

Manual RONDO V2

Rondo by



Preface

Congratulations to your new RONDO Flybarless System and thank you for choosing RONDO.



RONDO is a Flybarless System that is equally suited for beginners and advanced pilots due to its simple handling and high performance.

No matter what level of prior knowledge you have or for which model helicopter you would like to use RONDO, this manual will guide you through a quick and easy assembly and setup.

In order to enjoy this kind of flying experience in its full quality it is essential that you are very careful and accurate with the assembly and setup of your system. We therefore recommend you study this manual minutely even if you already have some experience with flybarless systems.

System components

The RONDO system consists of a RONDO central unit and a terminal. The central unit contains the controlling electronic with the three gyroscopes or short: gyros. In order to optimally fit the controlling electronic to a helicopter system several values need to be adjustable. This is where the terminal comes into action. With the terminal you can display, adjust and save all of these adjustable values.

New in v2.0:

- Simplified handling and installation. Once the mechanics are set correctly an airworthy setup can be reached by setting only two gain parameters for tail- and rotor head.
- Completely revised new regulation model with Rock-Solid-Algorithm (RSA). Therefore a most stable flight attitude and direct control. No „nose up“ at collective pitch during fast forward flight.
- The operation of one or two Spektrum-satellites via adapter cable is now possible directly at RONDO.
- The operating modes „Start/Landing“ and „Flight“ have been replaced by an automatic operation mode recognition. Instead you can now choose between the „Classic-Mode“ for scale and paddle like flying and the „Solid-Mode“ for general scenic flights, acrobatic flights and 3D.
- The display language can be switched between German and English.
- NO adjustment of cyclic trim or anything similar is needed. Solely the best possible mechanic setup is required.

List of abbreviations

RONDO = PRO-RC RONDO central unit

Terminal = PRO-RC terminal with four buttons and 2*16 characters LCD (display)

Gyro = gyroscope

→, ←, ↑, ↓-button = button right, left, up, down

Rigid-head = rotor head without fly bar or fly bar stabilisation

SP = swash plate



Operation

Once the terminal is connected to RONDO you can use the four buttons to navigate the menu and adjust the values. After connecting and switching it on you will be in the welcome menu.

```
RONDO PRO-RC v20
Select Function↑
```

Press the ↑↓-buttons to scroll through menu items. To select the current menu item press the →-button. You can find an overview of the menu structure in the appendix.

Many of the main menu items have more than one parameter that can be adjusted. If there is more than one parameter to adjust, press the →-button repeatedly to select the one you would like to adjust. Press the ←-button once or the →-button repeatedly to navigate back to the main menu. As soon as the value you selected is displayed its value can be changed using the ↑↓-buttons.

Changed values will immediately become valid, however they are not saved permanently and will reset to their previous values when the supply voltage is disconnected. Without any hassle it is therefore possible to try different values or even determine them during a flight and discard them afterwards by disconnecting the supply voltage or save them using the terminal.

If you want to save your adjusted values there are two possibilities to do so:

1. Select the main menu item "Miscellaneous Settings". Then, in the adequate sub menu, save all values in the usual practise by pressing the ↓-button.

```
Miscellaneous ↑
Settings → ← To Save All →
Banks Use ↓
```

2. The more convenient way however is to press and hold the ←-button then press the →-button, too in the main menu. This is called „Quick safe“ and is confirmed with „ALL PARAMETERS SAVED“ on the display. It can be used in any main menu except for the "Channel Monitoring" menu.

For flight operation the terminal must always be disconnected.

Mechanical preparation of your helicopter and requirements

In order to use RONDO you need to remove your helicopter's fly bar and make some adjustments if required. In case there is a rigid-head conversion kit offered by the manufacturer of your helicopter we recommend you use it as often times the servo ranges are already adjusted in these.

Note that for a rigid-head considerably higher forces act upon the servos. It is therefore generally advisable to use good and if applicable bigger or stronger servos.

We also recommend a stable and strong power supply for your system. From experience servos of helicopters with a rigid-head use more current.

It is also a good idea to use two cables between BEC and RONDO if possible. The supply cables can be connected to almost any slot in RONDO. The only exceptions are the receiver slot 6 and the slot for the terminal.

