In such case he just needs to let go the stick(s) for aileron and elevator and activate the SAFE® technology by flipping the assigned switch for SAFE® technology function. The helicopter then is rotated back into normal horizontal position by the shortest route over roll or pitch. The pilot must only operate the collective pitch function to control the height of the helicopter. Note that for safety reason there is a stick fading implemented. Even when SAFE® technology is switched on you can control aileron and elevator. The stick movements have priority over SAFE® technology. The larger the deflection of the corresponding control stick, the less effect SAFE® technology has. On the other hand when both sticks are in center position SAFE® technology takes over full control of the aileron and elevator function.

Bail Out Rescue Mode with Collective Pitch Control

Recommended by Horizon Hobby helicopter pilots, bail out rescue mode with collective pitch control provides the same functionality as the "Bail out rescue mode" described above. In addition, here SAFE® technology also controls the collective pitch function. During the rotation and after reaching the horizontal position, SAFE® technology inputs positive or negative collective pitch, making the helicopter turn (almost) without loss of height and maintain hover position (or slightly climping up) when horizontal position is reached. So the pilot can completely let go all sticks as soon as he activates SAFE® technology and the helicopter is automatically brought into a (relatively) safe location. Here it is possible to add some collective pitch and let the heli climb up even faster by moving the throttle stick beyond the point that is applied by SAFE® technology. But moving the throttle stick lower is locked as you can never apply less collective pitch than SAFE® technology. So the helicopter cannot be moved toward the ground by giving wrong collective pitch inputs by accident.

3D - Mode

In 3D - Mode, the Spektrum AR7210BX recognizes the current orientation of the heli (normal or inverted) and always rotates the helicopter to the nearest horizontal position when SAFE® technology is activated. This operation mode is well suited for practicing basic 3D - aerobatic maneuvers such as hovering or back flips. Since in 3D - Mode the stabilization can be fully overridden when actuating aileron or elevator function, it is possible to keep 3D - Mode activated for a longer period of time and to grope at an aerobatic maneuvers by only giving specific control inputs. Rolling and pitching back to horizontal position then does SAFE® technology for you. The pilot must only control collective pitch and rudder.

In addition, you can use this mode as rescue mode to stabilize the helicopter in an emergency situation. It should be noted, however, that the heli is always rotated to the nearest horizontal position. Therefore you must be very careful in controlling the collective pitch function as it may happen by accident that you give a collective input to the wrong direction. If you want to use 3D - Mode exclusively as rescue function, it is recommended to use 3D - Mode with collective pitch control.

3D - Mode with Collective Pitch Control

3D - Mode with collective pitch control provides the same functionality as the “3D - Mode.” In addition, here SAFE® technology takes over the collective pitch function. When reaching horizontal position SAFE® technology gives a positive or negative pitch input, so that the heli is held in the hover position or climbs up slightly. Here, the throttle stick is locked into each “wrong” direction. Therefore, the pilot can only give additional collective pitch input (in normal position positive, in inverted position negative pitch) to increase the climb rate of the helicopter. But he cannot move the helicopter toward the ground by accidentally giving wrong pitch inputs.

Flight Trainer Mode

In Flight trainer mode you can only tilt the helicopter to a certain angle by giving aileron or elevator stick input. Moving the helicopter even further is impossible, as long as SAFE® technology is active. This prevents the helicopter from being tilted into a lateral position that may cause a significant loss of altitude. As soon as the stick(s) for aileron and elevator is (are) released, the helicopter will be brought back to horizontal position. Additionally, the helicopter is stablized all the time, independant of any stick input. This together makes the helicopter fly very similar to a multirotor helicopter. The pilot does not have to focus on the constant need of correcting the helicopter‘s attitude and he can not bring the helicopter in a difficult attitude by making violent control maneuvers. Collective pitch and rudder are not affected by this operation mode.

Ⓜ SAFE® Technology — Hovering Pitch

If at Parameter Menu Point Ⓛ a mode “with collective pitch control” is selected, briefly pressing the button at Menu Point Ⓛ will lead to Parameter Menu Point Ⓜ. Otherwise Menu Point Ⓜ will be skipped!

At Parameter Menu Point Ⓜ the collective pitch will automatically be set to hovering position, which will be used when SAFE® technology is activated and the helicopter flies horizontally. Ideally the pitch angle is exactly as large as it is necessary to maintain a stationary hovering flight without ascending or descending. Typically this is somewhere in the range between 5 and 6 degrees. Depending on your personal preference the angle can be set larger, so that the heli climbs up and gains altitude when SAFE® technology is activated.

