Instruction Manual

For The

Flybarless System

Rondo

- fine in RC

Preface

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

We have made an effort to realise RONDO as a 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.

There are more and more fans of flybarless flying and once you tried „topless“ flying for yourself you will quickly become one of them. A model helicopter that follows the pilot's instructions precisely and is therefore easier to handle in critical situations is simply more fun and your learning curve will rise more quickly. New figures and manoeuvres can be practised more stress-free when you can trust your model to do what you want it to.
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.

We hope that through RONDO you too rediscover model helicopter flying.

Always happy landings,

Your team

Content

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 called 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.

List of abbreviations

RONDO = PRO-RC RONDO central unit
Terminal = PRO-RC terminal with four buttons and 2*16 characters LCD (display)
Gyro = gyroscope
R-, L-, U-, D-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 terminal main menu. Press the U-BUTTON or D-BUTTON to scroll through menu items. To select the current menu item press the R-BUTTON. Many of the main menu items have more than one parameter that can be adjusted. If there is more than one parameter scroll through and press the R-BUTTON again to select the one you would like to adjust. To navigate back to the previous menu item or back to the main menu press the L-BUTTON. As soon as the value you selected is displayed it can be changed using the U- and D-BUTTON.
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: for one thing it is possible to choose the menu item „Save and Reset Handling“. Then, in the adequate sub menu, save all values in the usual practise by pressing the U- or D-BUTTON. The more convenient way however can be used while you are anywhere in the main menu. Press and hold the L-BUTTON then press the R-BUTTON, too. This is called „Quick safe“ and is confirmed with „ALL PARAMETERS SAVED“ on the display.
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.

As there is a huge number of different model helicopters out on the market it is impossible to go into every single mechanic and every possible conversion here. We would therefore like to help out with a few tips about what to consider generally when converting the rotor head.

Removing the fly bar and the washout usually results in three consequences:

- The inner SP ring needs to be guided.
- Longer rods that lead from the inner SP ring directly to the main blade holder are needed.
- Due to missing mixer levers the distances for rotor blade adjustment change.

To deal with the first two points there are several possibilities: either you use a single SP-Guidance, for example as offered by VARIO Modellhubschrauber, or you adjust a guidance that guides the two connecting bars between the SP and the blade holders. Another possibility is to use the existing but not otherwise used pitch compensators if applicable. In order to do so the pitch compensator needs to be fixed to the rotor shaft (stick on or screw on) and the levers' long sides need to be shortened.

Usually the longer rods are the minor problem. They can possibly be used from different existing models or they can be self-made. However you need to consider the fact that quite large forces can occur here. Make sure that you dimension the rods accordingly.

As mentioned above the required servo ranges change due to the missing mixing levers. For example let's say you needed 80% servo range for 10° pitch before the conversion then you possibly only need 60% afterwards. Of course it would be possible to mechanically leave all distances as they are and electronically reduce the servo ranges accordingly. However, this is not a very attractive approach as this leads to the loss of servo ranges and therefore resolution which on the other hand results in a much worse control.

You also need to consider that forces on the servos are much higher for a rigid-head. Therefore it is generally advisable to use good and if required bigger or stronger servos. If the set-up for distances is performed correctly and if good, modern servos are used you will however generally be rewarded with a flawless performance.

For the realisation of the required servo reduction there are again different approaches. The best way is to use blade holders where the linkage ball is further away from the main rotor hub so that a larger distance is needed for the same pitch of the rotor blades. It is also possible to modify existing blade holders or use one of the many solutions different manufacturers offer. Anyway, you should always make sure you position the linkage ball in a way that you do not create a so called „Delta 3". This means that both blade holder linkage balls should be concentric to the main rotor hub and therefore exactly at the same height as the rotor shaft. If you imagine a line through both linkage balls this line should be crossing the rotor shaft at an exact 90° angle. Often linkage balls with longer distance bolts do the trick here.

Another very easy but only conditionally suitable possibility is to connect the control rods further

inside the servo arms. This is probably not feasible for a push-pull control as it will likely lead to tensions. Without a push-pull control however, that is with only one control rod at the servo, this method is well feasible.

How you determine the correct reduction will be discussed in detail during the adjusting procedure further down.

TREX 500 conversion to rigid-head for RONDO. The long pitch compensator leverage ends have not yet been shortened. For more details see www.pro-rc.de

We also recommend a stable and strong electricity supply to the system. From experience servos in rigid-head helicopters use more current. It is therefore required to use a reasonably dimensioned receiver battery and a voltage stabiliser or a sufficient BEC for electric helicopters. It is also a good idea to lay two cables between BEC and RONDO or receiver. The supply cables can be connected to any of the free RONDO connectors apart from the receiver connector 6 and the terminal connector.

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 as it is common for other systems on the market as RONDO 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 distance they 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.