RONDO assembly and connection

For mounting the central unit choose a position that is easy to reach and low on vibrations. It should also not be placed next to any pieces that might be electro statically chargeable such as for example a tail drive belt and RONDO should not be exposed to any exhaust fumes.

Use the enclosed double sided foam sticky tape for mounting RONDO. Only use the enclosed tape and not just any other tape as it is adjusted to RONDO in its thickness and stability. There is no need for mounting an additional steel plate for RONDO as it already has the steel plate integrated in its base. Make sure that all adherence surfaces are oil free and dust free!

You can mount RONDO to a standing or hanging position. Usually the plug connector is transverse to the flight direction. In case mounting is only possible with the plug connectors pointing in flight direction, for example due to short servo or receiver cables, you can set this 90° rotation in the RONDO menu system.



When positioning RONDO it is essential that you are extremely careful and patient as the three integrated sensors will later only measure the difference in the very movement are supposed to. Askew or rotated mounting will lead to clearly worsened flying and controlling characteristics. Therefore please take your time here! Later on if the helicopter drifts away heavily when doing pirouettes the reason is mostly askew positioning of the central unit.

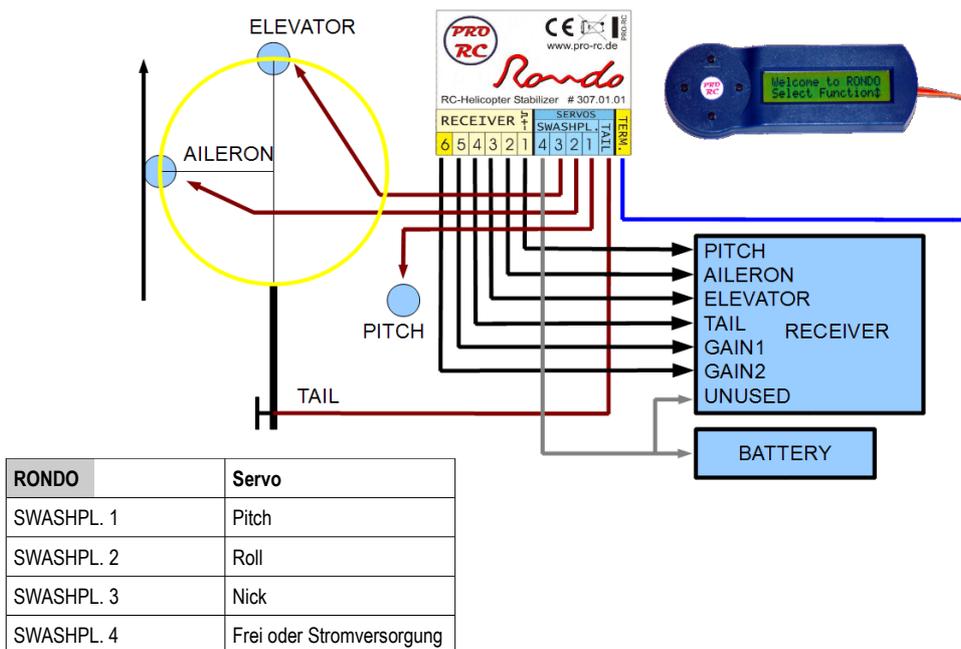
The standard connection table for RONDO to receiver is:

Control function	RONDO receiver input
Pitch	1
Aileron	2
Elevator	3
Tail	4
Gain 1	5
Gain2	6

Connect the servos to RONDO as follows:

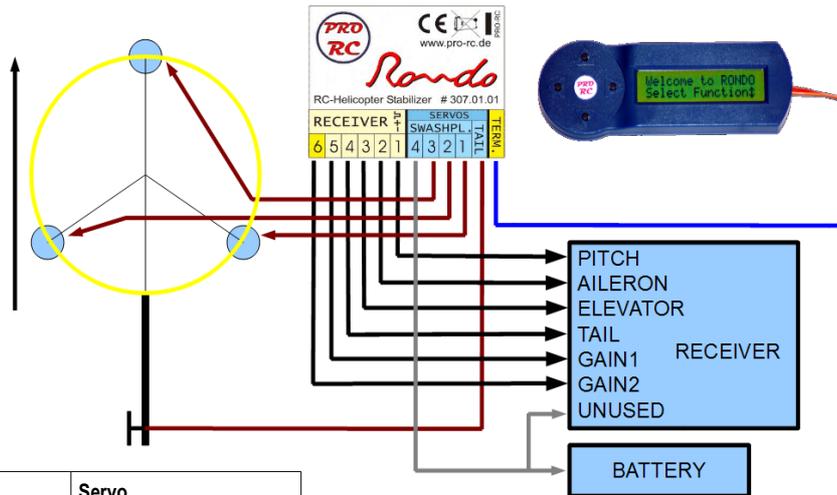
The tail rotor servo always has to be connected to the RONDO „TAIL“ jack.

Connection diagram for mechanical swash plate mixing:



If SWASHPL.4 is used for power supply make sure you only connect ground and supply voltage. A receiver output signal must not be connected to the servo output!

Connection diagram for electronic 120°/135°/ 140° swash plate mixing:

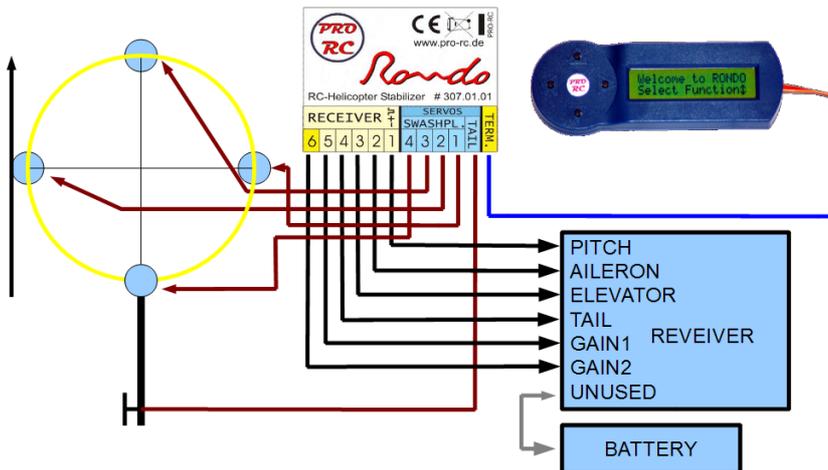


RONDO	Servo
SWASHPL. 1	Rollservo 1
SWASHPL. 2	Rollservo 2
SWASHPL. 3	Nickservo
SWASHPL. 4	Frei oder Stromversorgung

If SWASHPL.4 is used for power supply make sure you only connect ground and supply voltage. A receiver output signal must not be connected to the servo output!

There is no problem if your swash plate has both aileron servos in front and the elevator servo at the back. It is however important that the elevator servo is connected properly. In case the two aileron servos are swapped it is possible to compensate that with „Servo Reverse“ later on.

Connection diagram for electronic 90° swash plate mixing:



RONDO	Servo
SWASHPL. 1	Rollservo 1
SWASHPL. 2	Rollservo 2
SWASHPL. 3	Nickservo 1
SWASHPL. 4	Nickservo 2

The pin configuration for a 90° swash plate is similar to the pin configuration for a 120/135/140° swash plate but SWASHPL. 4 is then the rear elevator servo and cannot be used for electric supply.

It is generally true that:

The two channels Gain1 and Gain2 are there to control the sensitivity of the gyro systems. It is possible to use both sensitivity channels in order to adjust the swash plate sensitivity and the tail rotor sensitivity separately even during a flight. If only one channel is used, the swash plate and the tail rotor are both adjusted together.

The throttle servo or the electronic speed controller are usually connected directly to the receiver. The operation with a so called single-line-receiver or with Spektrum-satellite-receivers is an exception. Please see the appropriate chapters further down.

Programming the transmitter

In your transmitter choose the model type “helicopter with mechanical swash plate control”. This is very important because RONDO needs all functions on different channels and all mixing is done in RONDO if needed. Deactivate **all** mixers that might be pre-set in your transmitter such as for example the static DMA mixer for the tail and check the result on the servo display of your transmitter.

