

INSTRUCTIONS

HC 3SX

**HC 3X
XTREME**

**HC 3X
base.**

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FEATURES

The HC3-Xbase, HC3-Xtreme and HC3-SX are professional RIGID electronic units (FBL systems) and replace the auxiliary flybar on the rotor head. Because they are lighter, helicopter models without flybar are more agile and manoeuvrable, and are approx. 15% more powerful. In combination with this FBL electronic, huge performance is delivered, without the need to adjust the fragile flybar mechanism.

Its precision throughout the range and with maximum latching performance are outstanding. By means of the latest-generation high-quality MEMS gyros, the HC3-Xbase, HC3-Xtreme and HC3-SX have full 3D capability, whilst boasting a top-quality, ultra-fast tail gyro. No external gyro is required. In addition, a symmetrical torque control (revo) is in place in the gyro. The resultant further increase in holding ability was made possible because the tail gyro is internally coupled with the coll.pitch data of the rotor head control unit.

The HC3-SX includes an optional horizontal stabilisation (active self-leveling of the attitude). The HC3-Xtreme and HC3-Xbase expressly incorporate no horizontal or position stabilisation and are thus fully suitable for competition. The HC3-Xbase, as a basic version, includes all functions necessary for normal requirements. It can be upgraded any time to the full functionality of the HC3-Xtreme. This way, the user is free to add the various tuning and optimization possibilities at a later time, as favoured by competition pilots and for large scale models etc. For upgrade, the device does not need to be shipped. Only an upgrade key is needed, which will be transferred into the device using the PC software.

The head gyro eliminates all undesired rigid head characteristics, resulting in optimum control and precision.

Of course, the system is also suitable for flybarless scale helicopters (twin- and multi-bladed) as well as flybarless helicopters such as trainers, etc., and even supports flybar-equipped helicopters. It can be used for helicopters with electric or combustion engines as well as turbine models.

Servos: all current analog, digital and brushless servos are supported, including narrow-pulse servos (760µs) for the tail (e.g. robbe-Futaba S9251 or BLS251).

Swashplates: HC3-Xtreme and HC3-SX: all current variants, including four swashplate servos and virtual swash rotation (CPPM/H1, H3-90°, H3-120°, H3-140°, H4-90°, H4-90°+45°). HC3-Xbase: CPPM and eCCPM 120°.

Direct USB connection for fast programming; the easy-to-use set-up software as well as USB connector come as standard. For the HC3-Xbase, software and instructions are available as internet download.

Clear separation of the gain (sensitivity) settings for the head and tail gyros, due to independent auxiliary channels (which in case of the HC3-SX additionally provide the activation and in-flight-adjustment of the Horizon-stabilisation). Adjustment work is reduced to a minimum.

TECHNICAL SPECIFICATIONS:

Dimensions:	36 x 34 x 14mm
Supply voltage:	4...10V (2S-LiPo-compatible, min. 5.5V using Spektrum/JR satellites)
Max. roll & pitch rotational speed:	500°/s
Max. tail rotational speed:	650°/s (typical)
Tail servo output:	optionally digital (220Hz) / analog (55Hz) / 760µs
Head servo output:	optionally digital servo (220Hz) / analog servo (55Hz)
Maximum servo currents:	Total 10A (continuous load)
Weight:	Approx. 18g (without cable loom)
Length of connecting cables to receiver:	90mm (longer cables optionally available, see "accessories")

SCOPE OF DELIVERY:

- Main unit including assembly material
- Cable loom for receiver connection (90mm)
- USB stick containing PC software (Win98, ME, 2000, XP, Vista, 7) and operating instructions
- USB lead for direct connection to PC/notebook (for HC3-Xbase as internet download)

QUICK INTRODUCTION



INSTALLATION

MOUNTING POSITION

Important is an orientation exactly aligned to the level of the main rotor, i.e. the assembly surface must be orthogonal or parallel to the rotor shaft. Contrary to normal tail gyros, this is particularly important to ensure that the head stabilisation maintains constant attitude even during pirouettes. During static manoeuvres, the electronic unit may ignore an inclination in the mounting angle, but of course not during pirouettes, in which case the helicopter would „wobble“. An angular deviation compared to the ideal mounting attitude of the FBL system is hard to be recognised at the small unit, than in flight, looking at the much larger rotor disc. Therefore we recommend to check the alignment extremely accurate, best by using an angle measuring tool.

All four orientation directions are possible with the HC3-Xtreme and HC3-SX. With the HC3-Xbase, possibilities are confined to front or back side for the socket side. As an alternative, the FBL system can also be fitted upside down to the underside, or on a left or right vertical side. (After changing the orientation, the setting must be reprogrammed). Exact orientation of the housing sides in parallel with the helicopter's longitudinal axis is also important to ensure that the aileron and elevator directions are exactly matched.

AVOIDING VIBRATIONS

The assembly surface must be sturdy and must vibrate to the least possible extent. It must not give way elastically because this may cause additional unintentional vibrations due to resonances. In case of vertical mounting to a chassis wall, choose a location close to a screw joint. The closer it is fitted to the rotor shaft, the less are vibrations, and the more precise is guidance during very fast turning manoeuvres. Avoid tail booms containing transmission shafts, since they may vibrate to a huge extent.

In the case of internal combustion engines, it is particularly important to optimally observe this issue because of invisible vibrations. If the housing should tangibly or visibly vibrate extremely while the engine is running, despite correct installation, we recommend choosing a different installation position that is protected better against vibrations.

AVOID HEAT

Keep distance from exhaust tubes etc. The tail servo may become hot; do not use as mounting surface.

USE THE ADHESIVE FOAM TAPE INCLUDED

Use the thin adhesive tape for acro / 3D and electric powered models. For scale models or models with an internal combustion engine, we recommend to first use the included thick (softer) tape. Before sticking on the tape, remove any traces of oil or dirt so that the FBL system cannot come loose (this could make the model uncontrollable!).

