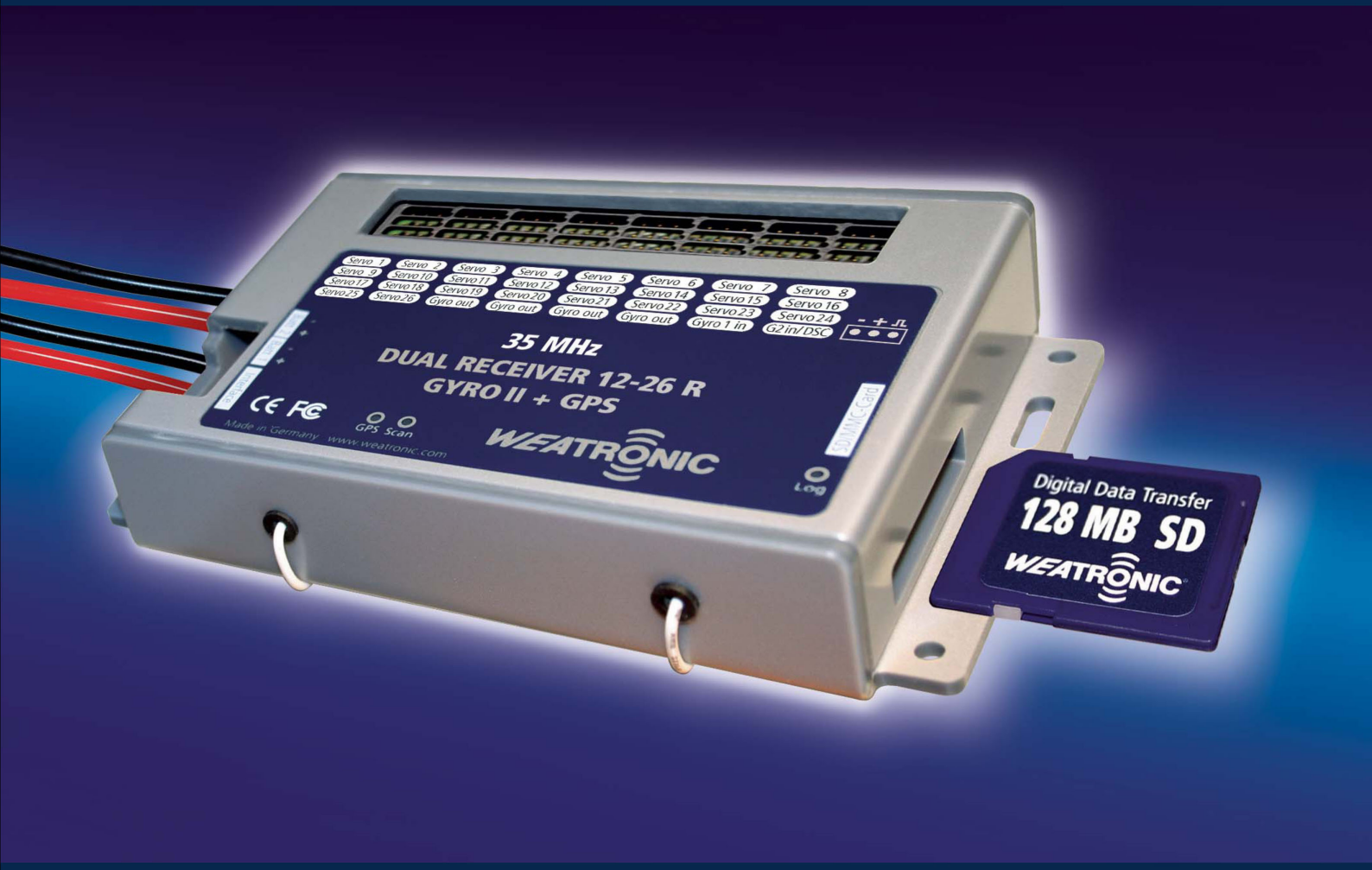
DUAL RECEIVER

http://www.jetcat.kr



Operator's Manual

12-26 R GYRO II + GPS
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WEATRONIC®

DISTRIBUTOR, KOREA SUD
Jet Aero Modelling, Inc.