Depending on the transmitter's manufacturer the 100% display for the transmitter does not correlate to the same servo travel. It is therefore advisable that you set your values as RONDO „sees“ them. In order to do so, connect the terminal to RONDO and switch on the transmitter and the receiver. It is not necessary to connect the servos yet. Use the ↓-button to switch to “Channel Monitoring” and press the →-button to display all channels.

```
Channel      ↑  ←T+000 | %100 || %100
Monitoring   →  CP+000E+000A+000
```

In this menu you can see what RONDO determined the values to be. This way you can easily adjust the previously mentioned channels. The abbreviations used in the menu are: T = tail, I = gain channel 1, II = gain channel 2, CP = collective pitch, E = elevation, A = aileron.

Initially limit the travel for your transmitter as follows:

```
E+/-080 A+/-080 Tail servo: T+/-060 Collective pitch: CP+/-100
```

A RONDO stabilised helicopter can reach enormous yaw rates depending on its setup. To make sure the first flight does not end in nasty surprises and with too high yaw rates, we strongly recommend to start of with the reduced servo travels. Later on it is easy to increase them via the transmitter.

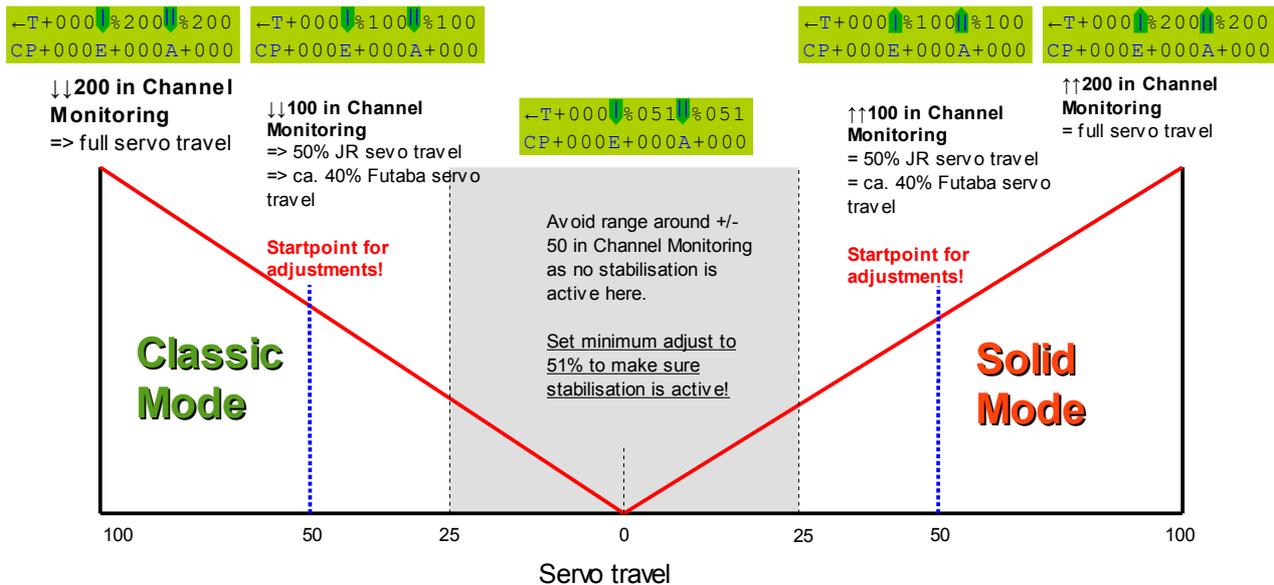
Sensitivity setup:

For the sensitivity control of RONDO via the transmitter as well as for the choice of the flight mode one or two further channels are needed, preferably controlled by simple 2-pin switches. Sliders would basically work too, but they are not recommended as their positions are hard to reproduce. The 2 positions of these switches or sliders will later determine the controller sensitivity. Once all values are set, they will only change very rarely. For now it is sufficient to allocate one or two switches/sliders to each channel depending on the number of free channels. It is the standard to use only one switch for both sensitivity channels and this setup is recommended especially for less experienced pilots.