By moving the aileron stick left or right the hovering pitch can be adjusted. The color of the Status-LED indicates the range which the pitch is in between at the moment. This range is specified as percentage of maximum positive/negative pitch which was set at Setup Menu Point Ⓚ.

Status-LED	Hovering Pitch
OFF	> 20% of maximum collective pitch
Purple Solid	> 30% of maximum collective pitch*
Red Solid	> 50% of maximum collective pitch
Blue Solid	> 70% of maximum collective pitch

**Factory setting: 37.5%*

If the maximum positive/negative pitch angle is changed at Setup Menu Point Ⓚ then also the hovering pitch will change! So after re-adjusting the maximum angles also check and re-adjust the hovering pitch at Parameter Menu Point Ⓜ.

When using the "3D — Mode with pitch control" make sure that the pitch range is symmetrical, i.e. the maximum positive and negative pitch angles are of same size. Otherwise the hovering pitch will differ in normal and inverted position as the hoving pitch is calculated from the maximum pitch! The setting at Parameter Menu Point Ⓜ affects both directions. A separate adjustment of the hovering pitch angles is not provided.

Channel Assignment Menu

By default, the Spektrum AR7210BX and all additional features can be operated with a 6-channel transmitter. If desired, and a transmitter with 7 or more channels is used, SAFE® technology can be operated with a separate channel and you can assign a separate switch channel for the Nitro Governor instead of controlling the RPM Governor by throttle channel. Teaching the additional channels is done in the "Channel Assignment Menu":

1. Press and hold the push button on the Spektrum AR7210BX unit and power it on. Menu LED Ⓐ will flash instantly, the Status LED will either be **Red** (no transmitter signal) or **Blue** (transmitter signal is there). Release the button.
2. At Menu Point Ⓐ, the switch channel for the nitro RPM governor can be assigned. Move the specific channel (switch or knob), the **Blue** Status LED will flash shortly to indicate the channel has been detected. Then press the button to proceed to Menu Point Ⓑ. If you don't want to assign a separate channel, either you don't need this function at all or if you want to use the throttle channel to control the governor, don't move any channel but simply skip this assignment by briefly pressing the button.
3. At Menu Point Ⓑ, you can assign your separate channel for switching SAFE® technology. Here again you can simply skip by Pressing the button and keep the default setting (using combined mode with gear channel).

For these functions you can assign any channel from AUX2 to AUX6. Note that it is not possible to assign both functions to the same channel. Also note that the specific AUX output on the unit cannot be controlled by this channel then. Instead as a side effect the channel output will be mapped to the next free channel internally, i.e. when not using the governor function and you assign channel AUX2 to control the SAFE® technology, the AUX2 output on the unit then will be mapped to the transmitter's AUX4 channel.

Usage of SAFE® Technology

Once SAFE® technology was enabled by choosing one of the five SAFE® technology types at Parameter Menu Point L, SAFE® technology can be activated and deactivated in flight by using the switch on the transmitter whose channel was assigned as actuator for SAFE® technology in Receiver setup menu. When the Spektrum AR7210BX is ready for operation check whether activation of SAFE® technology works as expected:

Similar to the tail gyro gain display you can determine the status of SAFE® technology by watching the yellow Menu-LEDs. These light up each time after the initialization sequence as well as when the amount of SAFE® technology gain is changed respectively when SAFE® technology is activated/deactivated. To distinguish the tail gyro gain display from SAFE® technology the Status-LED lights up in red color when the status of SAFE® technology is displayed. When SAFE® technology is deactivated Menu-LED A starts to flash. If one of the Menu-LEDs B through N lights up, SAFE® technology is active. The individual Menu-LEDs signal the amount of SAFE® technology gain. The larger the deflection of the switch channel for the SAFE® technology is, the farther the Menu-LED will go in the direction of point N and the stronger the effect of SAFE® technology will be. In particular this determines how fast and violent the helicopter will be rotated back to horizontal position. For the first flight it is recommended to adjust the throw of the SAFE® technology channel just until Menu-LED G lights up when SAFE® technology is activated. If using a small helicopter like 450 size or below typically you can set the gain even higher (until Menu-LED I lights up).