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1 Technical Description / Versions

1.1 Preamble

The weatronic Dual Receiver product line was developed in Germany by a skilled team of electronic telecommunications and information processing specialists. This device is a highly engineered electronic product which has been set up according to the latest knowhow and by using the most modern components. Highest quality and functional safety were the engineering objectives. During the manufacturing process each device and each of the two multi-layer boards are subjected to an expensive optical and electrical test procedure.

Weatronic Dual Receivers were tested according to CE specifications and comply with the requirements of the US Federal Communications Commission (FCC).

Weatronic Dual Receivers have been subjected to comprehensive inflight evaluation tests which included all types of load conditions. Large-size models with two-stroke magneto ignition engines as well as those with electronic battery ignition have been evaluated, and models with large brushless electric drives also, and furthermore, jets with turbine drive systems. The operational safety and the susceptibility to interference of Dual Receivers seems to be unique so far.

Please read this operator's manual and the installation proposals carefully, so that you can achieve optimum utilization of the safety potential and of the comprehensive variety of functions of the Dual Receiver.

1.2 Description of the Dual Receiver

So far, responsible model pilots had to invest considerable expenditures, in order to equip their large model, be it a TOC machine, a scale model, a jet or a helicopter with a safe governing system. The operation hazard, which is not small, emanating from large and partly very fast model planes requires maximum functional safety. Besides a high-class Dual Receiver, possibly featuring PCM modulation control, one servo energy supply for the connection of two batteries has been required so far, in order to trigger the numerous and strong servos safely and to minimize the risk of a power supply failure. As soon as several servos are acting on one control surface - as it is typical for the ailerons, rudders, and elevators - an additional servo adjusting device has typically been required, in order to synchronize these servo machines. Especially the experienced model plane pilots have often been using an electronic stabilization unit in addition, better known as gyro. For helicopters, a gyro is mandatory.

Those who wanted to use the ultralight Lithium-Polymer batteries had to rely on a voltage regulator which reduces the voltage from 7.4 to the rated voltage of the servos as well as of the Receiver, or he needed an appropriate electrical energy supply module which functions in combination with these batteries.

Specifically safety-minded pilots of large models have even built in a second Receiver (which is mandatory in France for the large models), in order to gain more safety in case of interferences. Weatronic Dual Receivers represent an integrated on-board electronic system which complies with these requirements in one single unit.Weatronic Dual Receivers provide much more performance features than traditional remote control receivers. One single device includes a highly modern digital diversity receiver with two completely separated input circuits and two antennas, including a highperformance power supply system for strong servos, which are fed by two power sources with peak current capability. Maximum attention has been given to simple handling and maximum functional safety during the development of the Dual Receiver. Its immunity to interferences of any kind, its tuning precision and the enormous usable range may be unique on the market for model plane electronic systems. Furthermore, no alternation of crystals will have to be used any more, because the Dual Receiver itself is conducting the frequency selection (so-called synthesizer).

Its full performance is being developed specifically by the combination with the high-end PCM transmitters of the makes Futaba and Graupner/JR. It is recommended to operate weatronic Dual Receivers together with the actually best and safest types of modulation from JR/Graupner, i.e. the SPCM 1024 procedure or the Futaba PCM 1024. But for users of PPM transmitters such as the Multiplex brand, Dual Receivers will function with this procedure as well. Dual Receivers are suited above all for larger and largest Acro-Prop models, scale models, helicopters, and specifically for turbine-powered jets and helicopters also. Large and the largest gliders also are using the advantages of their enormous safety reserves and comprehensive scope of functions.

■ The EDP functions of the Dual Receiver are taken over by a **16 Bit CMOS microcontroller** of the latest state of the art. It controls the electronic units described below. It evaluates above all the field strength of the two receiver units and processes the individually better suited signal. This is executed within a range of one ten thousendth of a second.

■ Two identically structured twin Superhet receivers with **two antennas are taking over the reception and the further processing of the radio signals**, where the individually first mixed frequency is being generated by a **digital DDS (Direct Digital Synthesis)** synthesizer. Their demodulated low-frequency signals and field strength information will be transmitted to the processor. The channel selection is conducted automatically, without any need to change crystals. The Dual Receiver features an extreme tuning precision and immunity to interference, a high sensitivity and a very large usable range which is clearly beyond the range of traditional receiver systems. It has 8 or 10 channels respectively.

■ One **power unit** supplies the required current for the servos (12 or 20 outputs) and has been designed specifically for high current peaks of modern digital servos. It **regulates the control signals** to the required level and screens the servo lines. The supply lines can therefore be as long as required by the type of the individual model, and they require no additional screening by means of ferrite cores. But it is recommended to use stranded servo lines only.