Now set 100% for both sides – read from the Channel Monitoring Menu. “For both sides” means for both switch/slider end points. The switch over is clarified by arrows ↓ in the Channel Monitoring Menu.

```
←T+000 ↓ %100 ↓ %100      ←T+000 ↑ %100 ↑ %100
CP+000E+000A+000         CP+000E+000A+000
```

Arrow down is equal to the “Classic” operating mode, arrow up is equal to the “Solid” operating mode.



Classic Mode	Scale and flybar-like flight style
Solid Mode	Flight mode for standard-, aerobatic and 3D flight style

Adjusting RONDO

After you have mounted RONDO and programmed your transmitter accordingly, all that is left to do is to set up the Gyro reverses as well as servo reverses and travels before you can start off to your first flight.

RONDO's main menu is set up in a way that you can follow it step by step for the first setup. Therefore we will follow this same principle here and explain each step one after the other.

First of all switch on your transmitter and check that all trimmings are in the centre. When switched on RONDO always initially measures the stick centres for elevator, aileron and tail. In case one of these values is too far away from the centre RONDO will not initialise. The blue LED will then flash continuously. When the measurement is successful the LED will light up constantly.

If you use the single line access or the Spektrum access all channels need to be in the centre position for the initial switch on in order to let RONDO initialise. As soon as channels are correctly assigned to functions through the menu „Function Assignment“ this is only true for elevator, aileron and tail.

Because RONDO measures the stick positions whenever it is switched on and therefore also their deviations through trimmings it is not possible to the trimmings at the transmitter!

Before you switch on your helicopter, we recommend you detach all linkages from the servos so that they cannot block in case for example when servo travels are far too big.

Now switch on your helicopter. The LED in RONDO will start flashing for a few seconds then it will start to light up continuously. Directly after the switch on, RONDO will try to calibrate the sensors and initialise the system. **During this time do not move your helicopter or the control sticks.** If the helicopter or the sticks are moved anyway calibration of the sensors is not possible and the LED will not change to light up continuously which means the system will not be ready for use. In this case the change will only take place if the helicopter was not moved for at least a few seconds.

If you have not yet connected the terminal go ahead and do so now. The terminal display will show the following message:

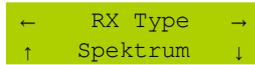
```
RONDO PRO-RC v20
Select Function:
```

As soon as the RONDO menu is visible press the ↓-button.

Receiver Assignments

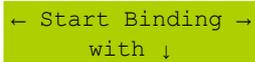
RX Type

The operation of one or two Spektrum satellites via an adapter cable directly at RONDO is now possible. In order to use this operating mode connect the adapter to receiver 5 and 6 at RONDO. First use the **↓**-button to switch to the menu „Receiver Assignments“, then the **→**-button for the submenu „RX Type“. Here please choose „Spektrum“



Start Binding with

Then use the **→**-button to choose the menu item „Start Binding“and start the process with the **↓**-button.



Now switch off RONDO and set the transmitter to Binding Mode. Then switch on RONDO and wait until the satellite LEDs light up constantly. Now restart RONDO and the transmitter.

Finally go to the menu „Receiver Assignments“ and use the **→**-button to choose the functions to assign the channels.



It is also possible to use a single-line receiver. A single-line receiver is connected to „Receiver 1“ via cable. In this case please choose the value „Standard“ for „RX Type“.



For the single-line receiver the channels also have to be assigned to the functions.

Channel Monitoring

Channel Monitoring is used to check the stick assignments and the range settings of your transmitter.



Tail Settings

Tail Servo

Here you can choose the control frequency of your tail servo.

1520us	Digitalservos
760us	S9251, S9256, BLS251

An incorrect setting of the control frequency can destroy the tail servo and does not lead to a better tail performance!

CPitch→Tail

Cyclic→Tail

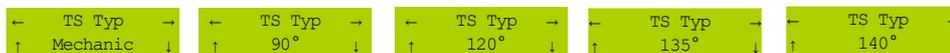
There is the option to set a mixer each for the functions Pitch to Tail and Cyclic to Tail in RONDO. It is however very rarely needed.