SAFE® Technology with Separate Switch Channel

SAFE® technology activation and strength can also be programmed to a separate switch on 7+ channel Spektrum transmitters, using any channel assignable to a 2-position switch, AUX2 and higher. Travel and direction of the SAFE® technology channel determine whether SAFE® technology is active or not and how strong it reacts. A deflection into one direction will activate SAFE® technology. Typically Menu-Led N (maximum gain) will light up when activating SAFE® technology for the first time, as the travel of the channel will be 100%. Adjust the deflection of this channel, i.e. by reducing the servo travel in the transmitter, so that one of the Menu-LEDs lights up next to point G (or point I when using a small helicopter) as described previously.

When the switch channel is moved into the other direction Menu-LED A will light up and flash. In this case SAFE® technology is deactivated. When SAFE® technology is deactivated, i.e. the switch is placed in the other direction, the status LED remains momentarily **Red**, and the Menu-LED flashes next to point A to confirm deactivation.

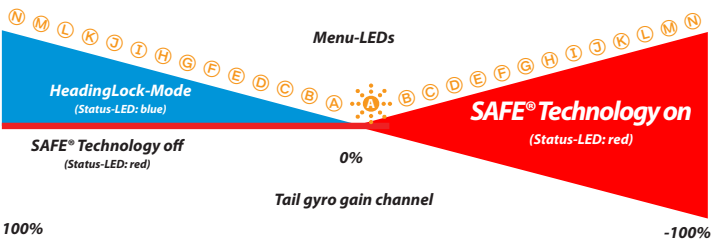
If SAFE® technology works reversed, e.g. one of the Menu-LEDs Ⓑ through Ⓝ lights up when the switch for SAFE® technology is in “off”-position and the Menu-LED Ⓐ does not disappear independant of the servo throw when the switch is in “on”-position, then simply reverse the channel for SAFE® technology in your transmitter by using the servo reverse function.

SAFE® Technology with Combined Switch Channel

The tail gyro gain channel is also used for SAFE® technology. In the switch position where SAFE® technology is off, the channel deflection determines the amount of tail gyro gain as usual. Increase or decrease the (servo) travel of channels to adjust the tail gyro gain. The amount of tail gyro gain is indicated by the yellow Menu-LEDs each time after initialization procedure and always when the gain changes. Here the Status LED lights up **Blue**. When you flip the switch and the channel is deflected to the other direction, the Spektrum AR7210BX will keep the current tail gyro gain and activate SAFE® technology. Here the Status LED lights up **Red**. When adjusting the height of deflection of the channel into this direction you can specify the SAFE® technology gain by adjusting the servo travel. So here one channel is used for two functions. Depending on the direction you can either adjust tail gyro gain or SAFE® technology gain and by switching between directions SAFE® technology is activated or deactivated.

When using SAFE® technology with combined switch channel make sure SAFE® technology is at least deactivated once before take off. Otherwise the tail gyro gain would be minimal as the system would not have been able to determine your tail gain adjustment after initialization.

In this mode it is absolutely necessary to use a switch that changes the control directions directly and without intermediate steps. In particular, do not use a slider on the transmitter! Otherwise, when you activate SAFE® technology the tail gyro sensitivity would be decreased to 0% before the system turns on the SAFE® technology. So you would have 0% of tail gyro gain when SAFE® technology is active.

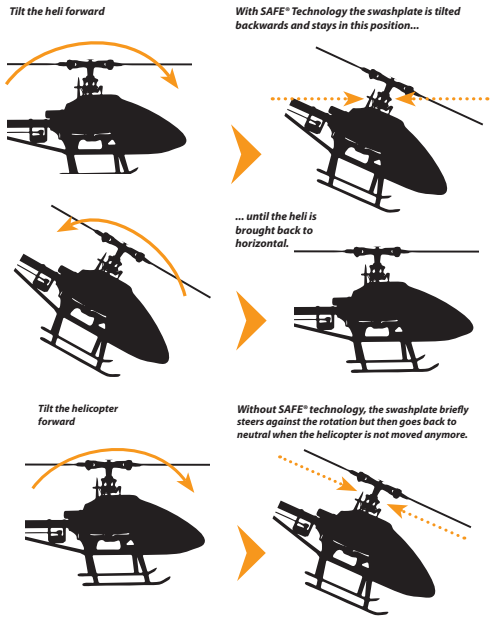


The tail gyro Rate-Mode is only available when SAFE® is operated with Separate Switch Channel.

