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FC6350HX Helicopter Flybarless System

FC6350HX Hubschrauber mit Flybarless-System

Système Sans Barre Stabilisatrice pour hélicoptère FC6350HX

Sistema per elicottero Flybarless FC6350HX

Created 6/24

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NOTICE

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Meaning of Special Language

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

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

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

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

NOTICE: This product is only intended for use with unmanned, hobby-grade, remote-controlled vehicles and aircraft. Horizon Hobby disclaims all liability outside of the intended purpose and will not provide warranty service related thereto.

Table of Contents

SPMFC6350HX	
Type	FC6350HX Helicopter Flybarless System
Dimensions (L × W × H)	42.5 x 24 x 13.6mm (1.67 x 0.94 x 0.54in)
Weight	16.2g (0.57oz)
Voltage Range	4.8V – 8.4V

Introduction

The Spektrum™ FC6350HX flybarless system is the heart of your helicopter flying experience. As a 3-axis stability system for your flybarless helicopter, the FC6350HX can be set up and tuned using your Spektrum transmitter as a forward programming interface. That means all of the system settings can be programmed through your transmitter without the need for an additional interface or device. The FC6350HX utilizes AS3X technology to deliver pro-level flight performance for sport, precision, and aggressive 3D flying. And the optional-use SAFE technology offers panic recovery and self-leveling options.

Add a Spektrum Smart ESC to your heli to further expand integrated features with no extra wires or sensors. Whether you fly with Smart or non-Smart technology batteries, when the FC6350HX detects a Smart ESC connection, it provides a variety of real-time power system-related telemetry data to compatible AirWare™ equipped transmitters while you fly. Available telemetry information includes motor RPM, current, battery voltage, and more.

The FC6350HX can also be programmed, updated, and backed up using the optional Spektrum USB programming cable (SPMA3065) and PC programmer application. Visit the SPMFC6350HX product page at HorizonHobby.com for more information.

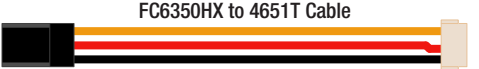
Features

- Supports two DSMX remote receivers
- Optional and configurable SAFE Panic Recovery and Stability Flight Modes
- Easy to use Forward Programming interface for setup and gain adjustments from compatible Spektrum Transmitters
- Smart Technology ready for Smart ESC and Smart Battery Telemetry
- Supports DX, iX, and NX series transmitters
- Supports Digital and Analog servos
- 70Hz to 560Hz Adjustable Servo Frequency (760µs and 1520µs center)

Contents

- (1) Helicopter Flybarless System (SPMFC6350HX)
- (1) DSMX SRXL2 Serial Receiver with Telemetry (SPM4651T)
- (1) FC6350HX to 4651T Cable
- (1) 4651T Update Cable
- (1) Product Manuals (SPMFC6350HX and SPM4651T)
- (2) Gyro Mounting Pad (SPMA3032)

FC6350HX to 4651T Cable



4651T Update Cable

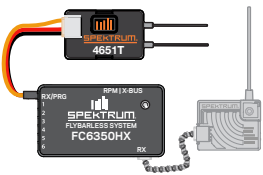
Installation

1. The FC6350HX Flybarless System must be attached to the airframe with the servo connector facing either forward or aft. The side of the FC6350HX facing the main rotor disc must be parallel to the rotor disc.
2. Use one mounting pad (SPMA3032) to secure the FC6350HX to the airframe.

NOTICE: Do not connect the swash plate, throttle or tail rotor servos until the servo frequency has been configured. Failure to do so may result in damage to the servo and/or your model.

Remote Receivers

The FC6350HX Flybarless System uses a SRXL2™ Telemetry Remote to access **Forward Programming** as well as other Smart features. Connect the 4651T using the supplied cable to the RX/PRG port as shown.



Optional DSMX Remote Receiver
An additional non-telemetry DSMX remote receiver connected to the side port labeled RX is recommended when flying models with blades longer than 360mm.

For information on binding remote receivers without a bind button, refer to the section titled ***Binding with Second Remote Receiver.***

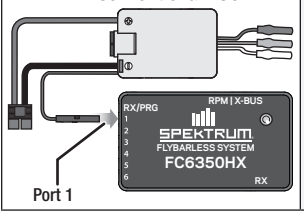
IMPORTANT: Always ensure the remotes are connected to the transmitter before flying the model. A solid orange LED on each remote receiver indicates a successful connection.

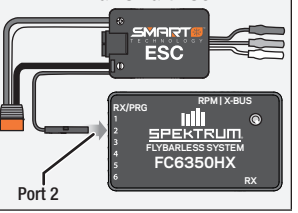
ESC Connection

WARNING: Always remove the pinion gear or disconnect the main drive motor from the ESC to disengage the drive system during initial setup. The main rotor blades may turn in response to setup changes or transmitter inputs. Failure to do so could result in serious personal injury or property damage.

IMPORTANT: For fuel powered models, do not connect the throttle servo until the throttle setup step 17.

Connect your ESC to the Flybarless System	
Conventional ESCs/Throttle Servo (PWM signal) connect to Port 1.	Spektrum Avian Smart ESC must be connected to Port 2 to enable Smart ESC Telemetry.
Conventional ESC	Avian Smart ESC





Before Setup

The FC6350HX Flybarless System is setup, programmed, and tuned via the **Forward Programming** menu on a compatible Spektrum aircraft radio system.