Important in the case of internal combustion engines: Do not additionally lash the housing as this would restrict the damping effect of the foam. For the same reason, do not tightly lash the connecting cables (servos and receiver) and do not lay them in a straight line, but in a bend leading to the FBL system.



EARTHING THE TAIL BOOM

Make absolutely sure that there is an electrically conductive connection between the tailboom, engine housing and chassis.

If necessary use a small cable to establish an equipotential bonding connection. Especially a belt drive in the tail boom can act as a „Van de Graaff generator“ and its sparks can penetrate into receivers and servos and destroy them.

Caution: carbon is also conductive!

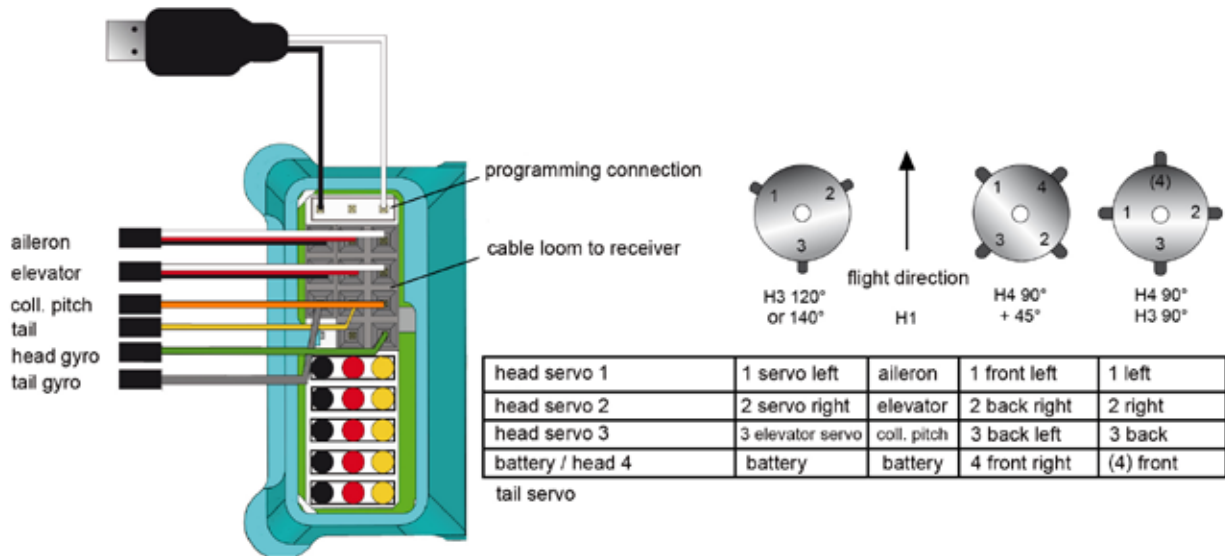
PREPARING THE REMOTE CONTROL

Switch off all head mixers in the transmitter! The mixers are set exclusively in the FBL system according to the guidance type. In the transmitter, it is best to select an unmixed standard program (fixed-wing aircraft or basic program). This is expedient in the case of electric helicopters because the additional functions are best executed in the device. As an alternative, a CCPM helicopter program can be used.

A helicopter program makes sense when you are used to it, e.g. you want to use an AVCS menu, or if you need a pitch-throttle-curve, e.g. in the case of an internal combustion engine, or if (e.g. when scale flying) you want to achieve idling with the coll.pitch stick.

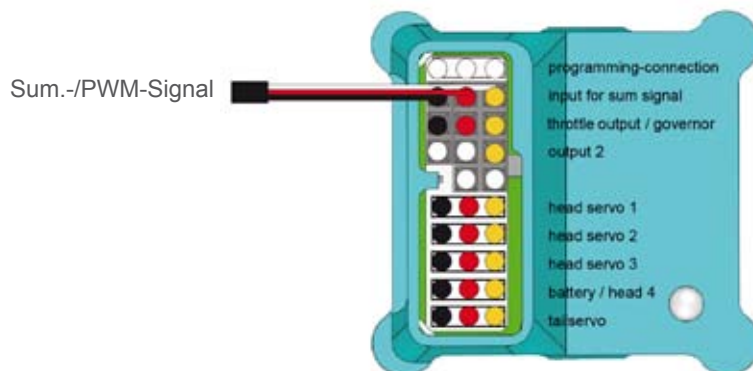
CONNECTION

VIA SERVO OUTPUTS



VIA SUM/PWM SIGNAL OR ROBBE/FUTABA S.BUS

If the receiver features a sum signal (,serial PWM' or ,PPM') output, it can be connected via this output, so only one cable is needed. To do this, use one single cable, connecting it as illustrated. In this case, the throttle channel is looped through by the FBL system and its output is at the neighbouring slot (which otherwise serves as „elevator“ input). A further channel is also externally available, e.g. for a speed controller. This channel is supplied on the coll.pitch input socket, but only the signal wire. If necessary, connect the others (earth and supply) via a servo splitter cable. Conclusion: As soon as a sum/PWM input is activated, the aileron input serves as the sum/PWM input and the elevator and coll.pitch inputs become the outputs for throttle and further channel.



VIA SATELLITE RECEIVERS (SPEKTRUM / JR)

Up to 2 (diversity) receivers can be connected, one at each side. Also see the info texts in the PC software for adjustments and satellite receiver binding (no main receiver is needed for binding the satellites to the transmitter!). The usual input ports for Tail-gyro and Head-gyro channel must be idle, i.e. not connected to any signal source. When using Spektrum/JR satellites, the FBL system needs to be supplied with min. 5,5V. 4,8V batteries (4x NiMH or NC) are not sufficient!