■ A **voltage regulator** is integrated in the power unit, which generates a constant 6.0 V for the servos and which supplies the receiver unit with the optimum voltage. It is fed by two batteries, one main battery as well as one backup battery of equal or smaller size, which will replace it in the event of an emergency (e.g. a defect of one cell, a short circuit or an empty condition of the main battery). 7.2 Volt NimH batteries (6 cells) as well as 7.4 V LiPo batteries (two cells) may be used.

■ High-performance and low-loss **P channel MOSFETs** will take over the switching between the batteries.

■ All flight data will be stored on the SD/MMC card. As for battery voltage, current consumption, field strengths of the radio signals received, number of the valid and the failsafe frames, antenna used, switching over procedures between the receiver units, positions of all connected servos, and the service temperature. The incurring data volume amounts to approximately 8 MB per hour, i.e. a 64 MB card will last approximately 8 hours, a 512 MByte card even well over 48 hours. But an SD/MMC card is not necessary for the operation of the Dual Receiver.

■ When using the version with **GPS data logging function**, more flight data such as speed, height, distance from the starting point, position etc. will be stored.

■ All flight and operation data can be transmitted to a PC by means of a **USB interface**.

■ **Firmware updates** from the weatronic homepage can be stored on an SD/MMC card and be transmitted by it to the Dual Receiver. Thereupon the update will be conducted automatically.

■ With the Dual Receiver type 12-20 R Gyro, an **on-board gyroscope** (gyro) takes over the stabilization of the longitudinal axis (aileron). Its sensitivity can be adjusted continuously.

■ An additional **gyro** can be connected to all Dual Receivers and be allocated to any of the outputs.

■ An **electronic switch** provides the fail-safe operation and a vibration-resistant function. It will be triggered by an external ON/OFF switch in the **control board**, ideally mounted at the fuselage. The on-board electronic system remains fully functional in case of a failure of the external switch.

■ The external control board has three functions: Switch on/off, start transmitter finding, indicate battery operation and condition by means of a **red LED**. Additional, ultra-bright LED (**see Internetshop www.weatronic.com/shop or selected dealers**) can be connected. All stored flight and operation data are displayed by means of the graphics software.

■ **All functions/channels** can be configured individually for the desired fail-safe positions. In addition, it is possible to check out the **fail-safe settings** in flight by means of a free channel.

1.3 Versions

1.3.1 weatronic Dual Receiver 8-12 R

The Dual Receiver 8-12 R has 8 channels which may be combined in any way with 12 outputs for the connection of 12 servos. Even those digital servos which are the most powerful ones by torque are operating at full load and maximum torque, due to the peak current power unit and the constant voltage of 6 V. The Dual Receiver 8-12 R will find the channel of the related transmitter in the 35 MHz A and B band all by itself. Versions for the 36 and 72 MHz bands (USA) are available also.

All settings conducted in view of the operation of the Dual Receiver 8-12 R, such as the selection of the modulation procedure, allocation of servos, and synchronization of servos can be implemented in a simple way by means of the software included. The program is self-explanatory and can be used easily, even by individuals, who are no skilled PC professionals.

Any number of servo outputs (up to a maximum of eight) can be allocated to each channel. The precise synchronization conducted on up to 16 points of the servo travel by several servos acting on one control surface is done by the Dual Receiver automatically with a mouse click by means of its functional software. Therefore, a servo setting unit is not required at all. Moreover, any use of V cables is not only unnecessary, but would have a deteriorating effect, because the voltage would be reduced considerably and the servos could not develop their full performance. The purpose of the expensive electronic power supply system of the Dual Receiver would thus be destroyed.
The power unit of the Dual Receiver 8-12 R supplies the servos with a constant voltage of 6.0 V, disregarding whether NimH or LiPo batteries are connected.

The current value made available - 20 amps short-term - is by far sufficient to call up completely the performance of even the most powerful digital servos that are commercially available. The supply lines of the servos are screened, the signal impulses of the Dual Receiver are amplified, and controlled in an optimum way. Therefore, the servo cables may be sufficiently long. But it is recommended, to use stranded silicon cable exclusively, with a cross section of 0.35 mm^2. Further details can be found in the Installation Recommendations, Par. 5.