Swashplate Configuration

SwPI Config.

Here you can choose our swash plate type. The following options are available:



Servo Reverse

Tail Servo. SwPI Servo 1-4

With the help of the control sticks check if the swash plate and the tail rotor are controlled in the correct direction. If only one function is inverted invert this function at the transmitter. Otherwise use this menu to invert each servo's direction.



For the following settings the maximum servo ranges are always set automatically. The servos are set to the appropriate positions by RONDO whilst you do not have to hold on to the transmitter sticks.

Servo Center Check + Adjust

Tail Side 1-2, SwPI 1-4

After choosing the function „Servo Center Check“ all servos are set to their center position. Now mechanically adjust the swash plate linkages or the servo levers in a way that the swash plate is perpendicular to the rotor shaft and that **Pitch is set to 0 degrees**.

For the fine tuning you can now use the sub menus to adjust each servo's center position.

This basic setting is important for a balanced flight behaviour and the functioning of the automatic operating mode detection.

Tail / SwPI Ranges

Tail Side 1-2

This menu is used for adjusting the mechanical servo travels. As soon as you switch from the main menu to the first sub menu using the →-button the tail servo will move to its end position 1. Adjust the end position by using the ↑ ↓-buttons so that the servo does not reach its mechanical limit. The →-button takes you to the menu for the tail rotor's end position 2.

CPitch Side 1-2

In the sub menu "CPitch Side 1" the swash plate automatically moves to its end position 1. With a pitch gauge check if the pitch angle complies with your requirements.

```
← CPitch Side1 →
↑ 80% ↓
```

In the sub menu "CPitch Side 2" the swash plate automatically moves to its end position 2. Proceed here as described above.

```
← CPitch Side2 →
↑ 80% ↓
```

Please set symmetrical pitch values for both end positions (e.g. +/- 10 degrees).

Max. Cyclic

In the sub menu "Max. Cyclic" you can set the maximum cyclic amplitudes for the swash plate. After choosing the function the swash plate automatically moves to the center position. As soon as the elevator or aileron stick is moved the swash plate automatically slowly moves to the appropriate end position. Only ever use elevator **OR** aileron never both at the same time. In case you accidentally used both functions change back to the CPitch menu and then back to the Max. Cyclic menu. Make sure that while you make these settings no servo blocks reach its mechanical limit .

We recommend you set about 7 degrees for the elevator and aileron function. Please measure under all circumstances!

Gyro Reverse

This gives you the possibility to adjust the gyro reverse of each gyro axis.

```
← Tail Gyro →   ←Elevator Gyro →   ← Aileron Gyro →
↑ Normal ↓     ↑ Normal ↓     ↑ Reverse ↓
```

Please check for the gyro reverse as follows:

Hold your helicopter horizontally. Now tip it about 45 degrees forward. The swash plate should tilt backwards. This means that RONDO performs the exact steering movement that the pilot would use to stabilize the model. Please check all axes in this way and please be very precise when doing so. **An incorrect gyro reverse makes the model unsteerable and will certainly lead to a crash.** At this point also check the reverses of your control sticks. Please note that the rigid-head alteration can invert the pitch. Increasing collective pitch must show a higher pitch at the rotor blades. The swash plate can indeed move downwards in the process!

Dynamic SwPI Settings

Dyn. SwPI

This function compensates exterior influences for pirouettes. It should therefore be switches on in any case!

Dyn. SwPI Dir.

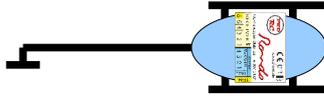
Use this menu item to set the compensation direction. In order to make these settings the swash plate moves to an elevation end position. Look at the swash plate from the side and turn your helicopter's nose left and right repeatedly. Thereby observe the swash plate movement. The direction is set correctly when for example the swash plate is tilted forward and while you turn the helicopter's nose away from you the swash plates side that faces you moves downwards for a moment. In the same manner it should move upwards when the swash plate is tilted backwards while you perform the same movement. Later while the helicopter is flying this compensation will be much smaller. The big amplitude during programming is only used in order to make the check easier. If this approach seems too complex just switch on the dynamic swash plate rotation and perform a pirouette later on. If the helicopter is thereby quiet (without swash plate control input!) the direction is correct. If the helicopter wobbles invert the direction. If the compensation direction is set incorrectly the result will simply be unclean pirouettes there is no danger.