A firmware update on your transmitter may be required to access Forward Programming. Visit **spektrumrc.com** to register and update your transmitter.

- Before entering **Forward Programming**, engage Throttle Hold.
- Before exiting **Forward Programming**, lower the throttle to the full stop position. Wait until the LED flashes green before powering down to ensure settings are saved.
- Always exit forward programming before disconnecting the power source to ensure parameters are saved.
- The Flybarless System must be powered on and connected (bound) to your transmitter to access the forward programming menus.

LED indications for reference, setup required

Red, green, blue rapid blinking	Initialization complete
Slow green strobe	Normal operation
Slow red strobe	Failsafe, remote receiver(s) are not connected to the transmitter.
Rapid red flash when exiting forward programming	Throttle not low; not in Normal/Hold
Slow cyan strobe	Forward programming mode
Yellow Flash (during calibration)	Calibration proceeding normally
Red Flash (during calibration)	Calibration Error, FC not level or is being moved during calibration

Transmitter Setup

1. Create a new default helicopter model on your Spektrum Transmitter.
2. Go to the Flight Mode Setup menu (System Settings in DX and NX transmitters, Model Setup in iX transmitters) and select Hold Switch: **Inhibit** and assign a switch.
3. Go to the Trim Setup menu(System Settings in DX and NX transmitters, Model Setup in iX transmitters) and set Aileron, Elevator, and Rudder Trim Steps to zero. Set Trim Type: **Common**.
4. Go to the Frame Rate menu (System Settings in DX and NX transmitters, Model Setup in iX transmitters). Set the Servo Mode to **Hybrid 11/22ms**.
5. Go to the Gyro menu (Function List in DX and NX transmitters, Model Adjust in iX transmitters), select Switch: **Inhibit** and change to **Flight Mode** Switch. Set each flight mode gain to 75% to start.
6. Configure the throttle curves and pitch curves in your transmitter for each flight mode. Refer to the manufacturer recommendations for the Helicopter, ESC, Motor/Engine, and Transmitter.

   The swashplate type, servo reversing, subtrim and travel settings are made within the Flybarless System using the forward programming menu.

FC6350HX Setup

1. If you are using a remote receiver without a bind button see the section ***Binding with Optional Second Remote Receiver*** for binding instructions. Power ON the FC6350HX Flybarless System and press the bind button on the 4651T remote receiver.

   Lower the throttle stick to the stop position, and enter bind mode on the transmitter. See your transmitter manual for more information.

   Once the binding process is complete, the remote receiver(s) LED turns solid orange, indicating the remote receiver is bound and connected to the transmitter.

   The FC6350HX LED will begin flashing green, indicating a successful bind. A red flashing LED indicates binding was not successful. Repeat step 1.

2. In the transmitter menu, select **Forward Programming**.
   The transmitter connects to the Flybarless System and the forward programming menu is displayed on the transmitter.
3. Navigate to the **Setup→Swashplate→Output Setup** menu.
4. Set the **Frame Rate** to the operating frequency specified by your servo manufacturer.
5. Select the **Type** menu. Set the swashplate type to match your helicopter's configuration.

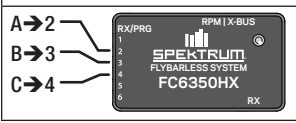
WARNING: You must select the swashplate type that matches your helicopter, and connect the servos as shown in forward programming. A mistake at this step will cause problems with tuning and flight performance.

Connect your swashplate servos to the Flybarless System.

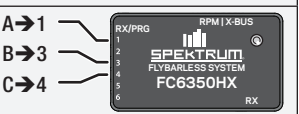
Your transmitter will show you the location of the ports on the swashplate, Connect the servo from each labelled location to the corresponding Flybarless System port, as shown in the illustrations below.

CCPM 120° and 120°R swashplate types are shown for reference.

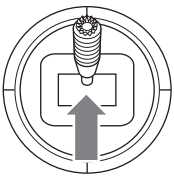
Conventional ESCs/Throttle Servo (PWM signal) connect to Port 1.

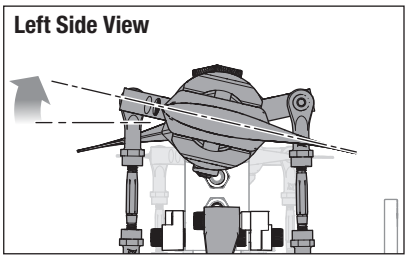


Spektrum Avian Smart ESC connects to Port 2.



6. Select **Back**, and navigate to the **Direction** menu.
   When you move the collective pitch stick up, the swashplate must respond with the correct positive pitch action. Set the Direction in the Output Setup menu to ensure a positive collective stick movement results in the correct positive blade movement.
   IMPORTANT: Do not change servo reversing in the transmitter's servo menu.



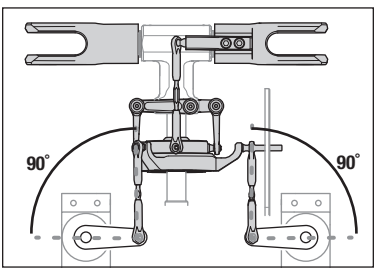


   Select **Back** to return to the previous menu.