One can select by choice the highly safe digital modulation procedure Graupner SPCM 1024 or the equally safe procedure Futaba PCM 1024. Multiplex customers or transmitter owners mastering the analogue PPM modulation may switch over to this procedure by mouse click. To fully utilize the safety reserves of the weatronic Dual Receiver 8-12 R, it has been recommended to use one of the PCM procedures.
With regard to the battery connection, six-cell NimH batteries or two-cell LiPo batteries available at weatronic can be used. But batteries from other suppliers/manufacturers featuring the appropriate specifications may also be used.

1.3.2 weatronic Dual Receiver 12-20 R

The design structure of the Dual Receiver 12-20 R is identical with the one of the smaller variant, but it has 12 channels which can be allocated in any way to the 20 outputs, in order to connect 20 servos.

1.3.3 weatronic Dual Receiver 12-20 R Gyro

This version has also 12 channels which can be connected in any way with 20 outputs, in order to connect 20 servos. In addition, the Dual Receiver 12-20 R Gyro features an integrated electronic stabilization system for the longitudinal axis (aileron) if the Dual Receiver is installed in longitudinal direction. If mounted in transverse direction the Gyro stabilizes the elevator.

The sensitivity of the Gyro can be varied in flight by a separate channel from zero to maximum. In this way, one can check out the ideal sensitivity during flight, and program the Dual Receiver with this setting. Thereafter, this channel can be released for other functions.

1.3.4 weatronic Dual Receiver 12-20 R Gyro + GPS

Besides all functions of the 12-20 R Gyro version, this version includes an independently operating, GPS-based data logging system. The GPS determines flight data such as position, flight path, flight speed, maximum flight speed, altitude, and maximum altitude. The data is stored on the on-board SD/MMC card. All the GPS data is shown graphically by means of the weatronic FSE software and can be stored on the PC.

1.3.5 weatronic Dual Receiver 12-26 R Gyro II + GPS

The Dual Receiver 12-26 R Gyro II + GPS is the high-end product of the weatronic product line. It handles 12 channels and supplies 26 exits for servos or other actuators. In addition to the on-board GPS, there are also two gyros which knit on longitudinal axis and transversal axis - at horizontal installation. Similar to the smaller versions, the on-board current supply provides 4 separate voltage regulators for a maximum of 20 Ampere at a constant 6.0 Volts on the 26 outputs.

2 Putting Into Service

2.1 Preamble

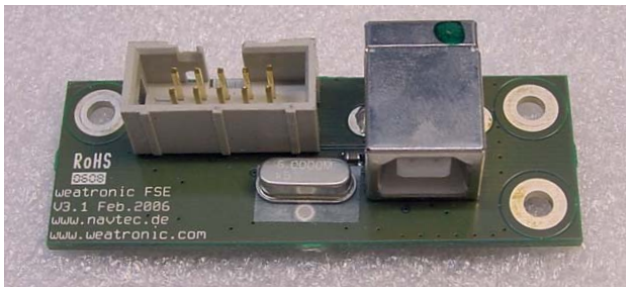
Weatronic Dual Receivers are highly complex electronic devices featuring an enormous variety of performance characteristics due to their sophisticated firmware and due to their powerful microprocessor. Therefore, a commercial PC or laptop will be required to fully utilize these possibilities. The CD included with each device contains the software required for the configuration and for archiving the flight data of the Dual Receiver. To assure a perfect functioning, it is strongly recommended to install the software from the CD included with each device to one's own computer, and not to use copies from other users. Alternatively, the software can be downloaded from the weatronic homepage.

The Weatronic Dual Receiver unit is supplied with:

- a short ribbon cable confectioned with two plugs to configure the system before being installed into the aircraft.
- an 18" length of ribbon cable, and 3 connectors to allow the user to create a custom cable to fit perfectly into their airframe.
- a USB board
- a control board
- a front panel with some screws

At first you must connect the enclosed ribbon cable confectioned with two plugs at the jack of the Dual Receiver. Because of the nose at the plug this is only possible in one position. Connect the other plug to the USB board.
Attention: First insert the enclosed CD in the CD/DVD compartment of your PC. Then Install the software of the CD - see the following chapter. Then connect Dual Receiver to the PC by means of USB cable. Install the USB driver software as described in the next chapter. Otherwise Windows refuses the driver software installation. You then must install the driver software in a circumstantial way. Please inform about it in the attached instruction.