TREX500 with rigid-head and RONDO

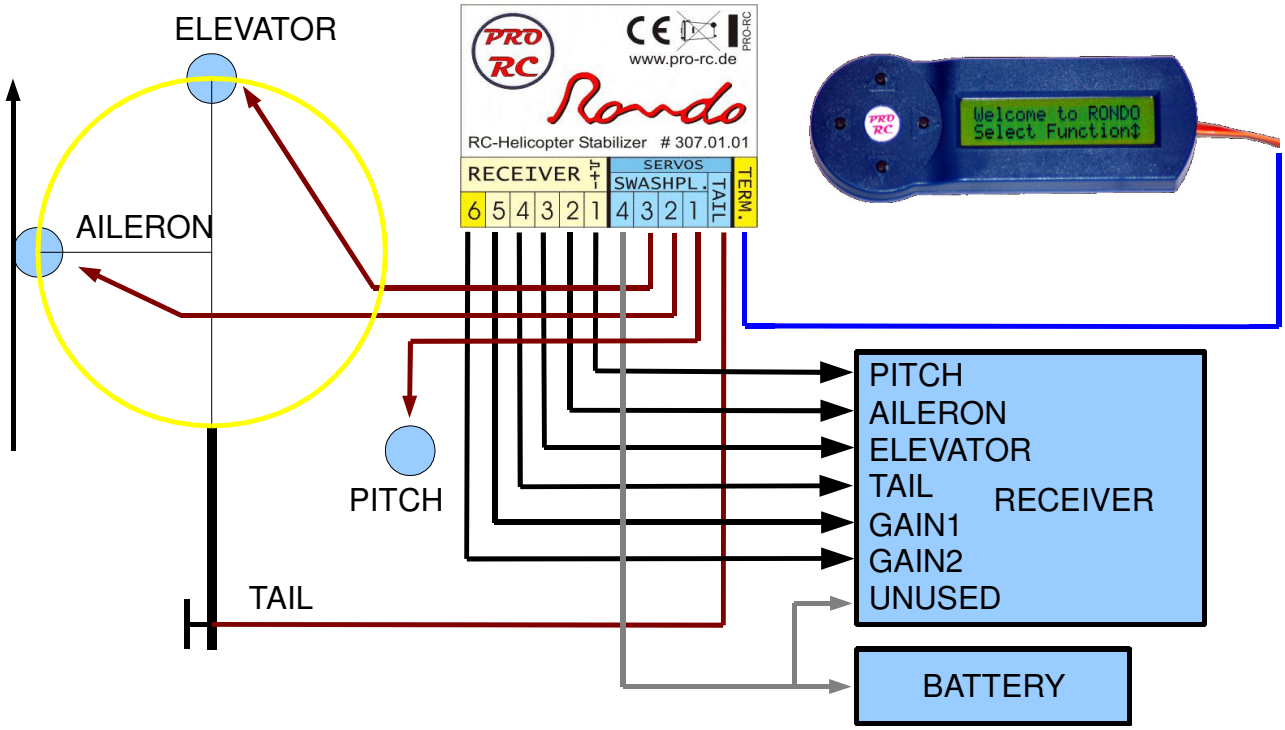
The standard connection table for servos and RONDO to receiver is:

Connections to receiver:

RECEIVER 1-Pitch
RECEIVER 2-Aileron
RECEIVER 3-Elevator
RECEIVER 4-Tail
RECEIVER 5-Gain1
RECEIVER 6-Gain2

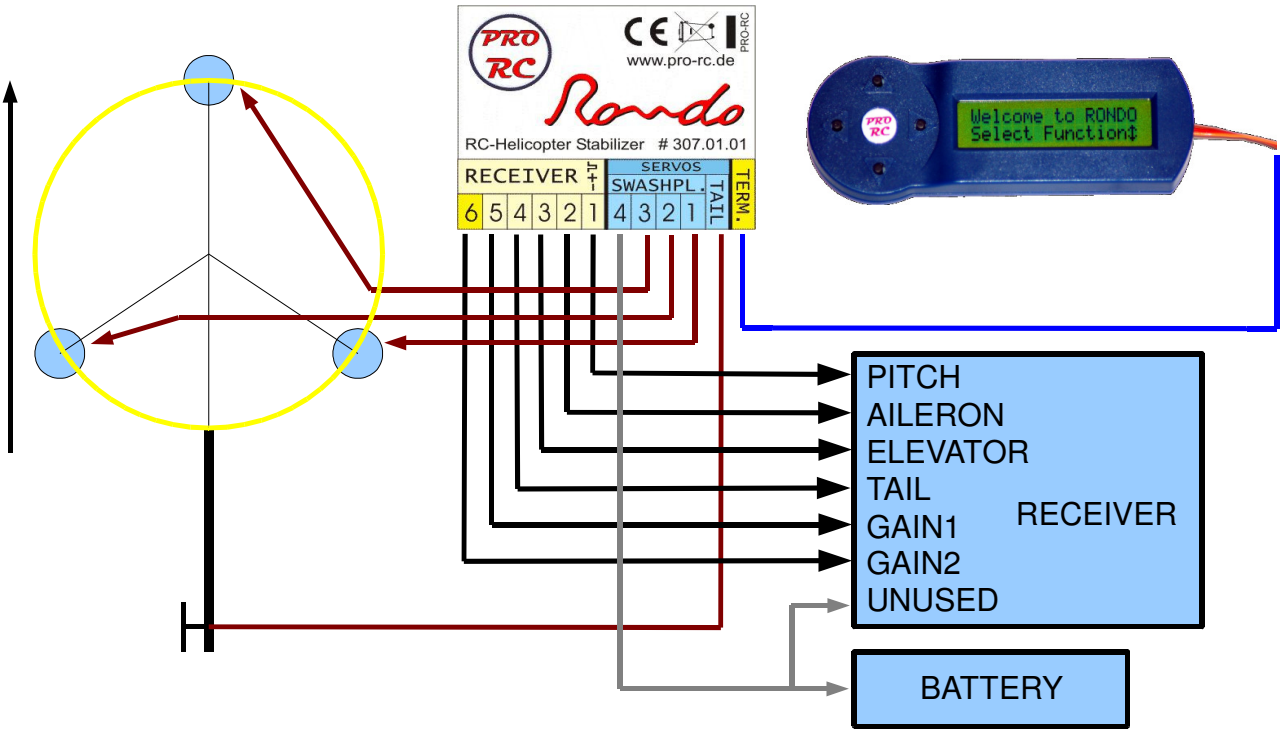
The tail rotor servo is always connected to the „tail“ jack.