7. Select the **Sub Trim** menu. The swashplate servos move to the center position. For each of the swashplate servos, use the sub trim adjustments to ensure the servo horn is perpendicular to the servo linkage.

   Adjust the linkages from the servo to the swashplate to ensure the swashplate is level. Ensure the main blades are at zero degrees collective pitch. If not, adjust the swashplate to main rotor grip linkage to acheive zero degrees pitch.

   Select **Back** one to exit the **Swashplate→Output Setup** menu.



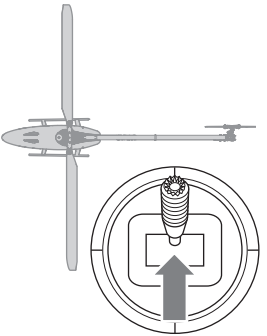
This image shows a neutral configuration set for zero degrees of blade pitch.

8. Select the **AFR** menu. Verify the roll and pitch cyclic are moving in the correct directions by moving the cyclic stick.

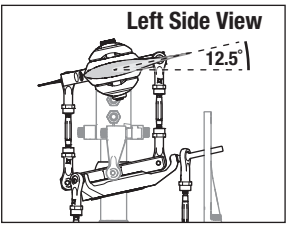
   Most helicopters have a leading edge control main blade grip, and the Roll and cyclic Pitch values will be positive. The only reason to use a negative value to acheive proper swashplate control is for trailing edge main blade grip designs.

   Verify proper fore/aft pitch and side to side roll control of the swashplate. If you do not achieve proper control, review the swashplate selection and servo ports at step 5.

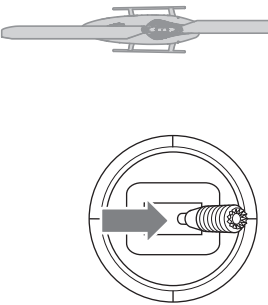
9. Center the collective stick and place a pitch gauge on a main rotor blade. The blades should be at zero pitch.
   - Turn the main rotor so the blades are 90° to the tail boom, apply full forward cyclic, and adjust the Pitch AFR until your pitch gauge reads 12.5.



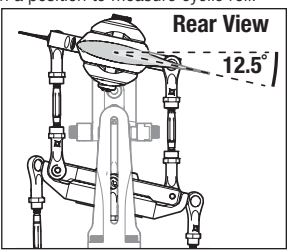
These images show the rotor blades in a position to measure cyclic pitch.



   - Align the main blades with the tail boom, apply full right cyclic, and adjust the AFR until your pitch gauge reads 12.5.

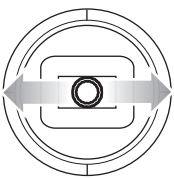


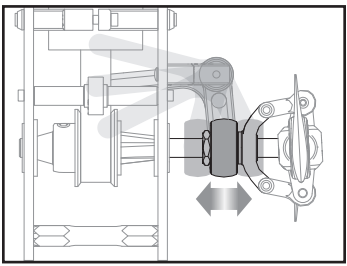
These images show the rotor blades in a position to measure cyclic roll.



10. Move the collective pitch stick to full positive and full negative. Adjust the **Collective AFR** to set your desired collective pitch range. We recommend 12.5° positive and negative if you do not have a preferred range to start with. Remove the pitch gauge.
    Select **Back** twice to return to the **Setup** menu. The swashplate setup is complete.
11. Navigate to the **Tailrotor→Output Setup** menu. Set the **Frame Rate** to the operating frequency specified by your tail rotor servo manufacturer.
12. Connect the tail rotor servo to Slot 5.

    Select **Back** to return to the previous menu.
13. Navigate to the **Direction** menu. Move the tail rotor stick on the transmitter to the right and ensure the tail rotor servo is moving the correct direction. If not, reverse the channel direction on the FC6350HX.
14. Select **Subtrim** to center the tail rotor servo. The linkage should be perpendicular to the servo arm.
    Select **Back** to return to the previous menu.
15. Select the **Travel** menu.
    - Select **Left** travel. Move the stick slowly to the left to determine if binding occurs, and adjust travel to ensure full travel and there is no binding.
    - Select the **Right** travel. Move the stick slowly to the left to determine if binding occurs, and adjust travel to ensure full travel and there is no binding.





    TIP: 90% to 100% is recommended to achieve optimal flight performance. If you are not in this range, we recommend moving the location of the ball on the tail servo arm to acheive the proper amount of travel on the tail pitch slider.

    Press **Back** twice to return to the **Setup** menu.
    Tailrotor setup is complete.

WARNING: Always remove the pinion gear or disconnect the main drive motor from the ESC to disengage the drive system during initial setup. The main rotor blades may turn in response to setup changes or transmitter inputs. Failure to do so could result in serious personal injury or property damage.

16. Exit **Forward Programming**. Configure the throttle settings within the transmitter according to the instructions provided by your ESC manufacturer.
17. Once throttle setup is complete, enter **Forward Programming** mode, and select the **Setup→Throttle→Failsafe** menu.
18. Lower the throttle stick to the full stop position, and select **Capture** to record the throttle failsafe position.
    Select **Back** to return to the **Setup→Throttle** menu.
19. Select **Throttle→Hover**
    This setting is the throttle point where your model hovers in normal mode. The Flybarless System applies special anti roll over algorithms or or below the hover throttle setting, helping to make takeoffs and landings easier. The Stunt 1 and Stunt 2 throttle curves should be above the hover throttle setting to ensure the roll over mitigation is disabled in flight.