Functional Test of SAFE® Technology

When activating SAFE® technology you should be able to see an immediate impact on the swashplate control. If the heli is tilted to one side, Spektrum AR7210BX permanently steers the swashplate opposed to the inclination. In the region around horizontal position the swashplate will always stay nearly horizontal to the ground. The system constantly tries to bring the helicopter back to the horizontal position as long as the helicopter is oblique.

When SAFE® technology is deactivated on the other hand, the swashplate will always be moved back to neutral position (perpendicular to main rotor shaft) as soon as the helicopter is standing still for a few seconds, independant of the current leveling. Here the system only corrects currently occurring rotational movements, but does not regulate the absolute deviation from horizontal position.



When using a SAFE® technology mode with collective pitch control additonal to the cyclic movement also the collective pitch is moved in positive or negative direction when SAFE® technology is activated and the helicopter approaches the horizontal position. The pilot can add collective pitch in the same direction by using the throttle stick, but not in the opposite direction. Check to see if this works correctly and whether the control directions are correct. If the helicopter is kept in hovering position, some positive collective pitch must be applied by SAFE® technology and you can use the throttle stick to add more positive pitch, but not less. Analogous this must work when the heli is in inverted hovering position if using the “3D — Mode with collective pitch control.” Here SAFE® technology will apply some negative collective pitch and you can only add more negative pitch, but not positive.

Flying with SAFE® Technology

First Test Flight

If not done already, for the first flight keep SAFE® technology deactivated and adjust all flight parameters like tail gyro gain, cyclic gain, etc.

If the heli is setup well, you can familiarize yourself with the effect of SAFE® technology. For this we suggest to use the "Bail out rescue mode." Fly the helicopter in a sufficient amount of height in a stable hover and activate the SAFE® technology by using the appropriate switch. The helicopter should continue to hover in approximately the same position. Now give some aileron or elevator stick input and release the stick when the helicopter reached some oblique position. SAFE® technology should bring the helicopter back to the horizontal position more or less rapidly.

Deactivate SAFE® technology and again tilt the helicopter by giving some stick input. The helicopter will stay tilted if you release the stick. Only when SAFE® technology is activated by flipping the switch again, the helicopter will be rotated back to its previous horizontal position.

If using a SAFE® technology operation mode with collective pitch control, moving the throttle stick does not have any effect in some area as SAFE® technology takes over collective pitch control as long as the throttle stick is in this area and SAFE® technology is activated. Therefore, verify the throttle stick is in a position that will roughly produce the same amount of collective pitch, before and while deactivating SAFE® technology. Otherwise when deactivating SAFE® technology the helicopter would make a leap down, if the throttle stick controls a smaller pitch angle than SAFE® technology. To prevent this you can optionally enable a throttle stick lock with the StudioX software and the optional USB2SYS (SPMA3030 or BTXA76007) interface.

For safety reason you should never take off or land with activated SAFE® technology. As SAFE® technology actively gives control commands to the control loop of Spektrum AR7210BX, the swashplate may tilt to one side if the helicopter is not placed perfectly level on the ground. This may cause the helicopter to tilt and crash when trying to take off or when the motor is switched off and the main rotor is running out.

Fine Tuning SAFE® Technology

The amount of deflection of the SAFE® technology switch channel controls the SAFE® technology gain. This determines the speed and roughness of the control input from SAFE® technology. If the effect of SAFE® technology is too low the heli rotates back to horizontal position too slowly, increase the SAFE® technology gain by increasing the deflection of the SAFE® technology channel (i.e. by using the servo throw adjustment for this channel in the transmitter). If, on the other hand, the heli overshoots after reaching neutral position and bobs briefly, the SAFE® technology gain might be set too high. Reduce the gain accordingly. Verify that cyclic gain (dial1) and cyclic feed forward (dial 2) are well adjusted. It is recommended to adapt the SAFE® technology gain to the preferred application. If you would like to use SAFE® technology as emergency rescue then set the gain as high as possible. On the other hand when using SAFE® technology mainly as a training aid, for example in 3D — mode, then make the effect of SAFE® technology rather weak, so that the system does take over control gently.