Connection diagram for mechanical swash plate mixing:



SWASHPL. 1-Pitch
SWASHPL. 2-Aileron
SWASHPL. 3-Elevator
SWASHPL. 4-free or electricity supply

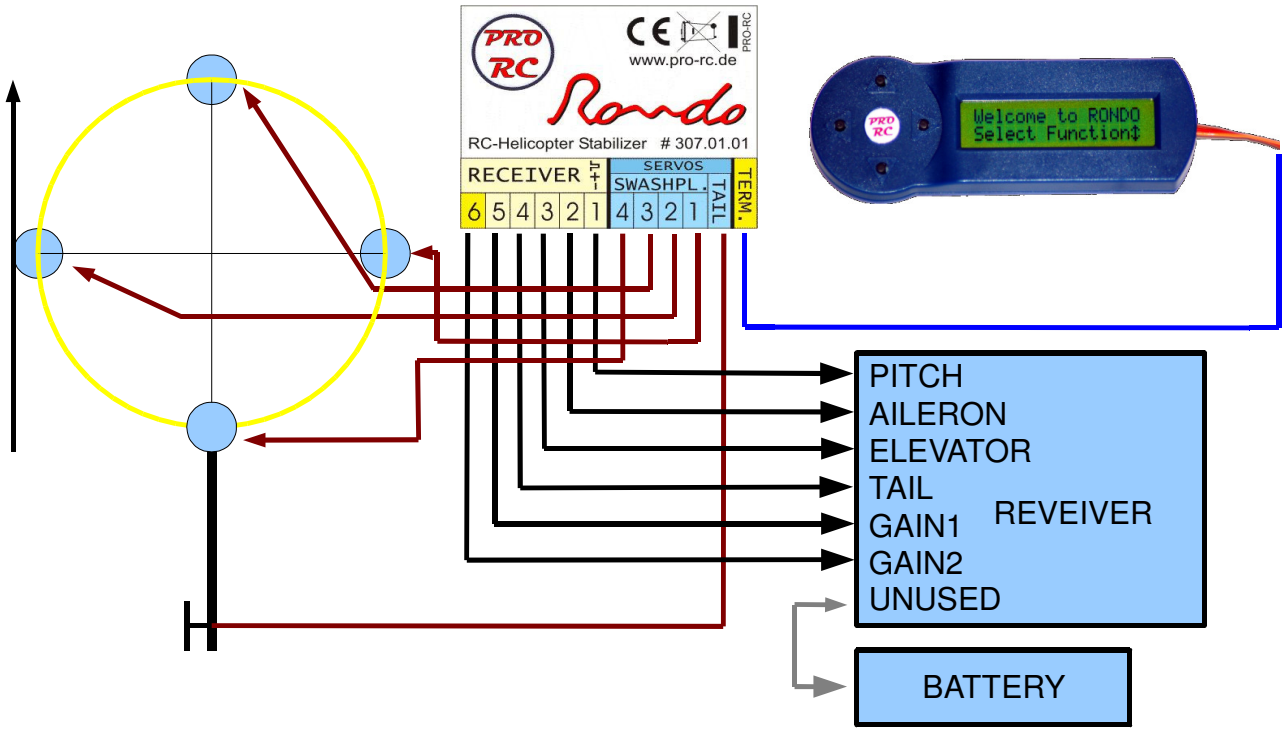
Connection diagram for electronic 120°/140° swash plate mixing:



SWASHPL. 1-Aileron servo1
SWASHPL. 2-Aileron servo2
SWASHPL. 3-Elevator servo
SWASHPL. 4-free or electricity supply

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 90° swash plate mixing:



SWASHPL. 1-Aileron servo1
SWASHPL. 2-Aileron servo2
SWASHPL. 3-Elevator servo1
SWASHPL. 4-Elevator servo2

The pin configuration for a 90° swash plate is similar to the pin configuration for a 120/140° swash plate but SWASHPL. 4 is then the rear elevator servo and cannot be used for electric supply. If the receiver also has no other free pin for electric supply you will need to use a Y-cable. It is useful to always realise electric supply with two cables from the BEC connected to either the receiver or RONDO.

The two channels Gain1 and Gain2 are there to control the sensitivity of the gyro systems. If you have two free channels it is advisable to use them both as that will allow you to adjust the swash plate sensitivity and the tail rotor sensitivity separately even during a flight. If you only have one channel left however, for example when using a 6-channel receiver, you can only use the Gain1 channel. The swash plate and the tail rotor are then both adjusted together. A detailed description of how this is done can be found in the chapter „Gain Channel Settings“ further down.

RONDO also gives you the opportunity to use a so called “single line” receiver. This means you only need to lay one cable between receiver and RONDO. To find out if your receiver has a single line output study its manual or ask the manufacturer. Assigning the different channels for single line usage is done through the transmitter or within the menu item „Function Assignment“ in Rondo’s professional menu. The receiver’s single line output is always connected to Rondo’s Receiver connector 1. All the other channels are not capable of single line usage.

When laying the servo cables make sure they are not bent or under any kind of mechanical strain. Ideally all cables that are connected to RONDO should be let away in a slight arc. It is important that all cables are not too stiff so that they cannot carry any vibrations to RONDO.