    During the initial setup, you can set **Throttle→Hover** to a high value and test the model. Once the throttle setting is determined for hovering in normal mode, set the **Hover Throttle** value.

    Select **Back** to return to the **Setup** menu.
20. Select the **Gyro Settings→Orientation Menu**, and set the mounting orientation to match the FC6350HX mounting orientation on your helicopter. The system will ask you to perform the sensor calibration after setting the sensor mounting orientation. Level the side of the FC6350HX that faces upwards and select Apply to complete the sensor calibration step. Once complete, physically move the helicopter on each axis to ensure the system is compensating in the correct direction.
    Select **Back** twice to return to the **Setup** menu.
21. Select the **FM Channel** and select **Inhibit**.
22. The **Gain Channel** defaults to the gear channel. This is the transmitter aux gyro gain channel for the tail rotor.
23. Press **Back** to exit the forward programming menu, and save the parameters.

The FC6350HX Flybarless System setup is complete.

After completing initial setup and test flights, see the Forward Programming Menu Reference in this manual for more information about flight modes and governor setup for fuel powered models.

Operation

Preflight Checklist

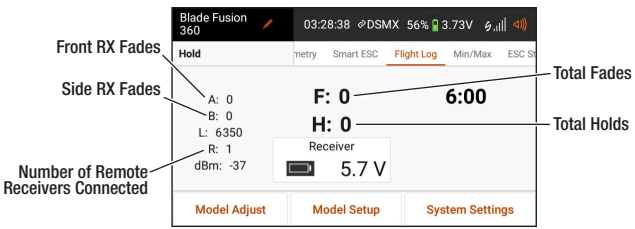
- ❏ Inspect the model, wiring, and electrical components.
- ❏ Power ON the transmitter. Activate **Normal Flight Mode** on the transmitter.
- ❏ Activate **Throttle Hold** on the transmitter. Lower the throttle to stop or idle.
- ❏ Power ON the model, and wait for initialization to complete.
- ❏ Verify that all connected remote receivers display a solid orange LED.
- ❏ Confirm that the transmitter roll, pitch, yaw and collective inputs correspond to the helicopter controls and are operating the controls in the correct direction.
- ❏ Confirm that the FC6350HX is compensating in the correct directions for roll pitch and yaw.
- ❏ Review all operational instructions before flying your model.
- ❏ Place the model on a level surface for take off.

Postflight Checklist

- ❏ For electric models, disconnect the flight battery
- ❏ Power down the FC6350HX
- ❏ Always turn the transmitter off last

Telemetry Flight Log

The transmitter telemetry flightlog will provide the following information.



NOTICE: After a flight, if total fades higher than 30 occur, evaluate the remote receiver positioning and ensure the antennas have a clear signal path to the transmission signal.

To help troubleshoot total fades and holds, review your transmitter and remote receiver manual for additional instructions.

Forward Programming Menu Reference

Main Menu

➔Swashplate

➔Roll

Degrees°/per second: Roll rate at 100% travel.

Proportional, Integral, Derivative: See Gain Adjustment in this manual for more information

➔Pitch

Degrees°/per second: Cyclic Pitch rate at 100% travel.

Proportional, Integral, Derivative: See Gain Adjustment in this manual for more information

➔Agility Defines how quickly the flybarless system reacts to your inputs. Smaller helis usually will have a smaller value and bigger helis will have a larger value, adjust to suit.

➔Tail Rotor

Degrees°/per second: Yaw at 100% travel.

Start: Determines how quickly the tail rotor begins to respond

Stop: Determines how quickly the tail rotor stops.

Proportional, Integral, Derivative: See Gain Adjustment in this manual for more information

➔Governor

Proportional: 100 is the recommended default and starting value. If you notice the head speed drops on quick cyclic commands, then enable the transmitters cyclic to throttle mixing. If the cyclic to throttle mixing was already enabled, then raise the proportional gain for the governor. To high of proportional gain will result in erratic kicking engine operation in a hover and often show as a tail kick.

Integral: 30 is the recommended default and starting value. If you notice engine over speed on long loaded conditions, or when transitioning from a loaded condition to an unloaded condition then decrease the Integral gain. To high of integral gain will result in a slow oscillation of the head speed in a hover.

Headspeed: Set the target headspeed per flight mode (requires FM channel to be configured).

➔SAFE

➔Stability

Gain: Determines how aggressively the Flybarless System attempts to hold level flight with no input.

Envelope: An angle setting which determines the limit where the helicopter will no longer pitch or roll past

Stability: May be set On or Off for each flight mode.

➔Panic

Envelope: An angle setting which determines the limit where the helicopter will no longer pitch or roll past.

Yaw: Maximum yaa rate in Panic mode.

➔Attitude Trim

Roll, Pitch: Trim applied to the model to level it in flight when you are in Safe mode.

➔Setup

➔Swashplate

➔Output Setup

Frame Rate: Select the frame rate to match your servos. Refer to your servo manufacter's recommended operating frequency.

Type: Select the swashplate configuration to match your helicopter.

Direction: Swashplate servo direction.

Sub Trim: Swashplate servos locked at neutral in this menu, trim for center.

➔AFR (Adjustable Function Rate- These control the rate of travel of a function which requires more than one servo operating together. These adjustments change the function, not a single servo.)