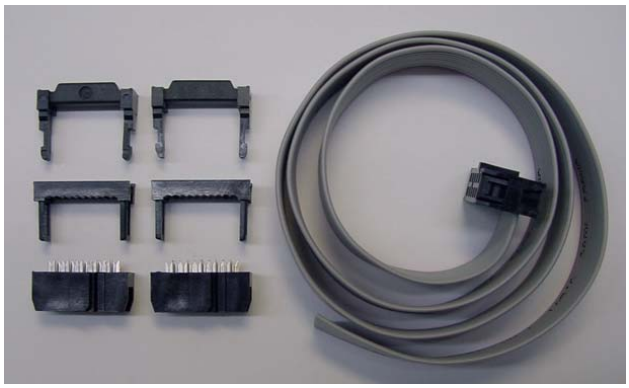
Switch board from the backside. See connector black for additional LED



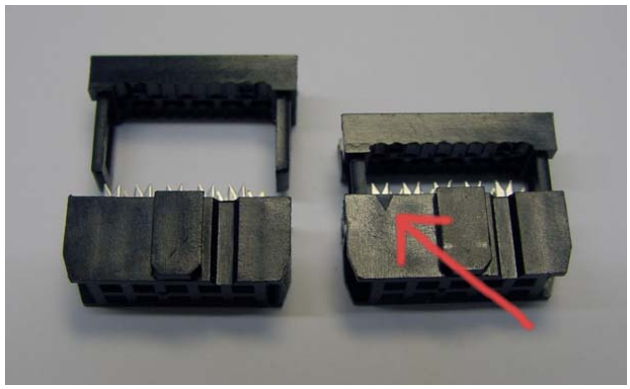
USB board to configure via PC

2.2 Instructions for Ribbon cable assembly

The 3 connectors are for the Dual Receiver unit, for USB board and the Control board (on/off switch and scan). After determining the location of these three components and the routing of the ribbon cable, mark the locations of the connectors on the cable. Pre-assemble the connectors by sliding the cable back plate into position on the connector body. There will be a gap of approximately 1/8" to insert the cable through. If you pushed the back plate on to far and it has snapped into place you can release it by carefully inserting a hobby knife between the connector body and the locking tabs while pulling the two apart.

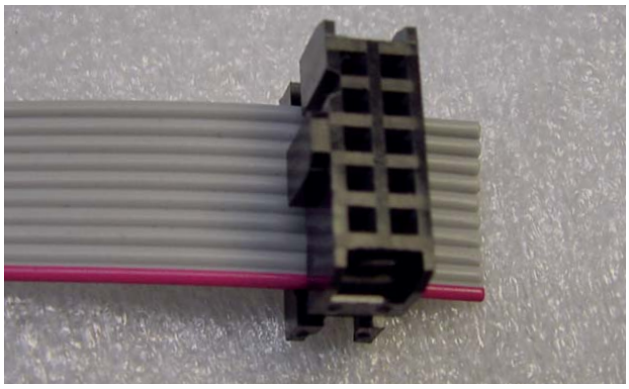


Three-part connector with ribbon cable

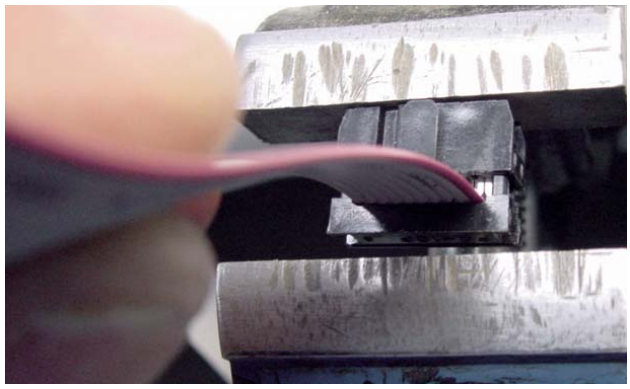


Observe proper orientation: coloured side of the ribbon cable on side of the arrow