Programming the transmitter

In your transmitter chose the model type helicopter with mechanical swash plate control. This is very important because RONDO needs all functions on different channels. The swash plate 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.

Limit the distances for elevation and aileron to 80% of the servo distances in your transmitter. For the tail servo choose 60% and for pitch 100%. Because 100% for one manufacturer does not necessarily mean 100% for another manufacturer it is 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. In the menu use the D-BUTTON to scroll to „Channel Monitoring“ and press the R-BUTTON to display all channels. In this menu you can see what RONDO determined the values to be and you can also easily adjust them to the values mentioned above. The abbreviations used in the menu are: T = tail, I = gain channel 1, II = gain channel 2, CP = collective pitch, E = elevation, A = aileron.

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

For Controlling the gain channel or the gain channels you should preferably use simple 2-pin switches. Sliders would basically work too, but they are not recommended. 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. If you use a slider it is very difficult to reproduce results as sliders are too easy to be moved.
For now it is sufficient to allocate one or two switches/sliders to each channel depending on the number of free channels. Now set 100% for both sides – read from the Channel Monitoring Menu.
This means for both switch/slider end points. The switch over is clarified by arrows in the Channel Monitoring Menu. Arrow down is equal to the operating mode „starting/landing“, arrow up is equal to the operating mode „flying“. Hereby 100% in JR systems probably equals to around 50% servo distance and a little less in Futaba systems.

Adjusting RONDO

After you have mounted RONDO and programmed your transmitter accordingly all that is left to do is to follow the set up procedure for RONDO 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. 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 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 the usage of a single line receiver is more or less an exception at the moment this „Function Assignment" can be found in the professional menu area.

Because RONDO measures the stick positions whenever it is switched on and therefore also their deviations through trimmings it is not possible to take over trimming from the previous flight. Please see chapter „first flight" for more information about that.

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 ranges are far too big.

Now switch on your helicopter. The LED in RONDO will start flashing for a few second 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. If it is 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 and as soon as the RONDO menu is visible press the D-BUTTON.

1. Channel Monitoring

As described above this is where you see the different input signals that are recognised from your transmitter. Check if every function can be Controlled independently and if the maximum display for every channel - except the gain channels - does not exceed 100%. If needed reduce the according servo ranges in your transmitter.

2. Servo Type Selection

Here, chose which servo type you use at the swash plate and the tail. For the tail the choice is between digital servos with normal pulse rate (1520us) or high pulse rate (760us) as they are expected in servos S9251, S9256 and BLS251 for example. There are deliberately no analogue servos offered in this list for the tail. The optimal performance for tail control is only possible with digital servos. For the swash plate you can chose between conventional analogue servos and digital servos (pulse rate always 1520us). Be careful: if you chose the wrong setting here the servos could be damaged!

3. Swashplate Configuration

Choose here if you use a mechanically mixed swash plate or if your swash plate uses electronic mixing with 120°, 140° or 90°.

The remaining menu items „Dyn. SwPl“ and „Dyn. SwPl. Dir.“ will be discussed later on.

4. Servo Centre

The purpose of this menu is to adjust the servo centres in a way that the servo levers stand in a 90° angle to the servo body. Most servos come with a number of servo levers. It is therefore possible to find the best fitting levers through trial and error and only very little adjustments are needed in this part of the menu.
The prevalent thing here is that the better and more precise the mechanical coordination the better the helicopter's flight behaviour will be!
When you enter the first sub menu (press R-BUTTON once) all servos are automatically set to the neutral position. It is extremely important that the servo levers are now exactly at 90° to the servos' long side. For every servo the following sub menus can be used (select each by pressing the R-BUTTON) to adjust all servo levers in a way that they fulfil the condition mentioned above.

Once you have completed this reconnect the linkages with the servo arms levers.

The next step is very important: As all servo levers are now perfectly angular this should also be true for all mixer levers and the swash plate. Exceptions for mixer levers of course are levers that are mounted askew as for example in some models by Hirobo or Miniature Aircraft. But even for these models there are always landmarks for a good neutral position on each lever.

Now that the servo levers and the swash plate are straight and push-pull linkages are parallel to each other set the pitch value to 0° for the rotor blades. In order to do so you are best to use a pitch gauge and change the length of each specified control rod until the rotor blades are exactly at 0°.

Because there is no fly bar in rigid-heads anymore it cannot be used as a reference for the pitch gauge. Instead use a horizontal point, for example on the rotor head main rotor hub, to aim at and to measure amplitudes correctly. If this is not possible you can also use a horizontal reference in the helicopter's environment, that is, of course, only when the helicopter is also horizontal with respect to this measurement. Usually this is only the case transverse to the flight direction and therefore you should always take the measurement with the rotor blades pointing in flight direction.

For the correct adjustment of the tail rotor there is usually specification about the centre position

given by the manufacturer. Please find out from your helicopter-mechanic's manual. In most cases the centre tail rotor's centre position is not at a 0° pitch of the tail rotor blades but at several degrees plus in order to compensate the torque created during normal hovering.

Take your time here as whatever time you invest during the initial set up you will certainly save out on the airfield! This is a fundamental equalization. Imprecise work will result in unwanted flight characteristics!

When leaving the menu make sure that all sticks are in the centre position as the distances are not adjusted yet, the linkages are reconnected however.

5. Servo Reverse

After all servos are assigned properly it might be the case that some servos need to be inverted in their running direction. Check the running directions of all servos and change them so that all servos correctly react to your Controlling. For electronic swash plate mixing and depending on the servo arrangement sometimes you need to invert a function in the transmitter. This can be done via the servo reverse function of your transmitter as every channel has its own output.