Roll: Defines the roll travel. Must be matched to 12.5 ° at max input with collective pitch centered.

Pitch: Defines the cyclic pitch travel. Must be matched to 12.5 ° at max input with collective pitch centered.

Collective: Defines collective pitch range.

Differential: Changing this value will increase the collective travel on one side of neutral so you can match positive and negative pitch. A positive value will only increase positive pitch, a negative value will only increase negative pitch.

E-Ring: Prevents binding or overdriving swash servos when moving sticks to the extremes. Forces the swashplate to operate in a circular motion if you stir the stick into corners of the gimbal.

Phasing: If the helicopter flips and rolls off axis phasing can be adjusted so the performance is precisely on axis with no cross control.

Decay: Default value is 50%, increase this value to increase takeoff stability. Experienced pilots can reduce this value to reduce drift in normal mode once the model has taken flight.

➔Tail Rotor

➔Output Setup

Frame Rate: Select the frame rate to match your servos. Refer to your servo manufacter's recommended operating frequency.

Direction: Set to acheive yaw control in the correct direction.

Sub Trim: Adjust to center the tail servo, mechanically center the tial pitch slider.

Travel: Adjust to acheive maximum travel without binding.

➔Advanced Setup

Phasing: If you feel like the cyclic response is lagging behind your inputs during pirouetting maneuvers, you increase this value.

Pre-Comp

Swashplate, Collective: Tail rotor Pre-compensation mix.

➔Throttle

Failsafe: Defines the failsafe position the FC will move the throttle channel to in the event of a signal loss for 2 seconds.

Hover: Defines the throttle position the helicopter requires for hovering.

Governor: Access the governor menu for a fuel powered model.

Governor: Select Inhibit or Nitro

Main gear: Define the number of teeth on the main gear

Pinion: Define the number of teeth on the pinion gear

Filter: 85 is the default value and starting value. This filter is applied to the head speed measurement and helps to ensure accurate RPM measurement even with the rich mixture generally used on model helicopter engines. This value should not require adjustment on most modern helicopter 2-cycle engines.

Low Throttle: 35 is the default and starting value. This parameter is used to ensure the clutch remains engaged and the engine can be

used for braking during overspeed conditions or unloaded conditions.

RPM Sensor: Allows setup and testing of RPM sensor

RPM Sensor: Normal or Reverse

Soft Start: Allows for slow start to prevent damage.

➔Gyro Settings

Orientation: Select the orientation that matches your mouting configuration.

Calibration: Follow the calibration procedure after selecting an Orientation.

FM Channel: Enables separate flight mode gains and the ability to enable or disable SAFE features per flight mode. When using this option always check to ensure all gains for every axis are set properly per flight mode.

IMPORTANT: When the selected flight mode is displayed on a page (switch position on your transmitter), it is because there is a set of programming values available for each flight mode for the values listed below the flight mode. It will only show flight modes when FM Channel is assigned. If FM Channel is not assigned, these Flight mode callouts will always say NORMAL.

Gain Channel: This is an optional feature and can be set to INH if desired. The Tailrotor gains in the FC6350HX are the base gains and the optional Gain Channel is used to increase or decrease the tail gain per flight mode.

Output Channel 6: Determines the transmitter channel which will operate the number 6 port on the Flybarless System. This is intended for auxillary functions which are not related to flight controls.

➔System Setup

Calibrate Sensor: Select this option to calibrate the sensor

Factory Reset: Select this option to reset the FC6350HX setting back to the factory default values. This option will wipe all settings on the Flybarless System and the setup process will need to be repeated.

Gain Adjustment

The main **Forward Programming** displays flight control adjustments under **Swashplate** and **Tailrotor**.

After the tail gains are fairly close, use the transmitter gyro gain function to adjust the gain for each flight mode.

1. Cyclic P Gain Adjustment (Default 50%)

   Higher gain will result in greater stability. Setting the gain too high may result in random twitches if your model has an excessive level of vibration. High frequency oscillations may also occur if the gain is set too high.
   Lower gain will result in less stability. Too low of a value may result in a less stable model, particularly outdoors in winds.
   If you are located at a higher altitude or in a warmer climate, higher gains may be beneficial—the opposite is true for lower altitude or colder climates.

2. Cyclic I Gain Adjustment (Default 50%)

   Higher gain will result in the model remaining still, but may cause low frequency oscillations if increased too far.
   Lower gain will result in the model drifting slowly.
   If you are located at a higher altitude or in a warmer climate, higher gains may be beneficial—the opposite is true for lower altitude or colder climates.

3. Cyclic D Gain Adjustment (Default 7%)

   Higher gain will improve the response rate of your inputs.
   If the gain is raised too much, high frequency oscillations may occur.
   Lower gain will slow down the response to inputs.

4. Cyclic Response (Default 100%)

   Higher cyclic response will result in a more aggressive cyclic response
   Lower cyclic response will result in a less aggressive cyclic response.

5. Tailrotor P Gain Adjustment (Default 85%)

   Higher gain will result in greater stability. Setting the gain too high may result in random twitches if your model has an excessive level of vibration. High frequency oscillations may also occur if the gain is set too high.
   Lower gain may result in a decrease in stability. Too low of a value may result in a less stable model particularly outdoors in winds.
   If you are located at a higher altitude or in a warmer climate, higher gains may be beneficial—the opposite is true for lower altitude or colder climates.