If the helicopter is not aligned horizontally as desired with active SAFE® technology, i.e drifts to one side in hovering, the artificial horizon can be readjusted. This is done at Parameter Menu Point Ⓐ which also serves as servo trim function. If you activate SAFE® technology at Parameter Menu Point Ⓐ via the transmitter's SAFE® technology channel, you switch to trimming of the horizon instead of trimming the servos. By moving the aileron or elevator stick the roll and pitch tilt of the horizon can be increased/decreased. Briefly touching the appropriate stick will trim the horizon stepwise by 0.5 degrees to the specific direction. Touching the stick repeatedly or holding it for longer time will trim the horizon by several steps. The Status-LED indicates the trim values: when it lights in blue color both angles are 0 degrees resp. they are in the factory setting. If the Status-LED lights red one or both angles are adjusted slightly. If the Status-LED is purple, then one axis is trimmed by more than 5.0 degrees. When the status LED goes out, one of the two axes is further trimmed than 10.0 degrees, which is the limit for each axis! By moving the rudder stick you can remove the trimm that has been set since entering this menu point. Place the helicopter in horizontal position and you should be able to see the effect of trimming. Note that the helicopter usually is slightly tilted to the side in hovering flight due to the drag of the tail rotor. Therefore as a starting point it is recommended to trim about 5 degrees to the right when using a helicopter with clockwise turning main rotor. Also note that SAFE® technology cannot recognize the absolute position of the helicopter. Depending on wind and environmental conditions it may happen that the helicopter drifts slightly into a certain direction during hovering flight. Also long-lasting vibration or fluctuations in temperature can cause the helicopter not always comply exactly the same attitude. Therefore, only trim in moderate steps and only when the helicopter reproducible drifts to the same direction!

Parameter Menu Point Ⓐ is used to adjust two different things: Trimming the servo center positions and trimming the SAFE® technology horizon. Depending on whether SAFE® technology is activated or not, either the artificial horizon or the servo center positions can be trimmed. The Status LED provides information on the currently active trim mode. If the Status-LED is lit permanently, the servo center positions are trimmed. If the Status-LED flashes, SAFE® technology is turned on and the artificial horizon can be trimmed.

When using SAFE® technology in "Flight trainer mode," the tilt angle directly depends on the transmitter's signal length and therefore varies depending on the transmitter type. You can fine tune the maximum angle by simply increasing or reducing the maximum deflection of your control stick(s) in the transmitter by using the Dual Rate function. You could even switch between different angles in flight. Also you can adjust the maximum tilt angle by using the StudioX software and the optional USB2SYS (SPMA3030 or BTXA76007) interface.

Menu Overview

SETUP MENU
(Menu-LED is steady ON)

		OFF	Purple Flashing	Purple Solid	Red Flashing	Red Solid	Blue Flashing	Blue Solid	Red/ Blue
A	**Mounting orientation**	horizontal socket, front	vertical socket, front	hor. inv. socket, front	vert. inv. socket, front	horizontal socket, back	vertical socket, back	hor. inv. socket, back	vert. inv. socket, back
B	Swashplate – **servo frequency**	**user defined**		50 Hz*	65 Hz	120 Hz	165 Hz	200 Hz	
C	Rudder – **center position pulse length**	**user defined**		960 µs		760 µs		1520 µs*	
D	Rudder – **servo frequency**	**user defined**		50 Hz*	165 Hz	270 Hz	333 Hz	(560 Hz)	
E	Rudder – **servo endpoints**	Use rudder stick to move servo to right endpoint and wait, then left endpoint and wait (or vice versa)							
F	Rudder – **sensor direction**					normal*		reversed	
G	Swashplate – **servo centering**	reference position		CH1 center position		CH2 center position		CH3 center position	
H	Swashplate – **mixer**	**user defined**		mechanical	90°	120°*	140°	140° (1=1)	
I	Swashplate – **servo directions**	nor | inv | inv		nor | nor | inv*		nor | inv | nor		nor | nor | nor	
J	Swashplate – **cyclic pitch geometry**	Use aileron stick to adjust 6° cyclic pitch on the roll axis to one direction (blades aligned with fuselage)							
K	**Collective pitch range & endpoints**	Set collective stick to max/min position and use aileron stick to adjust desired pitch. Set pitch direction by rudder stick input: Status-LED blue = positive pitch, red = negative pitch							
L	Swashplate – **cyclic limit**	Move aileron, elevator and throttle stick. Adjust maximum limit by rudder stick input							
M	Swashplate – **sensor directions**	inv | inv		inv | nor		nor | inv		nor | nor*	
N	**RPM Governor** – Operation mode	deactivated*				electric		nitro	