6. Tail/SwPl Ranges

This menu item is for setting the servo ranges in RONDO. However there is no need to adjust the range for every single servo as you set the ranges for a function instead. The elevator, aileron ranges are summarised as Cyclic Range because they always have to be treated in the same way.

Now it should be obvious if the existing servo linkage meets the requirements.

For the tail the range on both sides should be identical and not fall significantly below 80%. For a mechanical mixing this is also true for pitch, elevator and aileron as these are the single servo distances in this case.

For electronically mixed swash plates the pitch values should not fall below 30% and the Cyclic Range value should also stay above 60%.

Within these ranges pitch distances of +/-10° to +/-12° and a cyclic amplitude of +/-8° should be reached for „normal" model helicopters.
In case your values for servo and function ranges are way below the given minimum values or way above 100% we strongly recommend further mechanical adjustment! All pre-set Controlling parameters dimensioned for these amplitudes and significantly differing servo ranges will clearly decrease performance!

Note about cyclic pitch values: 8° cyclic amplitude usually gives the system enough mobility. In case the maximal rotational speed is not sufficient despite maximal servo range for elevator and aileron during flight mode later on increasing the Cyclic Range can increase the rotational speed. Sensibility values that were determined earlier might need to be reduced accordingly.

For example if you want to use a hovering pitch curve or if you rarely use negative pitch in general we recommend you limit it in your transmitter. A symmetrical setup is a crucial base for good Controlling.

For the tail rotor amplitude you should use the entire possible distance where both end points should have the same value as long as the manufacturer gave the correct centre position.

7. Gyro Reverse

Use this menu to set the Gyros reverses. In order to check if and which sensors need to be inverted please do as follows:
For the tail rotor hold your helicopter at its rotor head and rotate the mechanic. The tail rotor blades should now counteract the rotation created by you. This means that if you turn the helicopter's nose to the right (seen from above) the tail rotor blades should give a pitch that would counteract the rotation. Depending on the selected flight phase you will notice that the tail rotor usually is in an end position. This is normal as with RONDO full heading-lock is active for the entire servo range. If the tail rotor does not counteract the rotation invert the tail sensor.

Checking the reverses for elevator and aileron is done as follows: if you tilt your helicopter to the right (in flight direction) the swash plate has to tilt to the left. If you tilt it to the front the swash plate has to tilt back. In other words: for correct setup the swash plate always tries to maintain its previous position within the existing range.

If a gyro needs to be inverted it will take a few seconds after the switch until the inversion becomes obvious due to the fact that the sensors are calibrated anew during this time.

Depending on the selected flight phase it is possible that the swash plate does not completely return to the centre position. This is normal but should not exceed a few degrees.

8. Swashplate Configuration

Now the dynamic swash plate rotation can be set. This function results in the fact that pirouettes can be preformed in a much more stabile way. We skipped this menu item before but now everything else is set so we can take care of this function.

Switch on the function „Dyn. SwPl" and press the R-BUTTON to access the sub menu „Dyn. SwPl. Dir". The swash plate now tilts to the front or back. Now rotate your helicopter about its vertical axis (tail rotor function) by hand and observe the swash plate reaction. The swash plate should tilt away from the rotation you created. If this is not true invert the reverses.

Example: After selecting the menu your swash plate tilts to the front for example. Now rotate your helicopter clockwise (seen from above, nose to the right) and check if next to the existing elevator-travel there is also an amplitude to left for aileron.

After you stop rotating the helicopter the swash plate should return to its initial position; in this example to the front. It helps to rotate the helicopter several times and in different directions as well as a bit faster in order to recognise its reaction properly.

9. Gain Channel Settings

Next to the usual functions such as tail, pitch, elevator and aileron RONDO also has up to two additional Controlling inputs named Gain Channels. Generally this channel(s) are used to set the sensitivity or gain of the gyro's effect on the tail and swash plate. As with RONDO it is also used to

switch between flight phases. A big advantage hereby is that even with a 6 channel transmitter the gain values and the flight phase can be influenced via the transmitter.

A prerequisite for RONDO is at least one gain channel (Gain1) but as an option two channels can be used, too. Optimally a switch with two possible positions is used for a gain channel. It is also possible to use a slider but you will have to put up with a few disadvantages if you do so.

This switch is used to switch between the flight phases. In the terminal the two flight phases are marked by up and down arrows next to the values for Tail and SwPl as well as for Channel Monitor in the professional menu. We mention these flight phases because they can actually be used to set up completely different characteristics. Within the basic setup be distinguish between „start/landing“ (arrows down on display) and „flying“ (arrows down on display).

At first you need to decide if you are going to use one or two gain channels. You can only consider using two channels if your transmitter altogether has more than 6 channels. Otherwise all the channels are already occupied by tail, elevator, aileron, throttle and Gain1. If you want to use two gain channels in the menu Gain Channel Settings set the value to „Tail SwPl“. If you only use one gain channel this value needs to be set to „Both ---„.

Your transmitter has already been programmed in a way that for both positions (end stops for a slider) about 100% are displayed in the Channel Monitor. As mentioned earlier this equals about +/- 50% at the transmitter for JR transmitters and slightly less for Futaba.

If you switch all possible parameters or just a selection of them is determined by the Gain Channel Settings menu. If the display shows "Both ---" it means that with Gain1 all values for the swash plate and tail are switched. For "Tail SwPl" the tail values are set through Gain1 and the swash plate values are set through Gain2. In this case we also have two different flight phase switches.