6. Tailrotor I Gain Adjustment (Default 95%)

   Higher gain results in the tail remaining still. If the gain is raised too far, low speed oscillations may occur.
   Lower gain will result in the tail drifting in flight over time.
   If you are located at a higher altitude or in a warmer climate, higher gains may be beneficial—the opposite is true for lower altitude or colder climates.

7. Tailrotor D Gain Adjustment (Default 10%)

   Higher gain will improve the response rate to your inputs. If raised too far, high frequency oscillations may occur.

   Lower gain will slow down the response to inputs, but will not have an effect on stability.

SAFE® Technology and Panic Recovery (Optional)

The SAFE Panic Recovery function is enabled by setting up the following mix within the transmitter:

Before enabling the SAFE Stability mode, test the operation by activating SAFE Panic Recovery function in flight at a safe altitude with the transmitter sticks centered. The model should return to within 4 degrees of level.

Mixing		
P-Mix 1	**Normal**	
	Channels	**Ger > Gyr**
	Rate	**125%/0%**
	Offset	**–100%**
	Switch	**Switch I**
	Position	**0** **1**

To activate the SAFE Panic Recovery function, move the collective stick to the center position and press the bind button (switch I) on your transmitter.

NOTICE: Vibration can lead to attitude drift in flight. When SAFE Panic Recovery is activated, if the model is outside of 4 degrees of level, evaluate the model for vibration and, if necessary, perform the calibration step.

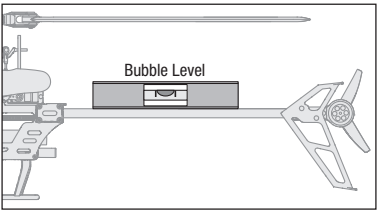
SAFE offers a self leveling mode which can be applied to any flight mode you select; it may be configured if desired. Always complete test flights and gain adjustments before enabling SAFE Technology features. All gains, flight mode setup, envelope and gain settings are available within the Forward Programming SAFE menu. To enable or disable the stability function per flight mode set the FM Channel to the appropriate channel within the Setup menu.

Calibration

The FC6350HX is calibrated at the factory. Recalibrate the unit if the panic or stability functions do not return to level or if there is a slow drift in the roll, pitch, or yaw axis:

The calibration is performed in the selected mounting orientation with the FC6350HX side facing upward being level. When changing the mounting orientation setting the system will ask you to calibrate the gyro. Once the model is level, select Apply to complete the calibration step.

1. Level the model using a bubble level on the roll and pitch axis, power on and initialize the system.



2. Go to the **System Setup** menu and select **Calibrate**.
3. Select **Apply**.
   A red flashing light during calibration indicates the model is either not level or not stationary. Level the model, taking care to keep it still.
   A yellow flashing light during calibration indicates the calibration is proceeding normally.
4. After the calibration is successful, the LED flashes green.

SMART Technology Telemetry (Optional)

Spektrum SMART Technology provides telemetry information including battery voltage and temperature.

A firmware update for your transmitter may be required.

To view SMART Telemetry:

1. The SMART Logo appears under the battery logo on the home page. A signal bar appears in the top left corner of the screen.
2. Scroll past the servo monitor to view SMART technology screens.

For more information about compatible transmitters, firmware updates, and how to use the SMART Technology on your transmitter, visit www.SpektrumRC.com.

Binding with Second Remote Receiver

1. Remove the telemetry remote cable from the BND/PRG/RX2 port.
2. Insert a bind plug into the BND/PRG/RX2 port.
3. Power ON the FC6350HX, the orange LED on the remote receiver will begin to flash to indicate it is in bind mode.
4. Leave power connected and remove the bind plug.
5. Reconnect the telemetry remote cable to the BND/PRG/RX2 port and press the bind button on the telemetry remote receiver. The orange LED on the telemetry remote will flash when it enters bind mode. Release the bind button.
6. Put your transmitter into bind mode. The Orange LED on the remotes will remain lit when the bind is successful.

Repeat the process if necessary.

FM Channel (Optional)

It is not neccesary to use this feature for many configurations, and may add confusion when not required (a set of PID values of for each flight mode results in up to 45 separate values which require separate tuning).

Only use this feature to tune for isolated problems, or for enabling SAFE features in specific flight modes. You may enable or inhibit Stability mode (SAFE) for each FM channel.

Flight mode set up in main transmitter menu

1. Select **System Setup on DX and NX or Model Setup on iX** -> **Flight Mode Setup**
   Assign a switch for the flight mode selection. See your transmitter manual for more information about setting up Flight Modes on your transmitter.
2. Select **System Setup on DX and NX or Model Setup on iX** -> **Channel Assign**
   Link the functions by assigning the Flight Mode channel. Select any auxillary channel that is not in use and assign it to Flight Mode.

Forward Programming Setup

1. Select **Forward Programming** -> **Setup**
   Select **FM Channel**, assign the channel which was previously selected in transmitter programming.
2. Select **Forward Programming** -> **SAFE®** -> **Stability**
   Each FM channel within Forward Programming can have Stability (self leveling/ SAFE) enabled or disabled. Take into account your FM channel switch position, then set Stability on or off as desired for that flight mode.
3. FM channel have PID tuning options for each axis (pitch, roll and yaw).
4. Move the FM channel switch to the other positions; a setup screen will appear for each mode. Set the Stability function on or off as desired and tune the PID values for each FM channel as required.