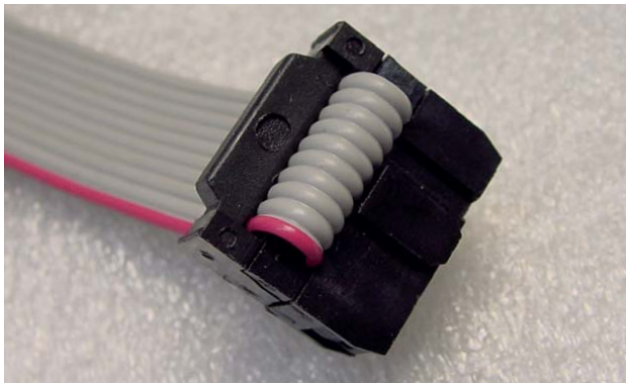
Insert the cable through the connectors observing proper orientation. Both the polarizing key and the pin receptacles on the connectors should all be facing the same direction. Slide a connector to its marked location, and then crimp it in place by squeezing it together while keeping it at 90 degrees to the cable. To squeeze the connector together you may use a vice, or a pair of pliers with parallel jaws such as channel locks, squeeze until the back plate snaps into place. Once all the connectors are in place insert the safety locks until they click in. Now you can cut the cable flush with the connectors.



Insert safety lock –later cut of protruding cable



To squeeze connector parts you may use a vice



Turn around cable then fasten second safety lock (not necessary for USB board)

2.3 Setting Procedures

At the beginning the Dual Receiver requires a one-time basic setting described below, which is very simple.

Attention: First insert the enclosed CD in the CD/DVD compartment of your PC.
Then Install the software of the CD - see the following chapter.
Then connect Dual Receiver to the PC by means of USB cable.
Install the USB driver software as described in the next chapter.

Otherwise Windows refuses the driver software installation. You then must install the driver software in a circumstantial way. Please inform about it in the attached instruction.