*Factory setting

PARAMETER MENU
(Menu-LED is flashing quickly)

		OFF	Purple Flashing	Purple Solid	Red Flashing	Red Solid	Blue Flashing	Blue Solid
A	**Cyclic** and **rudder trim/SAFE® trim**	Use aileron and elevator stick to trim, hold button 2s to trim rudder. Reset all by rudder stick input. Switch trim mode by activating SAFE® technology using the SAFE® switch channel.						
B	**Control Behavior**	**user defined**		normal	sport*	pro	extreme	**transmitter**
C	Swashplate – **Pitching up behavior**	**user defined**		very low	low	medium*	high	very high
D	Tail – **Rate Consistency**	**user defined**		very low	low	medium*	high	very high
E	**Stick deadband**	**user defined**		very small	small*	medium	large	very large
F	Tail – **RevoMIX**	**user defined**		off*	low - nor	high - nor	low - rev	high - rev
G	**Cyclic response**	**user defined**		normal*	slightly increased	increased	high	very high
H	**Pitch boost**	**user defined**		off*	low	medium	high	very high
I	**RPM Governor** – Throttle response	**user defined**		normal	slightly increased	increased	fast	aggressive
J	**RPM Governor** – Initial spool up rate	**user defined**		50 RPM/s	100 RPM/s	200 RPM/s	300 RPM/s	400 RPM/s
K	**RPM Governor** – Quick change rate	**user defined**		as initial rate	300 RPM/s	500 RPM/s	700 RPM/s	900 RPM/s
L	**SAFE®** – Operation mode	deactivated*	Bail out rescue	Bail out rescue with pitch	3D - Mode	3D - Mode with pitch		Flight trainer mode
M	(**SAFE®** – Hovering pitch)	Adjust by aileron stick input. Reset by rudder stick input.						

GOVERNOR MENU
(Menu LED flashing slowly)

		OFF	Purple Flashing	Purple Solid	Red Flashing	Red Solid	Blue Flashing	Blue Solid	Red/ Blue
A	**RPM sensor** – Function test	"nitro" mode: Status-LED blue when magnet passes sensor "electric" mode: Status-LED red when motor is running							
B	**Throttle** – Motor off/Idle position	"nitro" mode: throttle servo to (increased) idle position "electric" mode: throttle in "motor off" position, just before motor starts							
C	**Throttle** – Full throttle position	Set throttle channel/throttle servo to full throttle position							
D	**Transmitter** – Switch point display	RPM Governor off		RPM Governor maximum		RPM Governor on		RPM Governor autorotation	
E	**RPM sensor** – Divider	**1**	**2**	**3***	**4**	**5**	**6**	**7**	
F	**Main rotor** – Gear ratio	**user defined**	8	9*	10	11	12	13	14
G	(Sum of Ⓕ + Ⓖ + Ⓗ if not	+0.00	+0.20	+0.40*	+0.60	+0.80			
H	"**user defined**")	+0.00	+0.05	+0.10*	+0.15				

Adjustment Options Overview

Menu LEDs: *Amount of tail gain Ⓐ = 0% to Ⓝ = 100%*
SAFE® technology gain Ⓐ = "off" to Ⓝ = 100%
(only shown after powering up or when adjusting the gain)

Button:
—to enter Setup menu press down several seconds until LED Ⓐ is steady on

—to enter Parameter menu press quickly until LED Ⓐ is flashing

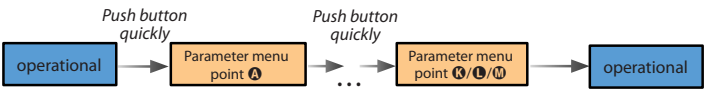
—to enter Channel Assignment Menu hold button before and while powering on

Dial 1*: Cyclic gain*
Dial 2*: Cyclic feed forward*
Dial 3*: Tail gyro response*

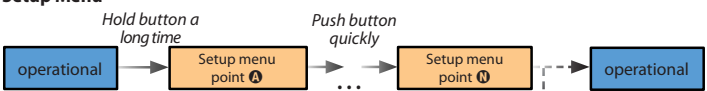
Status-LED
Tail gyro mode
blue = HeadingLock mode
*purple = Normal-Rate mode**
red = SAFE® technology

*Only available if SAFE® technology is operated with separate switch channel.