PLEASE NOTE WHEN CONNECTING

- As high servo currents can occur, a voltage supply must be routed directly to the device!
Also, the receiver must be supplied via the FBL system, not vice versa.
Use one of the following possibilities for the connection:
 - a) Battery connection / head 4 (in case no 4th head servo is used).
 - b) Programming connection (in case the PC adaptor is not connected; for programming the supply via receiver is ok).
 - c) In case a PWM receiver is used, the supply can be connected to the gas output. If used, a BEC controller is connected here anyway.
 - d) In case of supply from a BEC controller, route a parallel supply cable (e.g. Y cable) to either battery or programming connection of the FBL system. This connection must not possess a signal line, i.e. the third pole may have to be interrupted.
- d) For using only the tail gyro of the FBL system, you can either do a set-up with deactivated head gyro (still using the internal mixer), or only connect the tail gyro cables, plus one of the three-wired connectors (aileron or elevator input) only for supplying the receiver with power from the FBL system, by connecting it to any vacant socket of the receiver; preferably with disconnected signal-wire.
- Do not connect servos until the FBL system has been set to the correct servo type.
- Do not move the model for the first five seconds after switching on (LED flashes red, initialisation).
The FBL system runs a self-test and needs standstill to do this, as otherwise it does not activate the servos and starts to flash red.
- The cables coming from the receiver (cable loom) should all be laid as one common line. Single wires must not lie separately.
- The additional „head gyro“ and „tail gyro“ channels serve to set the respective gain (sensitivity) in flight. One potentiometer or slider on the transmitter each is used for these additional channels. As an alternative, a fixed value can be programmed on the transmitter, or the values can be programmed from PC directly into the device. If the corresponding channel is not connected, using the parameter's default setting. However, it is considerably easier and faster to have the parameters adjustable directly in flight.

LED DISPLAY

SWITCHING ON

- (flashes red) Switch-on phase; do not move for 5s;
Still no output of servo signals.

OPERATION

- (continuous red) Centre of the head gyro channel, minimum stabilisation
- (continuous yellow-orange) Active rigid stabilisation, ready for take off
- (continuous green) Only with HC3-SX: Horizon-stabilisation enabled

SETTING UP

- (flickering red) If connected to [Trim] or [Diagnose] menu: Servos remain in neutral position

ERROR DURING SELF-TEST, NO SERVO SIGNAL OUTPUT

- (1x) Waiting for RC reception
- — (2x) Battery as from switch-on < 4V (not suitable for charge monitoring!)
- — — (3x) Movement during switch-on phase, repeat activation
- — — — (4x) Movement/jolt during switch-on phase, repeat activation

INSTALLING THE SETUP SOFTWARE AND USB DRIVER

Simply double click on the installation file and follow the installation wizard - that's all.

INSTALLATION OF THE DRIVER SOFTWARE FOR USB-ADAPTER - WINDOWS XP, WINDOWS VISTA, WINDOWS 7:
The driver software for the USB-Adapter will be preinstalled automatically during installation of the HeliCommand-Software under the operating systems WINDOWS XP, WINDOWS Vista and WINDOWS 7.

When plugging in the USB-Adapter for the first time, a „Found new Hardware“ message will appear at the bottom right of your desktop for a few seconds; afterwards a message indicating a successful driver installation will appear. Now, the HeliCommand-Software is ready for operation together with the USB-Adapter.

In case of problems with the installation you find useful hints in the FAQ on www.helicommand.com.

INSTALLATION OF THE DRIVER SOFTWARE FOR USB-ADAPTER – WINDOWS 2000:

On WINDOWS 2000, the driver software for the USB-Adapter has to be installed manually; follow these steps:

- After plugging in the USB-Adapter the „Found new hardware“ Wizard appears; click „Next“
- In the next Window select the option „Search for a suitable driver for my device (recommended)“; click „Next“
Select only the checkbox „Specify a location“; click „Next“
- In the next Dialog Window click „Browse...“, select the program directory (e.g. C:\Program Files\HeliCommand) and, in this directory, open only the „USB Driver“ folder and click „Open“
- The Dialog window shows the selected directory now; click „OK“
- In the next Window, click „Next“; the driver software is installed now. Finally click „Finish“.

In case of problems with the installation you find useful hints in the FAQ on www.helicommand.com.

SETUP / ADJUSTMENT

After installation, the FBL system must always be tuned to the model and transmitter. This includes: adaptation of the transmitter to the device still without the servos moving, then setting up the FBL system to the model, and finally a direction test for the sensors and flying in.

SETUP ASSISTANT

For basic adjustment, the PC software offers a setup assistant guiding you swiftly and easily through all the steps. Additionally there are data sets available under „load file“, e.g. for Scale- and Acro flight, which will need only basic adaptations to match the individual model. See also www.helicommand.com or www.robbe.com

You can also proceed as described here in the instructions. The procedure corresponds to the menu tabs from left to right in the setup software. Before the first flight, remember to check not only the control directions, but also all sensor directions (step 11).

1. PC CONNECTION

Unplug the electric engine to reduce the risk of injury or feed the receiver with a separate battery. Unplug servos until step 4 has been set.

Install and start the setup software for the X-series. For each setup parameter, this software shows useful mouse-over tips and also provides notes in the [Help] menu.

Establish the USB connection by plugging the cable, as shown in the connection drawing on page 5, in the outermost slot, black = outside. The software indicates by a green panel when a data connection has been established.

For PC settings to take effect, write them to the device!

The arrow buttons in the right-hand column of the PC software (write, load, read, etc.) only apply to the parameters of the menu just displayed. Only in the [All] menu all parameters can be written and read completely, and complete settings can be saved or loaded in/from the PC. An unequal-sign indicates that at least one setting is different, for example has been changed and not yet written into the device. Clicking on the unequal sign makes the differences visible.

2. SETTING THE FBL SYSTEM TO THE FACTORY DEFAULT STATE

The first time you use the unit, load the factory reset data in the [All] menu and write this data into the device, unless it has been removed as new from the packaging. However, if you are connecting the FBL system again for later setting changes, first read the current settings from the unit into the PC.