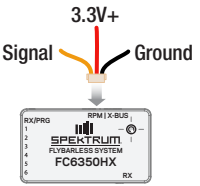
Governor Setup (Optional)

RPM Sensor (Nitro Governor)

Most 3.3V or 5V hall effect sensor or optical sensor intended for R/C helicopters can be used with the FC6350HX.

IMPORTANT: The SPMA9569 IS NOT compatible with the FC6350HX.

Check the polarity of your sensor wiring based on the diagram below before connecting the RPM sensor to the AUX port of the FC6350HX. The connector type used is a JST ZH 3-Pin or the same as a Spektrum remote receiver extension. SPMAJST1UL can be used to convert standard servo connector to the AUX port.



To verify the RPM sensor is operating correctly enter **Forward Programming** on the transmitter and select the **Setup** -> **Throttle** -> **Governor** -> **RPM Sensor** menu. Once in the RPM Sensor menu the FC6350HX will show a solid blue LED indicating that the RPM sensor is active.

Slowly rotate your engine until the magnet or optical surface is aligned with the sensor and the FC6350HX will show a solid blue LED indication. If the LED indication occurs when the sensor is not aligned with the magnet or optical surface, then invert the sensing direction using the **RPM Sensor** [Normal/ Reverse] option.

Flight Control Setup

Setup your FC6350HX and test fly your model. Leave the nitro governor function disabled until you have completed initial setup, test flights, break-in and tuning of your motor. The governor function should not be enabled until the setup is complete and the helicopter is flying optimally.

Per the throttle end point (EPA) setup the idle / stop and the full throttle position must be between 90% and 100% to ensure the governor functions optimally. If necessary, adjust the linkage and/or position on the servo arm/carburetor arm to achieve these goals.

Prerequisite Engine Tuning (Nitro Governor)

Once the flight control setup, model setup, motor setup and pre-flight check has been completed it is time to move onto test flying your model. Setup your throttle curves per the engine or helicopter instruction manual. Set the engine's needle valves to the engine manufactures recommended starting positions and prepare for test flying the model. During the test flights adjust the throttle curves and engine mixture until desired performance is achieved.

Once the throttle curves and engine mixture setup are complete, intermediate to advanced pilots can also use the transmitters cyclic to throttle mixing to help compensate for large cyclic inputs leading to increased motor loads during flight. 15% cyclic to throttle mix is a good starting point. Generally, the tail rotor to throttle mixing is not needed, so this function can be set to disabled.

With the governor function disabled it is paramount to tune the engine and throttle curves to maintain the proper head speed through most maneuvers. Only in some cases will you hear the motor under-speed or over-speed and that is where the governor will step in and compensate during flight.

Once the model is flying optimally on the throttle curves alone and you have determined what head speeds you want to run on the model you can begin setting up the FC6350HX Nitro Governor.

Nitro Governor Setup

To utilize different a head speed for each flight mode it is necessary to assign a channel to the FM Channel function to enable Flight Mode Switching, further details can be found in the FM Channel section of this manual. Enabling Flight Mode Switching will enable separate gains for the cyclic and tail rotor for each flight mode so make sure you verify that the swashplate and tail rotor gains have been set and are correct for each flight mode.

Based on your personal preferences you can run a Normal mode head speed since the governor does not become active until the head speed has reached 50% of the set head speed and the throttle must be above 25%. These requirements will allow you to operate the engine safely in Normal mode down to idle and provide safe governor operation during spool up. Once you land and lower the throttle below 25% in normal mode the governor will deactivate, and you can return the throttle to the idle position to allow the model to spool down.

To disable the governor function for a specific flight mode, set the head speed for that flight mode to 0. Once the governor activates it will smoothly ramp up to the set head speed in 3-4 seconds. If you activate throttle hold or drop the throttle to below 25% the governor will be disabled.

To enable the governor function, enter **Forward Programming** on the transmitter and select the **Setup** -> **Throttle** -> **Governor** menu. Set the **Governor** parameter to [Nitro], set **Main Gear** to the number of teeth on the main drive gear, and set the **Pinon** to the number of teeth on the pinon gear. Leave the **RPM Filter** and **Low Throttle** at the default values. Verify the RPM sensor is sensing correctly, please see the RPM Sensor (Nitro Governor) section above for further details on how to verify the sensor operation.

Exit back to the forward programing Main Menu. Select the **Governor** menu. Set the desired head speed for each flight mode via the [Head Speed] setting. Leave the rest of the settings at the default values.