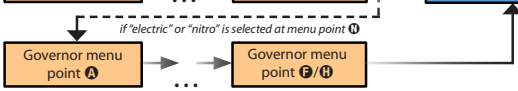
Parameter Menu



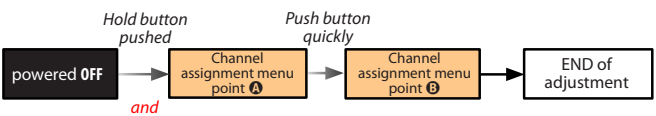
Setup Menu



Governor Menu



Channel Assignment Menu



and

power on while still pushing the button

Limited Warranty

What this Warranty Covers
Horizon Hobby, LLC, (Horizon) warrants to the original purchaser that the product purchased (the "Product") will be free from defects in materials and workmanship at the date of purchase.

What is Not Covered
This warranty is not transferable and does not cover (i) cosmetic damage, (ii) damage due to acts of God, accident, misuse, abuse, negligence, commercial use, or due to improper use, installation, operation or maintenance, (iii) modification of or to any part of the Product, (iv) attempted service by anyone other than a Horizon Hobby authorized service center, (v) Product not purchased from an authorized Horizon dealer, or (vi) Product not compliant with applicable technical regulations.

OTHER THAN THE EXPRESS WARRANTY ABOVE, HORIZON MAKES NO OTHER WARRANTY OR REPRESENTATION, AND HEREBY DISCLAIMS ANY AND ALL IMPLIED WARRANTIES, INCLUDING, WITHOUT LIMITATION, THE IMPLIED WARRANTIES OF NON-INFRINGEMENT, MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE. THE PURCHASER ACKNOWLEDGES THAT THEY ALONE HAVE DETERMINED THAT THE PRODUCT WILL SUITABLY MEET THE REQUIREMENTS OF THE PURCHASER'S INTENDED USE.

Purchaser's Remedy
Horizon's sole obligation and purchaser's sole and exclusive remedy shall be that Horizon will, at its option, either (i) service, or (ii) replace, any Product determined by Horizon to be defective. Horizon reserves the right to inspect any and all Product(s) involved in a warranty claim. Service or replacement decisions are at the sole discretion of Horizon. Proof of purchase is required for all warranty claims. SERVICE OR REPLACEMENT AS PROVIDED UNDER THIS WARRANTY IS THE PURCHASER'S SOLE AND EXCLUSIVE REMEDY.

Limitation of Liability
HORIZON SHALL NOT BE LIABLE FOR SPECIAL, INDIRECT, INCIDENTAL OR CONSEQUENTIAL DAMAGES, LOSS OF PROFITS OR PRODUCTION OR COMMERCIAL LOSS IN ANY WAY, REGARDLESS OF WHETHER SUCH CLAIM IS BASED IN CONTRACT, WARRANTY, TORT, NEGLIGENCE, STRICT LIABILITY OR ANY OTHER THEORY OF LIABILITY, EVEN IF HORIZON HAS BEEN ADVISED OF THE POSSIBILITY OF SUCH DAMAGES. Further, in no event shall the liability of Horizon exceed the individual price of the Product on which liability is asserted. As Horizon has no control over use, setup, final assembly, modification or misuse, no liability shall be assumed nor accepted for any resulting damage or injury. By the act of use, setup or assembly, the user accepts all resulting liability. If you as the purchaser or user are not prepared to accept the liability associated with the use of the Product, purchaser is advised to return the Product immediately in new and unused condition to the place of purchase.

Law
These terms are governed by Illinois law (without regard to conflict of law principals). This warranty gives you specific legal rights, and you may also have other rights which vary from state to state. Horizon reserves the right to change or modify this warranty at any time without notice.

WARRANTY SERVICES
Questions, Assistance, and Services
Your local hobby store and/or place of purchase cannot provide warranty support or service. Once assembly, setup or use of the Product has been started, you must contact your local

distributor or Horizon directly. This will enable Horizon to better answer your questions and service you in the event that you may need any assistance. For questions or assistance, please visit our website at www.horizonhobby.com, submit a Product Support Inquiry, or call the toll free telephone number referenced in the Warranty and Service Contact Information section to speak with a Product Support representative.