3. [RC]-MENU

Set the servo type for the tail and head servos. Set the type of receiver connection, if, instead of the normal channel outputs of the receiver, you are using a sum/PWM signal output, as available on some receivers. When using the sum signal connection, you cannot swap connectors in order or achieve the correct assignment of channels as usual (insertion sequence on the receiver), but you can use the channel assignment selector switches in the setup software. Finally click on „write“, and the equal-sign must appear.

4. [DIAGNOSE] MENU: SETTING UP THE TRANSMITTER

Check that each bar in the [Diagnose] menu is assigned to its correct function and only this function, i.e. without any mixers! Then program the RC transmitter for:

- a) Correct signal direction of each bar, by means of the transmitter's servo direction
- b) Travel of all channels all the way to their end-markings as displayed at the [Diagnose] menu (e.g. with robbe/Futaba equals 120 % in the transmitter)
- c) Adjust the transmitter's trim, so the bars for aileron, elevator and tail are exactly neutral. Pay attention to the „< > „ signs shown above the bars.

If all this is set properly, do not change anything in the transmitter from now on, except for the auxiliary channels Head- and Tail-gyro, and - in case of the HC3-Xbase - the stick travels during later setting of the desired agility.

5. CONNECTING SERVOS

Connect precisely according to the connection schematic (page 5).

Initially, unhook or disconnect the fourth head servo, if there is one.

6. SERVO CENTRE TRIMMING

The [Diagnose] and [Trim] menus send the electronic neutral position to all servos for as long as the PC connection exists. Use the [Trim] menu to adjust the mechanics as precisely as possible:

- a) First adjust the lever of each servo exactly orthogonal to its respective pushrod, using the lever's grids, with all trim values at zero. Only if the grids do not exactly fit, use the [Trim] menu's electronic trim values for fine adjustment. When the servo levers are orthogonal, adjust the rotor head mechanics so that
- b) The hover angle is reached at middle coll.pitch position (in case of 3D: 0°)
- c) The swashplate lies precisely horizontal, i.e. orthogonally to the rotor shaft

An exactly horizontal swashplate is particularly important because centre deviations can basically not be balanced-out in the transmitter, but only mechanically or in the [RC] menu. Although errors during hovering are fully balanced by the electronic unit, during pirouettes they would inevitably produce a lurching (tumbling motion).

Adjustment deviations can only be seen when the FBL system is connected with the [RC] menu or the [Diagnose] menu, because then the gyros and the transmitter signals are deactivated.

- d) If there is one, now adjust the fourth head servo and hook it in.
- e) Mechanically adjust the tail rotor to neutral position. Its neutral position is only lightly positioned against the torque, i.e. a small angle of attack amounting to about 2-3°. Due to the Revo mix, which is not active at this moment, the optimum position can later be set, dependent on the coll.pitch position, by which it will be moved, to some extent, further against the main rotor's torque.

6.1 [TRIM] MENU: → ELECTRONICALLY POST-TRIM THE SERVOS IF REQUIRED

To this end, observe the above points c, d and e.

7. [MIXER] MENU: → SWASHPLATE AND SERVO DIRECTIONS

Perform all settings from top until, and including, the swashplate type, and then write them to the device. The FBL system now possibly initialises again. During initialising, same as after every switching on, the helicopter must be left unmoved. Only then the self-test does run and the system will finally initialise.

Now, adjust all servo directions, but only in the [Mixer] menu. To do this, operate the sticks, check movement of the swashplate for the correct direction and reverse if necessary. In the case of eCCPM linkage (all types except H1/CCPM), begin with adjusting the coll.pitch direction, followed by the tail servo direction and then, if necessary, use the direction reverse for aileron and/or elevator. If necessary, adjust and check „virtual swashplate rotation“ now.

(Note: the rotor blades must not change their angles of attack in response to elevator and aileron commands if they are exactly in their respective cyclic rotation position.)

Sinus linearization is recommended, especially in the case of four head servos. In most cases, the optimum value is 5 (see also the setup software's tooltip text).

8. [MIXER] MENU: → ADJUST SERVO TRAVELS (AILERON, ELEVATOR, COLL.PITCH)

In the [Mixer] menu, set the travels to the experience-based values applicable to the model.

Usually the coll.pitch travel is defined for reaching a suitable maximum angle of attack, and aileron and elevator travels are set to the desired cyclic angle of attack or to the maximum amount which is possible without end-blocking the swashplate or other parts of the mechanics. Check this by simultaneously giving full excursion on aileron, elevator and coll.pitch.

Note that the aileron and elevator travels in the [Mixer] menu will also influence the sensitivity of the rigid stabilisation, which could be compensated by changing the „rigid gain“ in the opposite sense (via PC or transmitter), if it had already been optimized.

9. [TAIL GYRO] MENU

Set the travel limit for the tail servo according to the given tooltip text!

Gain optimisation can easily be done in flight via the tail gyro channel.

If required, the other parameters can also be optimised (see page 12).

10. [ALL] MENU: BACKUP OF ALL SETTINGS IN THE PC

Data backup is optionally only, since all settings are stored permanently in the device, unless they are overwritten by new values or by a reset with the factory default values. It may also make sense to save settings data when carrying out tests with various parameters. If a result is not satisfying, you can easily restore the prior data by loading the backup.