Miscellaneous Settings

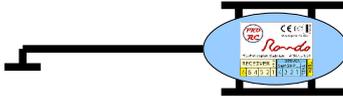
These are optional settings that are not compulsively needed for the basic setup.

Turn Rondo 90°

Ex factory RONDO is programmed in a way that the plug connector has to be mounted crossways to the flight direction.



If it is necessary for mechanical reasons RONDO can also be rotated by 90 degrees. This can be activated in the turn RONDO 90° menu.



Thereby it does not matter if RONDO is rotated left or right.

In every case it is necessary that you check the gyro reverses after the rotation and correct them if needed.

V-SwPI Twist

This is a static virtual swash plate twist as it is known from various transmitters. If for example your model reacts with a slight tilt to the right when you give elevation down, you can correct that behaviour with a virtual rotation by a few degrees to the left.

Language

Here you can choose the display language for the terminal. All settings and configuration values are obtained when the language is changed.

Bank

There are 4 banks (locations to store RONDO setup data). It is for example possible to use one bank for a functioning setup and another one for testing purposes. When RONDO is switched on it automatically loads the bank that was last saved.

To Save all Banks Use ↓

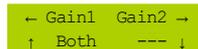
After you press the ↓-button all current settings are saved to the currently active bank.

Reset Selected Banks With ↓

Here all settings for the current bank set in RONDO can be reset to the factory settings.

Gain Channel Settings

This menu item is used for setting the transmitter sided sensitivity channels for the tail and main rotor plane. We recommend you use only one common switch for both planes.

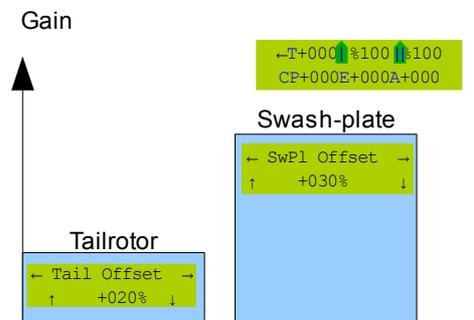


Tail Offset

SwPI Offset

In order to set both planes differently with a single switch use the functions „Tail Offset“ and „SwPI Offset“. With the help of those two values you can set the appropriate sensitivity to a higher or lower value and so you can adjust them to the requirements of your helicopter. If the transmitter sensitivity is 100% on the Channel Monitor display the values for the swash plate and the tail are deployed 100% or unmodified. The offset values change this percentage value accordingly.

In the diagram the transmitter sensitivity is 100%, the tail offset is +20%, the swash plate offset is +30%. This means the tail sensitivity is elevated by 20%, the swash plate sensitivity by 30%.



Computationally this presents as follows:

sensitivity tail gyro = sensitivity transmitter + Tail offset

sensitivity swash plate = sensitivity transmitter + SwPI Offset

The transmitter value therefore changes both sensitivity values parallel. Leave the offset values at 0% before the first flight.

Congratulations, at this point all basic settings are completed!
Remember to save your setup.

The first flights

Before the first take off we strongly recommend you closely check the following points:

- Are all control function directions set correctly?
- Are the gyro reverses (tail, elevator, aileron) correct?
- Is the Gain channel set to 100%?
- Are the offset values set to 0%?
- Is the center of gravity centered on the rotor axis?

Beginning with software version 2.0 it is no longer necessary to change between the operation modes „Start/Landing“ and „Flying“. The system automatically switches as soon as the model is airborne.