Other than the flight phase switch these channels of course still have their original gain function. This is not true for all of the double arrow parameters but it is true for the tail’s and swash plate’s P- and I-values. How much gain they put on and what they put it on can be seen in the Channel Monitor menu. There normally the transmitter sticks’ positions are displayed at a range +/- 100. For Gain1 and Gain2 values around 100% are displayed.

It is therefore possible to adjust the tail’s and swash plate’s P- and I-values from the transmitter via Gain1. In the setting "Tail SwPl" P- and I-values for tail and swash plate can be set separately through Gain1 (tail) and Gain2 (swash plate). If the monitor displays 90% for example the values will be decreased by 10%, if the display says 120% they will be gained by 20%.

Note on pre-set values:

The pre-set values, especially the sensibility values for tail and swash plate, for RONDO are set in a way that most helicopters can start and fly with them without any problems. Normally the sensitivity for both tail and swash plate can be increased still. Exceptions are smaller helicopters where especially the tail is lighter. In these it is possible that the pre-set values are too high already and the tail starts vibrating. Therefore we strongly recommend performing the very first start from a smooth surface. This way even before the start it should be obvious if the tail tends to vibrate or not. If vibration occurs go to the menu „Tail Offset“ and set a negative value.

Flight adjustment with one Gain Channel:

The ratio between tail and swash plate sensitivity varies for every model. When adjusting and slowly increasing the sensitivity either the swash plate or the tail will start vibrating first even though for the remaining function higher values are still possible. In this case you can use the menu Gain Channel Settings, menu items „SwPl Offset“ or „Tail Offset“ to either put a negative offset on the function near the value which causes oscillations or a positive offset on the other function. Both possibilities are equal. However when choosing a positive offset it is easy to pick a value that is too high so that vibrating occurs directly after take off. For negative offset it is possible to increase the offset again easily and this way one can slowly approach both functions' highest possible value.

Flight adjustment with two Gain Channels:

In principle the method is the same as for a one channel system. The only difference is that for a two channel system each gain channel switches the assigned sensitivity and flight phase. That is Gain1 for tail flight phase and sensitivity and Gain2 for swash plate flight phase and sensitivity. Please note that for the tail rotor flight phase switching is uncritical and both flight phases can be used for take off and flying. Only the consistency of pirouettes is limited in the „start/landing“ mode. It is however crucial that the swash plate's operation mode is not set to „flying“ (arrows up in display) when you start or land your helicopter.
Determination of the values with two gain channels of course is a lot quicker and more convenient than it is with one gain channel. However we recommend that you do not regularly fly with two gain channels but use the setting „Both ---“ in the end. This puts both flight phases onto one channel which simplifies the daily usage.
Finishing off leave the „Gain Channel Settings“ menu and save all settings using quick safe or via the menu item „Save and Reset Handling“

10. Save and Reset Handling

As described above this menu item is used to save all changes permanently. If you do not save your settings they will be reset and you can not use them when you start RONDO the next time.

In the sub menu „Reset Selected Bank“ in RONDO it is also possible to reset all changes made to the currently selected bank to the initial factory settings.

11. Memory Bank Selection

This menu item „Memory Bank Selection“ enables you to save several set-ups. There are four banks. If you want to keep the current setup and try RONDO with a different helicopter you could for example use bank 2 for the additional helicopter. Another example would be an approved setup in one bank and another bank for testing purposes.

Now all the settings are chosen and we can attend the first flight.

The first flight

Before the first take off we strongly recommend you check all settings and your helicopter again closely. Often times it is basic things that are done wrong when using a complex system like a 3-axis gyro.

Therefore please be sure to check the following points before the first flight:

Is everything secured?

Are all plugs and pins properly connected?

Did you check that nothing can hit?

Is any part grinding?

Can you use the sticks' full range without mechanical restraints?

Have you charged your batteries and do they provide a stable current?

Are the reverses correct for all stick amplitudes?

Are the gyro reverses correct?

Is the flight phase/ sensitivity switch set to „start/landing" mode?

If all settings are made correctly there should be no problems during the first flight. The only advice we would like to give you is that once the helicopter has reached a sufficient rotational speed you should not take off too hesitantly. Please remember that your helicopter now contains a Controlling system. You define a rotational speed via the stick but of course this can not be maintained by the Controlling system while the helicopter is still on the ground. As soon as the helicopter takes off the Controlling commands are followed and if at that time the sticks are not in the centre position this will be followed by a rotation and your helicopter will tilt. Therefore a rule for the start is to take off quickly but not hastily and only start Controlling afterwards. If you use RONDO in the „start/landing" mode when starting, just as we recommend, the danger of tilting due to control impulses that were send too early is down to a minimum.

Perhaps the flight characteristics strike you as odd the first few moments. This is mainly due to the fact that your helicopter is much more self-stable in the air through RONDO and this means that you have less Controlling to do. Here less is actually more!

If the basic mechanical setup was done correctly and your helicopter's centre of gravity is right you should not need any trimming in doldrums. If however you still need small trimming corrections you can use the transmitter to do so for now. After landing again you should then either set those corrections you made through the servo centres in RONDO or mechanically through the leverages. This is very important. The transmitter's centres are taken in with every start of RONDO. Therefore the trimming definitely needs to be done at the helicopter itself.

Other settings during the flight:
Depending on how you use channels Gain1 and Gain2 you can now increase their sensitivity step by step. Increase them until small oscillations of the tail or rotor head are visible and then decrease them again by a few steps. Make sure you increase by small steps to avoid getting a fiercely overshooting system. If this happens anyway it helps to turn the engine off before touch down. The affinity for vibrations depends on the rotational speed and decreases with decreasing rotational speed. If you use one gain channel and the sensitivity of the tail and rotor head are not even please refer to the setting examples of the Gain Channel Settings menu mentioned above.