11. **IMPORTANT! BEFORE FIRST FLIGHT AND AFTER ANY CHANGES!**

EXTENDED STEERING TEST INCLUDING A DIRECTION TEST FOR ALL THREE GYROS:

- a) When the model is ready to fly, check the neutral positions and directions of all stick functions and for all servos. If the swashplate tilts while you increase gyro gain, the transmitter's trims must be wrong (step 4, c in particular).
- b) Check directions of all three sensor axes as a wrong direction would fairly lead to a crash! By hand, briefly move the model to and fro about all three axes successively: side tilting, forward tilting and turning. The applicable servos must initially respond with the opposite action, i.e. swashplate wants to stay horizontal, and front side of the tail rotor blades move opposite to the tail swivel direction (i.e. tail rotor blows in the direction of its swivel movement). In the event of errors, a mistake must be either in the direction of the bars of the [Diagnose] menu or in the setting „mounting orientation“).
- c) RC range test: in compliance with the data specs of the 2.4GHz RC system or with antenna pushed in (35/40MHz)

12. **NOTE IN CASE OF TURBINE HELICOPTERS WITH SCALE CANOPY:**

We recommend to accomplish the following test before the first flight, for security reason:

Remove main and tail rotor blades, then check for servos to stand still when the turbine is running. The servos must stand still completely undisturbed during the turbine's whole start-up process up to flight rotation speed, while not moving the control sticks.

FLYING IN

- ! It is imperative to have tested all sensor directions! (see page 10, step 11)
- ! First fly with reduced gain settings for tail and head.
- ! Steering test before every takeoff. Never take off before the servos can be moved!

PAY ATTENTION DURING TAKEOFF

- ! Generally pay attention to the horizontal position of the swashplate!
Similarly to a tail gyro, it may happen that inadvertently issued slight stick deflections are amplified by the stabilisation before you are in the air.
- ! Acro models with a hard head-damping must not be launched on hard asphalt - unless you have dampened the skids with foam.
Otherwise, when the engine speed is raised, hard impacts and resonances can occur, with the risk of tilting over, because in this state, the model cannot correctly follow the control commands of the attitude control.

REALTIME-TUNING

(NOT AVAILABLE WITH HC3-XBASE)

The channel that normally controls the tail gyro gain can be assigned for control of any adjustable parameter from [Tail gyro] and [Rigid] menu.

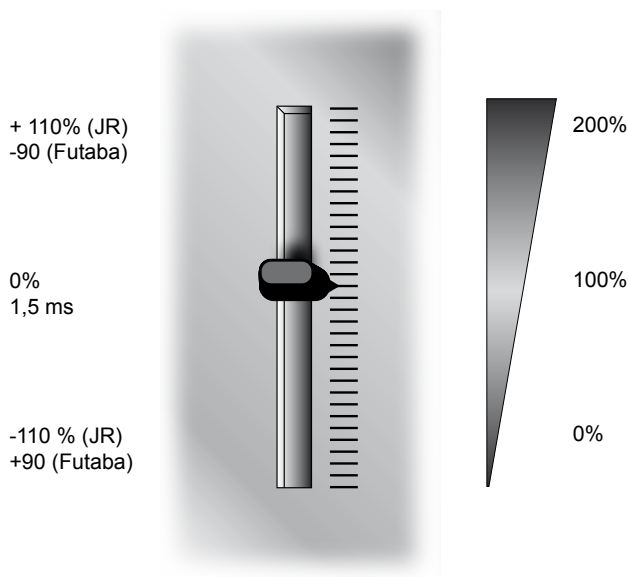
Note: when using this option, make sure, that the previously found tail gyro gain is set fix in the [Tail gyro] menu, and also do not forget to again check all settings after the use of this tuning feature.

When you have selected and assigned a parameter in the [RealTime-Tuning] menu, you can adjust it in real time from the transmitter, e.g. in flight (via the ‚modified‘ gyro channel). It is best to use a slider or a potentiometer on the transmitter (or a fixed value programmed there). Thus, settings can be optimised by remote control.

The applicable parameter's setting can be altered from zero to twice the pre-set value (but no higher than the setting limits). Neutral signal from the transmitter results in an unaltered setting, i.e. 100%.

When the assignment is cancelled again, the setting made on the transmitter is either discarded or you have to adopt it beforehand as the new setting.

REALTIME-TUNING-KANAL



TAIL GYRO OPTIMISATION

SENSITIVITY (GAIN) SETTING

As usual, set the gyro gain as high as possible, at which the tail does not yet tend to oscillate, not even at high flight speed. The tendency to oscillate and thus the holding force crucially depend on the speed of the tail servo, but also on a play-free and easy-moving linkage as well as an optimum drive (no belt slipping, no breakdown of the motor controller at full coll.pitch, etc.).

You can additionally optimise the gyro's performance to the model by tuning further parameters of the [Tail gyro] menu. In the case of high-performance acro helicopters, the following tuning procedure has proven itself and excellent performance can be achieved with it, even under extreme loads.

P-GAIN AND D-GAIN

Search for the setting at which the tendency to oscillate is at its lowest (referred to the same overall gain) and you can then further increase the overall gain to some extent.

- You prevent fast oscillations (fine dithering) by means of a lower D-gain.
- You prevent medium-speed oscillations by a higher D-gain or by a lower P-gain.
- You prevent slow oscillations and bouncing back by means of a higher P-gain.

DELAY (LOCKING-IN CHARACTERISTIC)

Use this to optimise the locking-in when the stick is released suddenly, with the result that the tail stands still without bouncing back (overshoot). Before adjusting the delay, adjust the tail gyro gain to a good and high value.

REVO-MIX (NOT AVAILABLE WITH HC3-XBASE)

This generates a direct ahead correction for the tail with every load change caused by coll.pitch excursion, even before measurable drift occurs (which the gyro would have to first detect in order to balance it out).

For the Revo-mix you can select:

- for 3D-flying → symmetrical pitch curve
- for scale flying, with coll.pitch hover position in joystick centre → asymmetrical pitch curve.