Inspection or Services

If this Product needs to be inspected or serviced and is compliant in the country you live and use the Product in, please use the Horizon Online Service Request submission process found on our website or call Horizon to obtain a Return Merchandise Authorization (RMA) number. Pack the Product securely using a shipping carton. Please note that original boxes may be included, but are not designed to withstand the rigors of shipping without additional protection. Ship via a carrier that provides tracking and insurance for lost or damaged parcels, as Horizon is not responsible for merchandise until it arrives and is accepted at our facility. An Online Service Request is available at http://www.horizonhobby.com/content/_service-center_render-service-center. If you do not have internet access, please contact Horizon Product Support to obtain a RMA number along with instructions for submitting your product for service. When calling Horizon, you will be asked to provide your complete name, street address, email address and phone number where you can be reached during business hours. When sending product into Horizon, please include your RMA number, a list of the included items, and a brief summary of the problem. A copy of your original sales receipt must be included for warranty consideration. Be sure your name, address, and RMA number are clearly written on the outside of the shipping carton.

NOTICE: Do not ship LiPo batteries to Horizon. If you have any issue with a LiPo battery, please contact the appropriate Horizon Product Support office.

Warranty Requirements

For Warranty consideration, you must include your original sales receipt verifying the proof-of-purchase date. Provided warranty conditions have been met, your Product will be serviced or replaced free of charge. Service or replacement decisions are at the sole discretion of Horizon.

Non-Warranty Service

Should your service not be covered by warranty, service will be completed and payment will be required without notification or estimate of the expense unless the expense exceeds 50% of the retail purchase cost. By submitting the item for service you are agreeing to payment of the service without notification. Service estimates are available upon request. You must include this request with your item submitted for service. Non-warranty service estimates will be billed a minimum of ½ hour of labor. In addition you will be billed for return freight. Horizon accepts money orders and cashier's checks, as well as Visa, MasterCard, American Express, and Discover cards. By submitting any item to Horizon for service, you are agreeing to Horizon's Terms and Conditions found on our website http://www.horizonhobby.com/content/_service-center_render-service-center.

ATTENTION: Horizon service is limited to Product compliant in the country of use and ownership. If received, a non-compliant Product will not be serviced. Further, the sender will be responsible for arranging return shipment of the un-serviced Product, through a carrier of the sender's choice and at the sender's expense. Horizon will hold non-compliant Product for a period of 60 days from notification, after which it will be discarded.

Warranty and Service Contact Information

Country of Purchase	Horizon Hobby	Contact Information	Address
United States of America	Horizon Service Center (Repairs and Repair Requests)	servicecenter.horizonhobby.com/RequestForm/	4105 Fieldstone Rd Champaign, Illinois 61822 USA
	Horizon Product Support (Product Technical Assistance)	www.quickbase.com/db/bghj7ey8c?a=GenNewRecord 888-959-2306	
	Sales	sales@horizonhobby.com 888-959-2306	
United Kingdom	Service/Parts/Sales: Horizon Hobby Limited	sales@horizonhobby.co.uk +44 (0) 1279 641 097	Units 1-4 Ployters Rd Staple Tye, Harlow, Essex CM18 7NS United Kingdom
Germany	Horizon Technischer Service	service@horizonhobby.de +49 (0) 4121 2655 100	Christian-Junge-Straße 1 25337 Elmshorn
	Sales: Horizon Hobby GmbH		
France	Horizon Hobby SAS	infofrance@horizonhobby.com +33 (0) 1 60 18 34 90	11 Rue Georges Charpak 77127 Lieusaint, France
China	Service/Parts/Sales: Horizon Hobby - China	info@horizonhobby.com.cn +86 (021) 5180 9868	Room 506, No. 97 Changshou Rd. Shanghai, China 200060

FCC Information

This device complies with part 15 of the FCC rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

CAUTION: Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

EU Compliance Statement: Horizon Hobby, LLC hereby declares that this product is in compliance with the essential requirements and other relevant provisions of the R&TTE (EMC Directive, LVD Directive, RoHS Directive).

A copy of the EU Declaration of Conformity is available online at:
http://www.horizonhobby.com/content/support-render-compliance.

Instructions for disposal of WEEE by users in the European Union

This product must not be disposed of with other waste. Instead, it is the user's responsibility to dispose of their waste equipment by handing it over to a designated collections point for the recycling of waste electrical and electronic equipment. The separate collection and recycling of your waste equipment at the time of disposal will help to conserve natural resources and ensure that it is recycled in a manner that protects human health and the environment. For more information about where you can drop off your waste equipment for recycling, please contact your local city office, your household waste disposal service or where you purchased the product.

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