In case your tail rotor does not stop evenly on both sides RONDO has the possibility to learn a hovering-offset. Thereby the tail rotor's control is taught and that makes stopping on both sides clearly more even.

In order to teach this offset value bring your helicopter to a calm hovering flight and quickly switch the sensitivity channel Gain1 four times. While you do that and even about five seconds afterwards you should not control the tail rotor at all if possible and the helicopter's nose should point towards the wind if there is no doldrums. Successful learning is confirmed by RONDO through a slight twitch in the tail.
Both sides should now engage equally. In order to save the value that was just taught you need to connect the display to RONDO after you landed. Instead of the usual welcome text you will see a special menu in which you can save the value just taught during the flight by pressing the L-BUTTON. Every other button discards the value.

Now all basically needed settings are made. In addition to that however there is the possibility to adjust several parameters in the „Professional Settings" menu and reach yet another performance enhancement. We recommend that only very experiences pilots use the professional menu to adjust these values as the changes that are made here are so subtle that usually only very experiences pilots will even notice them.

Therefore the following section is limited to an explanation of the single parameters and a short instruction on how to perfectly set those controller parameters.

The professional menu

To enter the professional menu scroll to „Professional Settings“ in the main menu and press the R-BUTTON. You are now looking at a menu that can be scrolled via the U- and D-BUTTON just like the main menu to select the different setting options. Operation of this menu is the same as for the normal menu. To change back to the normal menu select the menu item „Basic Settings“ and press the R-BUTTON.

Instructions for adjusting PI controls

Set the I-portion for the adequate control (tail or swash plate) to 0. Now only the p-portion is used for take off and hovering. Then increase the P-portion by itself until the system shows the affinity to vibrate. Increase by small steps only. When using only the P-portion for take off you may need to use clearly more travel compared to when you take off with both P- and I-portion in order to get the same reaction. This behaviour is normal and will disappear when you increase the I-portion again later on. After you determined the P-portion value which causes oscillating reduce this value again slightly (by about 5 to 10 points). Afterwards increase the I-portion again. We advise you to do this within an I-range of at least 10 and therefore in „flying“ mode. A change in the I-range has an effect on the I-portion. Increase the I-portion now until the system shows an affinity to vibrate again and once again decrease the determined value slightly. Vibrations that result from a too high I-portion are slightly more gentle and indirect than those that result from the P-portion.

Now the setting for the PI ratio is ideal and it should stay untouched even for further adjustments if possible.

Meanings of the professional menu parameters

Tail Stabilizer Settings

P-Gain:

The P-gain or proportional gain is the part of the control that takes over the immediate attenuation. Increasing this value leads to more direct control characteristics and harder stops. If the value is too high it leads to oscillating.

I-Gain:

The I-gain or integral gain is the control’s time memory. While the P-gain takes over attenuation the I-gain is in charge of bringing back the helicopter in its former position. Increasing this value leads to a more stable system that is also more immune to external influence. If the value is too high again this leads to vibrations just like a too high P-gain except I-gain vibrations are less hard and direct.

D-Gain:

The D-gain is the differential portion of control. It has a temporary effect on changes due to control impulses or disturbance. To a small extend the D-gain can attenuate vibrations however for high values it leads to abrupt control reactions.

Snap In:

Snap In is a function that supports stopping after turning. Especially for small models this can clearly help to improve stopping. Usually however it should be possible to reach a good stopping characteristic through the choice of P-gain and I-gain values. In case this is not possible Snap In can help to prevent that. Please remember that depending on the model stopping with Snap In can be very hard. In our opinion Snap In is more of an experimental function.

I-Range:

The I-range limits the area where the control's I-portion is active. Within this I-range the system does not go back to the neutral position by itself. For „start/landing" mode the tail's I-range should be limited. Otherwise high I-range easily allows that in case the pilot moves the stick before take off rotation is „demanded". Because the model is still on the floor control can only follow this request through once the helicopter is in the air. In this case the model would perform a rotation about its vertical axis during take off.

Acceleration:

This determines the acceleration with which the system reacts to control input. A value of 100 is equal to the maximal acceleration. Smaller values can optimise the overall characteristics.

Tail Stick Settings

Sensitivity:

The sensitivity determines the control input and rotational speed ratio. If this value is high the maximum rotational speed is reached before the end of stick travel already.

Speed:

Determines with what speed the stick can interact with the system. Smaller values decrease the reaction to the stick and can optimise overall behaviour.

Decay:

Determines the reaction speed to a released stick. Smaller values can optimise stopping behaviour.

Dead Band:

The Dead Band determines how far the stick needs to be moved away from its neutral position until rotational speed is created. This prevents bad neutral positions from having an effect on the controls.

SwPI Stabilizer Settings

P-Gain:

The P-gain or proportional gain is the part of the control that takes over the direct attenuation. Increasing this value leads to more direct control behaviour and harder stopping. If the value is too high this leads to oscillating.

I-Gain:

The I-gain or integral gain is the control's time memory. While the P-gain takes over attenuation the I-gain is in charge of bringing back the helicopter in its former position. Increasing this value leads to a more stable system that is also more immune to external influence. If the value is too high again this leads to vibrations just like a too high P-gain except I-gain vibrations are less hard and direct.