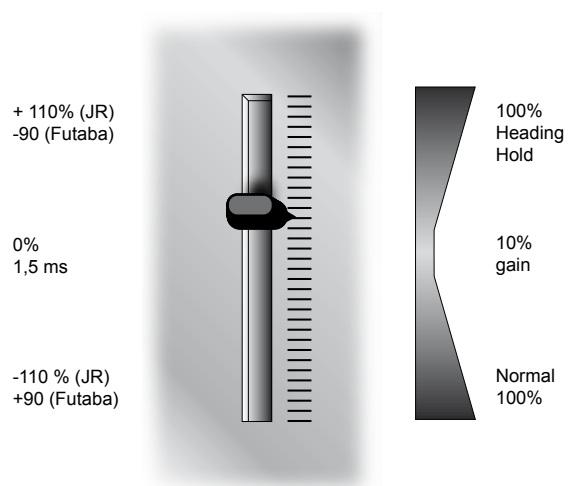
You optimise Revo mix with reduced gyro sensitivity as a test measure:

Issue sharp coll.pitch deflections and observe the tail. If the tail gives in to the torque at the start of ascent, i.e. swivels in the opposite direction to the main rotor, then increase the Revo amount. Finally, again raise the gyro sensitivity.

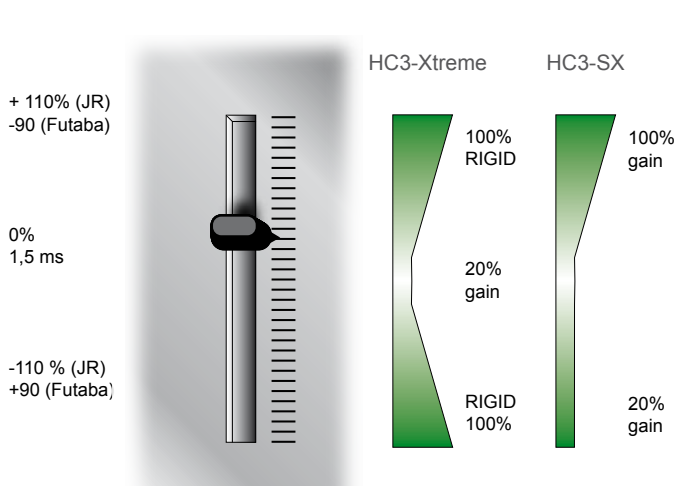
OPTIMISING THE ELECTRIC MOTOR CONTROLLER

If the tail performs a tiny excursion only after a coll.pitch change, the cause of this is mostly a sluggishly responding motor controller that allows the motor speed to break down briefly at the maximum load and then accelerates, thus applying a high load to the tail. In this case, mostly an improvement is achieved by increasing the motor's speed.

TAIL GYRO CHANNEL



HEAD GYRO CHANNEL



HEAD GYRO OPTIMISATION

The attitude stabilisation („head gyro“) for the rigid linkage maintains any pilot-operated attitude and prevents disturbances (such as ballooning against the wind). On ground, the function is visible at the swashplate when giving control commands it stays in the inclined position for a while.

AN EFFICIENT WAY TO OPTIMISE THE RIGID SETTINGS:

- Use the ‚Head-gyro‘ channel (or it’s default gain slider) to set the gain as high as possible, but safely below the onset of oscillations, and carefully beginning with small values. Too high gain may provoke oscillations, for example like a ‚shivering‘ in roll axis or a pitching in elevator axis.
- Then set the ‚agility‘ as desired; better at the PC than at the transmitter; only with HC3-Xbase, use the transmitter. Normally, adjustment is then already close to optimum or even perfect.
- If improvement is necessary, you can test sudden halt („latching“) after vigorous and abruptly ended stick deflections on aileron and elevator::

In case of a tendency of rocking / luffing in elevator axis, activate the elevator-filter and adjust it to the accuracy of one slider tick (see the tool-tip). This job is easily done by using RealTime-Tuning, after having pre-set the elevator-filter to a medium value.

→ In case of abrupt and jerky reaction to small and sudden stick inputs:
reduce ‚Initial response‘, or increase ‚Rigid gain‘ or P-portion.

→ In case the turning continues a short while even after ending the stick deflection:
for avoiding a too soft (sluggish) reaction:
Increase ‚Initial response‘; possibly also increase the ‚Rigid gain‘ and/or the travels in the [Mixer] menu.
for avoiding exaggerated and harsh reactions:
reduce ‚Agility‘ in the [Rigid] menu, and carefully increase the travels in the [Mixer] tab.

If aileron and elevator impulses cause mixed movements, this might be because of an incorrect setting of „virtual swashplate rotation“. Test it with reduced rigid gain: If the tail moves downwards in the event of rolling to the right, then increase swashplate rotation in the positive direction.

- Test response to long stick elevations:
In the case of a strong first reaction and then decelerated continued reaction:
reduce ‚Initial response and, if applicable, increase the „Agility“.
- Test high-speed flight
→ Against slow ballooning or undercutting:
reduce or resp. increase the „withdraw rate“.
→ Against temporary nose-up („dolphin“) during harsh coll.pitch rises:
increase ‚Rigid gain‘ as far as possible.
Also try with increased P-portion and ensure mixer is set to maximum travels
→ Against lasting ballooning after hard coll.pitch-up:
see mouse over text for „altitude holding range“.
- In case of tilting (tumbling motion) during pirouettes:
Align the sensor parallel to the rotor shaft.
Trim the swashplate exactly straight while there is a connection to the [Trim] menu (necessary to have all servos at neutral).

PARTICULAR FEATURES OF THE HC3-SX

Compared to the HC3-Xtreme: As long as the functions of the [Horizon] menu are not activated, the HC3-SX function is identical with the HC3-Xtreme's function – except for the difference that, using the head-gyro channel, only the positive sided signal controls the head gyro's gain (direction as displayed in PC → Diagnose).

SETTING UP THE HC3-SX

Important: The HC3-SX does not allow „exceptions“ during the setting-up procedure, particularly the coll.pitch travel has to reach its 100% end-markings as displayed in the [Diagnose] menu, positive and negative, and with the correct direction. If this is not the case, either adjust the coll.pitch travel (or the coll.pitch curve) in the transmitter and re-adjust the servo ways in the [Mixer] menu, or refrain from using any HC3-SX specific features.