With the basic setting the helicopter will hover stable and safe. In order to further increase the flight behaviour please follow the matrix below:

Flight behaviour	Optimisation RONDO	Optimisation transmitter
Helicopter has indirect behaviour to cyclic inputs		Increase the function's servo ranges / dual rate
Helicopter too versatile		Reduce servo ranges / dual rate use the transmitter EXPO
Tail oscillates	Reduce Tail Gain Offset	Reduce the transmitter gain (CAUTION: If only one sensitivity channel is used both tail and swash plate are changed!)
Tail not inherently stable	Increase Tail Gain Offset	Increase the transmitter gain
Tail rotation rate too low		Increase the servo range / dual rate
Pirouettes wobble	Invert Dynamic Swashplate	
Helicopter shakes on swash plate	Reduce Swpl Gain Offset	Reduce transmitter gain
LED flashes constantly		Set the trimming to the center position or do not move helicopter after switching it on

If your tail rotor does not stop evenly on both sides, RONDO has the possibility to learn a hovering offset. Thereby the tail rotor control is learned and stopping will be considerably smoother on both sides.

In order to learn this offset value bring your helicopter to a quiet hovering flight and switch the sensitivity channel Gain1 quickly four times in a row. Whilst doing that and even about five seconds afterwards you should not move the tail control at all if possible and the helicopter's nose should, if it is not completely calm, turn towards the wind. If the learning was successful RONDO will confirm with a slight tail twitch.

The stopping should now be the same on both sides. In order to save the learned value you must connect the display to RONDO after landing. Instead of the usual welcome menu a special menu will appear where you can save the learned value by pressing the ←-button. Every other button discards the learned value. The range in which this offset can be set by RONDO is limited. If, after connecting the terminal, you see the message „Out of Range“, the value is off limits and RONDO could not set the offset value. In this case it is often sufficient to give the tail rotor a slight positive pitch. You can reach this by changing the leverage length between the tail servo and the tail linkage. After that repeat the learning process for the hovering offset. You can delete the hovering offset by switching Gain1 quickly four times in a row while the terminal is connected. A menu will then offer you to delete the value.

In order to check if the swash plate is set mechanically correct switch to the Classic Mode. If the model drifts to one side there can be two main reasons. Either the swash plate is not aligned correctly or the center of gravity for the model is not correct. Check and correct the center of gravity first. If it is okay change the linkage of the swash plate accordingly until the model is nearly position stable in the Classic Mode. As mentioned before, RONDO learns the stick positions for elevation, aileron and tail when it is switched on.

Trimming via the transmitter is therefore not possible!

Specifications

Area of application: Model helicopters that are not subject to authorisation
Supply voltage range: VCC = 4 – 9 Volts, ~50 mA
Temperature range: 0 - 70°C
Relative air humidity over 90% or contact to humidity or water is not acceptable.

Measurements

RONDO: 34 * 34 * 22 mm
Terminal: 132 * 50 * 19mm
Weight RONDO: 31g (including steel plate for vibration attenuation)

Input signals receiver: (VCC = 5-9 Volts)
Pulse range: 1,520 ms +- 400µs
Repetition rate: ~ 20 ms
Logic High: > 3V
Logic Low: < 1V
Charging: > 10k

Servo output: (VCC = 5-9 Volts)
Pulse range Swashplate: 1,520 ms +- 400µs, repetition rate 14,6 or 3,6 ms
Pulse range Tail: 1,520 ms +- 400µs, 3,6 ms
760µs +- 400µs, 3,6 ms
Logic High: > 4V
Logic Low: < 1V
Inner resistance: 220 Ohm

Technology:

Three precision sensors in Silicon Micro Machine (SMM) technology.
Controlled yaw rate up to 800°/s, 12 bit resolution.
C-MOS micro processor 56 MHz.
LCD-Display for optimal readability even in bright daylight.

RONDO and PRO-RC Terminal are RoHS conform after [EG-Richtlinie 2002/95/EG](#)

Disclaimer of liability

A model helicopter that is equipped with RONDO always has to be used in a way that neither people nor objects can be endangered or damaged.

RONDO is solely designed for the use in model helicopters and it may not be mounted to any aircraft that carries humans.

Vibrations, static discharge, dirt, petrol residuals and humidity can cause fault in RONDO's functions and should therefore be kept away.

As PRO-RC has no control whatsoever over the appropriate handling of RONDO, PRO-RC can not take any liability for the use of RONDO unless the cause can be established to be of reckless action on the part of PRO-RC.