I-Range:

The I-range limits the area where the control's I-portion is active. Within this I-range the system does not go back to the neutral position by itself. In order to make it easier especially for flybarless beginners for „start/landing" mode the swash plate's I-range should be 0. Otherwise high I-range values easily allow that in case the pilot moves the stick before take off rotation is „demanded". Because the model is still on the floor control can only follow this request through once the helicopter is in the air. In this case the model would tilt and fall over during take off. Generally it is true that the higher the I-range the more the pilot has to make sure that the rotor circle is parallel to the floor prior to take off.

Decay:

Determines how fast the swash plate returns back to the I-range limit. In start-mode this is the centre position of the swash plate. Increasing this value can lead to more self stable flight characteristics. However it can also cause the helicopter to continue moving after the end of a control input.

Direct Elev./ Direct Aileron:

Direct Elev./ Direct Aileron specify which portion of the control input is passed on to the servos directly and without further processing. This is needed to synchronise the different parts of control that are also influenced by the helicopter's dynamic. If you notice a slight over-movement or flipping back when stopping this can be optimised by the use of this parameter. Generally speaking: For over-movement increase direct for flipping back decrease direct. Direct has to be set for both elevation and aileron individually.

Aileron Gain:

As mostly the aileron axis has a clearly smaller moment of inertia than the elevator axis it makes sense that you are able to set higher gyro sensitivity for elevator. This also has a positive effect on the elevator function's stability. Aileron Gain specifies how many percent of the sensitivity set for elevator have an effect on aileron. If the value is set to 100% both have the same sensibility. The smaller the value the less sensitivity is on the aileron axis. 80% for example means that aileron has 20% less sensitivity than elevator. The elevator sensitivity is not affected by this parameter.

Snap In:

Snap In is a function that supports stopping after turning. Especially for small models this can clearly help to improve stopping. Usually however it should be possible to reach a good stopping characteristic through the choice of P-gain and I-gain values. In case this is not possible Snap In can help to prevent that. Please remember that depending on the model stopping with Snap In can be very hard. In our opinion Snap In is more of an experimental function.

SwPl Stick Settings

Sensitivity:

The sensitivity determines the control input and rotational speed ratio. If this value is high the maximum rotational speed is reached before the end of stick travel already.

Expo:

In principle this is the same function as in computer transmitters. The more Expo the less sensitive the model reacts around the stick's neutral position. In RONDO Expo is implemented to achieve control characteristics that are as linear as possible. Set Expo to a value so that you model's reactions meet your expectations.

Dead Band:

The Dead Band determines how far the stick needs to be moved away from its neutral position until rotational speed is created. This prevents bad neutral positions from having an effect on the controls.

Tail Mixer Settings

With these mixers you can adjust admixtures of pitch to tail, cyclic to tail, tail to elevator as well as tail to aileron. As a general rule if even only very small values are useful here.

SwPl Mixer Settings

This is a swash plate compensation mixer. If you use a electronically mixed swash plate you can use this mixer to eliminate most of the functions influence on each other. The adjustment is made at minimum and maximum pitch (Side1 and Side2). In order to adjust a function, for example aileron, this function needs to be set to a deflected position. Then adjust the mixers until there you cannot see admixture to pitch or elevator anymore when moving aileron. Now follow the same procedure with elevator. Remember to make the adjustments at minimum and maximum pitch.

Miscellaneous Settings

V-SwPl Twist:

This is a static virtual swash plate rotation as it is known from several transmitters. For example in case your model reacts to elevator to the front with a slight tilt to the right you can correct this with the help of a virtual rotation of a few degrees to the left.

Dyn. SwPl Fine:

Here you can add a offset of the turning-rate for the dynamic swash plate rotation. Depending on your model and equipment this can result in stability improvement for pirouettes. The standard value is 50.

Turn RONDO 90°:

This swaps the aileron and elevator sensor's effect so that RONDO can be mounted rotated by 90°. After you use this function please be sure to check the gyro reverses!

Filter:

The filter only has to be activated in special cases. It has the effect that even models that vibrate very heavily can still be controlled. If you need to switch on the filter you need to check all control parameters again and adjust them anew if necessary. Controlling characteristics generally decrease if the filter is switched on. Therefore you should preferably minimise vibrations in the model.

SwPl Servo Ranges

Use this function to adjust the servo distances individually. It is possible to make individual adjustments for each servo's both end stops, too. Please note that this is usually not needed for a good basic mechanical setup and it should therefore be avoided.

Measure Centres

A function to re-teach the transmitter and gyro centres just like it is done every time RONDO is switched on.

Function Assignment

If a single line receiver is used it is required that you can assign functions freely. Here this is possible for each function and even double assignments can be chosen. It is therefore important to make sure that every channel is only assigned one function.

When using a normal receiver this can also reduce cable crossings. If, for example, you connected all of the receiver's channels 1:1 to RONDO you can use „Function Assignment" to let RONDO know which function is assigned to which channel.

As single line receivers transfer all channels to RONDO via one single cord even more than 6 channels can be received and processed. In this case the menu „Function Assignment" lets you assign up to 9 channels.

Specialties for Single Line receivers:

Because, and as mentioned above, there is only one cable that connects the receiver to RONDO for single line mode there is maybe no possibility to connect the throttle servo, or the speed controller for electric helicopters, to the receiver. As soon as RONDO realises that it is used in the single line mode it will offer an additional menu item after Gain2 – the possibility to assign „Throttle". This channel's output is always realised using the connection Servo4. This means that for single line mode it is depending on your receiver maybe not possible to use 4 SP servos for 90° Swashplate!

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 rotational speed up to 800°/s, 12 Bit interpretation.
- C-MOS micro processor 32 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.