HORIZONTAL STABILISER

The horizontal stabilisation can be used for various purposes, e.g. as support during photographic flights, particularly in greater distances, or as a training aid (beginners for hovering or inverted flight, or - after the activation of extended options - as a safety feature during acro flight training, using the stabilisation only as a „rescue switch“ in an emergency case.

HOW TO ACTIVATE THE HORIZONTAL STABILISER

Using FBL-helicopters without flybar, first optimise the Rigid stabilisation. Then read the resulting gain-setting of the head-gyro channel from the [Diagnose] menu (not from the transmitter!) and enter this value as default setting into the [Rigid] menu. Now the head-gyro channel is freed for the use of the Horizon option. To activate Horizon-Mode, use the [Horizon] menu to switch the channel assignment from ‚Rigid gain‘ to ‚Horizon‘. Using the head-gyro channel, you can now control the strength (gain) of the Hor-Mode during flight. To this end we suggest to use a switch or better a pot or slider at the transmitter for instant adjustment access. Stronger gain means quicker self-leveling and more necessary stick deflection, for example to decelerate a fast flight. The [agility] setting in the [Rigid] menu always affects the Horizon gain too.

FLYING WITH HORIZONTAL STABILISATION

Before starting the motor, ensure that the swashplate remains in approximate horizontal position while activating the Hor-stabilisation. It must not run into an end-blocking! Important: Begin with small stabilisation gain and increase carefully. Too high gain may cause dangerous oscillations. In this case, immediately reduce the gain and re-program the head-gyro channel at the transmitter to a limited signal (using ATV), so that it reaches not more than the previously found max. possible value for your heli. Only then the easy and safe selection of stabilisation modes is possible during flight. Rigid stabilisation, set at high level, may increase a tendency to oscillate. In this case it may be helpful to just slightly reduce the rigid gain, allowing a large increase of horizontal gain. Normally, take-off and landing is possible with activated Hor-Mode. This should be tested first with a gain not higher than 25%. Some large helicopters however are susceptible to a collision of main rotor and tail boom, if harsh elevator-back commands are given. This can be checked by whether the rotor blade bends down to that point when pushed hardly enough. In this case, the horizontal gain and/or the [Mixer] menu (servo ways) have to be adjusted so that the swashplate inclinations are limited to an appropriate elevation, and the Hor-Mode should be switched off during take-off and landing.

The tendency to oscillations may be increased before take-off, if the skids are standing on a hard surface and during fast flight. Therefore, in both cases the gain setting should be tested. Important: Do not reduce travels for aileron or elevator at the transmitter (dual rate) during Hor-Mode is used. Otherwise, the priority of the manual control (override), which is necessary for safety reason, may get lost. Therefore, allow a travel reduction (dual rate) at the transmitter only when the Hor-Mode is disabled (otherwise reduce either the maximum signal of the head-gyro channel in the same proportion as the travel has been diminished, or increase the 'Manual override' slider in the [Horizon] menu to at least the value which is in reciprocal proportion higher than its minimum end).

The Horizon stabilisation can make pirouettes out-of-round, since it aims to bring the main rotor plane into its neutral hover attitude. Adjustable at the menu: for round pirouettes reduce the Horizontal strength (gain) and/or increase the Rigid stabilisation.

HORIZON MENU

Normally all settings can be left at their default values. Beyond that, there are several options, which are precisely explained in the tool-tips (mouse-over) and should be read.

The slider ‚Manual priority‘ defines the stick elevation of aileron and elevator, which will disable the horizontal stabilisation (fading-out, yielding to manual control). High setting means early fade-out; the stabiliser only interacts with neutral stick (experienced pilots). Low setting creates a large ‚deadband‘, in which the sticks work but control the attitude angle only (beginner).

The self-leveling mode decides whether the stabiliser keeps the helicopter in normal (upright) position or brings it to the horizontal attitude, inverted or normal, which is „closer“.

- 1 [hover & scale] is not suitable for 3D flying and allowed only for helicopters which, due to their c.pitch range, are not capable of inverted flight.
- 2 [norm. & inv.] is the default option. It can be used as aid for hovering (beginner) or for inverted flying (training), as well as for experts (flying in greater distances etc.). This option is capable of inverted leveling, but has certain restrictions regarding 3D flight: the accuracy is guaranteed only if loops, rolls, turns, tic-tocs and similar figures are flown not more than ca. 10 times in a subsequent series.
The extended modes are suitable for unlimited 3D flying, and therefore provide the most reliable „rescue“ functions. These options are allowed only if the model will not be tilted more than 30° from powering on the HC3-SX until takeoff.
- 3 [acro] The most recommended option for 3D flying with best performance. Additionally the decision, whether the heli will be leveled upright or inverted, is depending on the current c.pitch stick position. But: no main attitude change when inclination is < ca. 45°. Example: if the heli has an inclination of 70° on elevator and/or aileron, i.g. is closer to normal flight attitude than inverted, but the current c.pitch signal is ‚negative‘, then the heli will be levelled inverted.
- 4 [goes to pos.] For levelling 3D helis in upright hover (‐safety switch‐). If the model was almost in inverted flight, the faster way via aileron may be used to level it back to upright flight.
- 5 [acro with pitch] The model will be self-leveled to the „closer“ horizontal attitude (normal or inverted), and additionally c.pitch will automatically be controlled for increasing altitude (fast ‐safety switch“ incl. ‐escape into the sky“). Read tooltips in PC software!
Not suitable for indoor flying!

TRIMMING NEUTRAL

Using Rigid stabilisation, trim adjustment at the transmitter is not necessary any more.

Helicopters equipped with mechanical flybar, even though they would not need a Rigid stabilisation, can still use this stabilisation in order to correct any minor trim differences and drifts. To this end, use the preset button [Flybar: stab] in the [Rigid] menu.