Troubleshooting Guide

Problem	Possible Cause	Solution
Helicopter will not bind to the transmitter (during binding)	Low flight battery or transmitter battery voltage	Fully charge or replace the flight battery and/or transmitter batteries
	Transmitter is not in bind mode	Power on the transmitter while holding the Trainer/Bind switch. Hold the Trainer/Bind switch until binding is complete
	Transmitter too close to the helicopter during binding process	Power off the transmitter. Move the transmitter further away from the helicopter. Disconnect and reconnect the flight battery to the helicopter and follow binding instructions
Helicopter will not link to the transmitter (after binding)	Helicopter is bound to a different model memory (ModelMatch™ radios only)	Disconnect the flight battery. Select the correct model memory on the transmitter. Reconnect the flight battery
	Flight battery/Transmitter battery charge is too low	Replace or recharge batteries
Flybarless System will not initialize	Helicopter was moved during initialization	If windy, lay helicopter on its side during initialization
	Transmitter is powered off	Power on the transmitter
	Controls are not centered	Center elevator, aileron and rudder controls. Make sure the throttle is at idle
Helicopter will not respond to the throttle but responds to other controls	Throttle not at idle and/or throttle trim is too high	Lower the throttle stick and lower the throttle trim
	Transmitter is not in normal mode or throttle hold is on	Verify the transmitter is in normal mode and throttle hold is off
	Motor is not connected to the ESC or the motor wires are damaged	Connect the motor wires to the ESC and check motor wires for damage
	Flight battery charge is too low	Replace or recharge flight battery
	Throttle channel is reversed	Reverse the throttle channel on the transmitter

Troubleshooting Guide

Problem	Possible Cause	Solution
Helicopter power is lacking	Flight battery has low voltage	Fully charge the flight battery
	Flight battery is old or damaged	Replace the flight battery
	Flight battery cells are unbalanced	Fully charge the flight battery, allowing the charger time to balance the cells
	Excessive current is being drawn through the BEC	Check all servos and the helicopter motor for damage
Helicopter will not lift off	Main rotor head is not spinning in the correct direction	Make sure the main rotor head is spinning clockwise. Refer to the motor control test
	Transmitter settings are not correct	Check throttle and pitch curve settings and pitch control direction
	Flight battery has low voltage	Fully charge the flight battery
	Main rotor blades are installed backwards	Install the main rotor blades with the thicker side as the leading edge
Helicopter tail spins out of control	Rudder control and/or sensor direction reversed	Make sure the rudder control and the rudder sensor are operating in the correct direction
	Tail servo is damaged	Check the rudder servo for damage and replace if necessary
	Inadequate control arm throw	Check the rudder control arm for adequate travel and adjust if necessary
	Tail belt is too loose	Make sure the tail drive belt tension is adjusted correctly
Helicopter wobbles in flight	Cyclic gain is too high	Tuning options using forward programming are available under the “Advanced Settings” section in this manual
	Headspeed is too low	Increase the helicopter’s head speed via your transmitter settings and/or using a freshly charged flight pack
	Dampers are worn	Replace the main rotor head dampers
Flybarless System won't complete calibration and displays a flashing red LED	Helicopter and/or Flybarless System is not level.	Ensure the Flybarless System is level on the helicopter, and the helicopter is sitting on a level surface.
	Vibration from the cooling fan on the ESC	Unplug the cooling fan for calibration. Plug it back in after calibration is completed.
	Vibration or noise on the helicopter	Unplug all servos from the flight controller and power the flight controller from a receiver battery in order to complete calibration.

1-YEAR 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 for a period of 1 year from 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, (vi) Product not compliant with applicable technical regulations, or (vii) use that violates any applicable laws, rules, or 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.

10/15

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/	2904 Research Rd Champaign, Illinois, 61822 USA
	Horizon Product Support (Product Technical Assistance)	productsupport@horizonhobby.com	
		877-504-0233	
	Sales	websales@horizonhobby.com 800-338-4639	
EU	Horizon Technischer Service	service@horizonhobby.de	Hanskampring 9 D 22885 Barsbüttel, Germany
	Sales: Horizon Hobby GmbH	+49 (0) 4121 2655 100	

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.

This product contains a radio transmitter with wireless technology which has been tested and found to be compliant with the applicable regulations governing a radio transmitter in the 2.400GHz to 2.4835GHz frequency range.

Supplier's Declaration of Conformity

Spektrum Heli Flybarless System (SPMFC6350HX)
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.

NOTE: This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

Horizon Hobby, LLC
2904 Research Rd.
Champaign, IL 61822
Email: compliance@horizonhobby.com
Web: HorizonHobby.com

IC Information

CAN ICES-3 (B)/NMB-3(B)

This device contains license-exempt transmitter(s)/receivers(s) that comply with Innovation, Science, and Economic Development Canada's license-exempt RSS(s). Operation is subject to the following 2 conditions:

1. This device may not cause interference.
2. This device must accept any interference, including interference that may cause undesired operation of the device.

Compliance Information for the European Union

EU Compliance Statement:
Spektrum Heli Flybarless System (SPMFC6350HX)
Hereby, Horizon Hobby, LLC declares that the device is in compliance with the following: 2014/30/EU EMC Directive ; RoHS 2 Directive 2011/65/EU; RoHS 3 Directive - Amending 2011/65/EU Annex II 2015/863.

The full text of the EU declaration of conformity is available at the following internet address: https://www.horizonhobby.com/content/support-render-compliance.

NOTE: This product contains batteries that are covered under the 2006/66/EC European Directive, which cannot be disposed of with normal household waste. Please follow local regulations.

EU Manufacturer of Record:
Horizon Hobby, LLC
2904 Research Road
Champaign, IL 61822 USA

EU Importer of Record:
Horizon Hobby, GmbH
Hanskampring 9
22885 Barsbüttel Germany

WEEE NOTICE:

This appliance is labeled in accordance with European Directive 2012/19/EU concerning waste of electrical and electronic equipment (WEEE). This label indicates that this product should not be disposed of with household waste. It should be deposited at an appropriate facility to enable recovery and recycling.

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