If necessary, the setting can be optimised using the gain (by RC or default setting) and the ‚Direct control portion‘ slider. ‚Elevator filter‘ may be used as additional feature.

DIFFERENCES TO THE HELICOMMAND M-SERIES

For those familiar with the HeliCommand, here are some essential differences:

Hor-Mode is only accessible after assigning the channel and is activated only by positive signal from the head-gyro channel.

Rigid stabilisation is activated by default.

For deactivation use the preset-button ‐Flybar: Off“ in the [Rigid] menu.

Another preset button [Flybar: stab] is particularly meant for engaging the Rigid stabilisation with conventional flybar helicopters, useful as compensation against off-trims and drifts.

Autotrim for flybar-equipped helicopters has been replaced by the Rigid stabilisation used with the setting „Flybar: stab“.

The SET button (learning transmitter neutrals) has been replaced by adjusting the transmitter’s neutral signals in the [Diagnose] menu.

Connection to the [Diagnose] or [Trim] menu brings all servos to neutral position, and servos will not work here.

No position hold mode available.

APPENDIX



TROUBLESHOOTING

SERVOS DO NOT RUN AND LED FLASHES RED

See page 6 (LED)

FINE AGITATION MOVEMENTS AUDIBLE WHEN USING DIGITAL SERVOS

No problem; these result from the control loop; much stronger movements occur during flight anyway.

JERKING TAIL SERVO

If the tail gyro's auxiliary channel is at neutral position, it will stay around the switching point between heading hold mode and normal mode, and will randomly switch it on or off. Use either a positive or a negative signal in the tail gyro channel to define heading hold or not and to obtain a useful gyro gain.

STEPWISE SERVO MOVEMENT

No problem - this is the slower time grid (frame rate) in which some RC systems transfer their pulses. With the faster frame rate of the device, this is merely more clearly visible on the servos.

NO CALM FLYING ATTITUDE ON THE TAIL AND/OR HEAD

Extreme vibrations (visible or tangible only) on the housing

Especially in the case of internal combustion engines → Observe the installation notes on page 4.

TILTING DURING PIROUETTES (LURCHING OR TUMBLING MOTION)

- Housing not mounted exactly aligned to the rotor shaft?
- With a neutral signal (when in the [Diagnose] menu), swashplate not exactly perpendicular to the rotor shaft?
- HC3-SX only: Horizon stabilisation active? → (neutral attitude, see page 15)

TILTING DURING PIROUETTES, ONLY DURING STRONG WIND OR IN HIGH SPEED

- Equalize aileron and elevator inclinations of swashplate using the Mixer menu.
- Use similar Rigid gains for aileron and elevator (Rigid Menu).

WEAK TAIL HOLDING

Travel limit and gyro gain correctly set?

TAIL UNEXPECTEDLY SWINGS OUT TO THE SIDE

Tail drive (belt or shaft) slipping?

WE RECOMMEND FOR YOUR SAFETY

- Always observe a sufficient safety distance from persons and objects.
- Do not underestimate the weightiness of rotating rotor blades.
- Always observe legal regulations.
- Keep your distance from radar stations, transmission masts and other radio interference sources.
- When passing on the model to third parties, always pass on these warning notes as well!

DISCLAIMER

Installation, adjustment and operation of the autopilot and a helicopter require appropriate skills. Errors and lack of attention can result in accidents involving severe personal injury and/or property damage or even traffic accidents. As the manufacturer and seller have no influence on correct handling, these risks are expressly pointed out. Liability for all manner of damage resulting from operation, even due to disruptions of the built-in instruments or signal transmission, is fundamentally ruled out, insofar as legally possible.

WARRANTY

We assume a warranty of 24 months for this device.

Any repairs performed will not extend the warranty period. During the warranty period, we will remedy any occurring malfunctions or manufacturing or material flaws free of charge. Further claims, e.g. in the event of consequential damages, will be ruled out. The unit must be transported to us at no expense to us, and it will also be returned at no expense to us. We cannot accept unpaid consignments. We cannot assume any liability for transportation damage and loss of your consignment. We recommend appropriate insurance.

THE FOLLOWING PREREQUISITES MUST BE MET FOR PROCESSING OF YOUR WARRANTY CLAIMS:

- Purchase receipt included with the consignment.
- The devices have been operated in compliance with the operating instructions.
- The device has not suffered any moisture damage, unauthorised tampering, excess voltages, overloads or mechanical damage.
- If possible, include pertinent hints on how to detect the fault.

NOTE

This document contains legally protected information. All rights reserved.

The content of this document can be amended or adapted without prior announcement.

The HeliCommand may be modified at any time on the basis of ongoing tests and resulting improvements. Please inform yourself regularly about current versions of the instructions, HeliCommand firmware and PC software.

The manufacturer provides no warranty for operability and usefulness in specific applications

The manufacturer is not liable for errors in this documentation and resulting damages in connection with equipment, performance or use of the material.

ACCESSOIRES

HC3 PC adaptor USB includes USB-PC-adaptor and software on CD	No. 85701000
HC3 foam tape Acro (3 pcs)	No. 85700001
HC3 foam tape Soft (3 pcs)	No. 85700002
HC3X cable loom L90 (90mm)	No. 85700090
HC3X cable loom L150 (150mm)	No. 85700150
HC3X cable loom L250 (250mm)	No. 85700250
HeliCommand USB-Stick (1GB)	No. 85702000
HeliCommand Baseball-Cap, white	No. 85703000
HeliCommand Baseball-Cap, black	No. 85704000
Connection cable GY520, HC3X 65 mm	No. 4090
Connection cable GY520, HC3X 90 mm	No. 4091
Connection cable GY520, HC3X 140 mm	No. 4092
Connection cable GY520, HC3 X 215 mm	No. 4093

VERSION 3.0

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