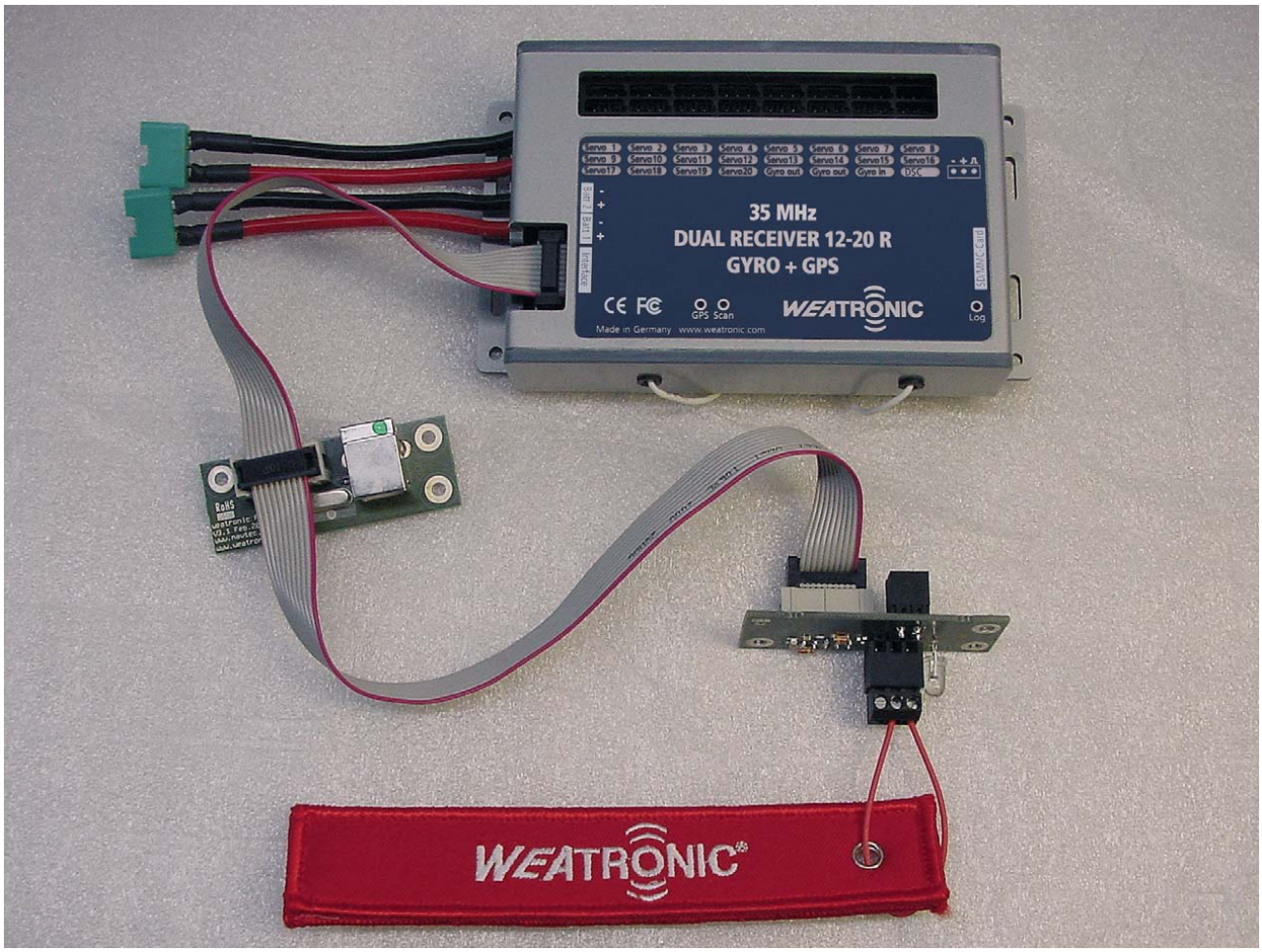
2.3.1 Software Installation

■ Insert the installation CD into the CD/DVD pocket of the computer The CD includes the software package weatronic FSE including the programs RXCtrl, the graphics program NAVview and the data conversion program NavtoCSV the Web setup tool from Microsoft DirectX 9.0C. The latter is existing on many computers already and belongs to MS Windows XP package. driver for the USB chip in the Dual Receiver

■ The installation software starts automatically, please follow instructions.

■ If the Autostart function on your PC does not work, then please call up the CD drive of your PC from the Explorer, open the **file FSE-CD** and click on the file **Setup.exe**. Then the installation program will start. After finishing please connect Dual Receiver to the PC by means of USB board and cable.

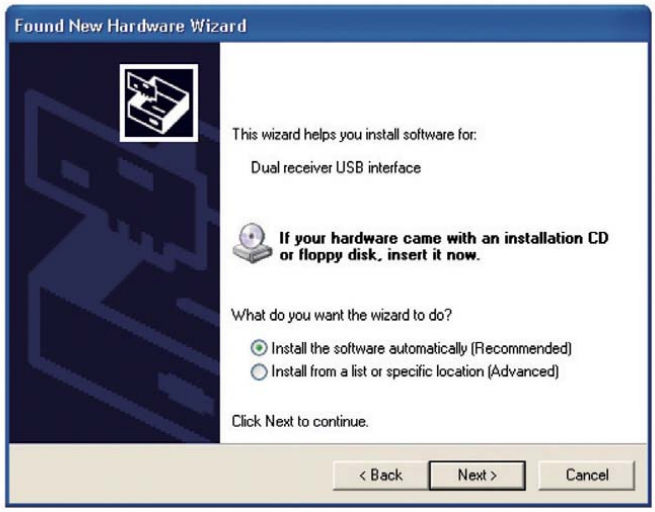
Now connect the Dual Receiver with the USB cable to one free USB port of the PC. The power supply will come from the PC. Initially, no batteries must be connected.



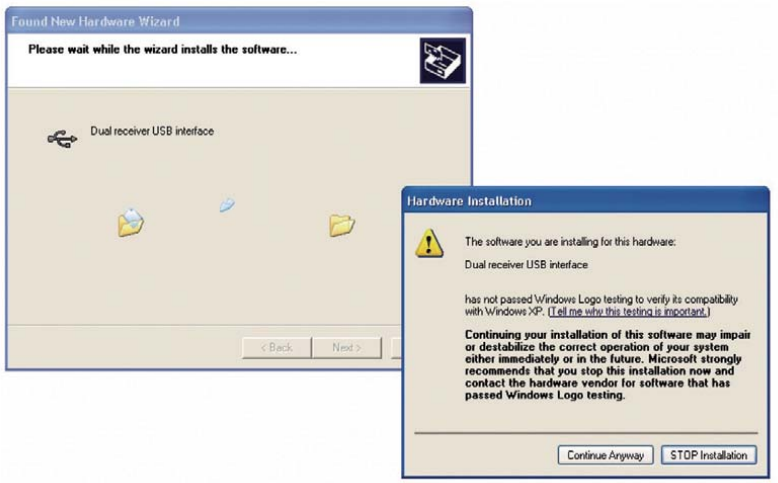
Windows now says "**Found new Hardware**" and opens this window:

Mark the undermost field and click on "**next**".

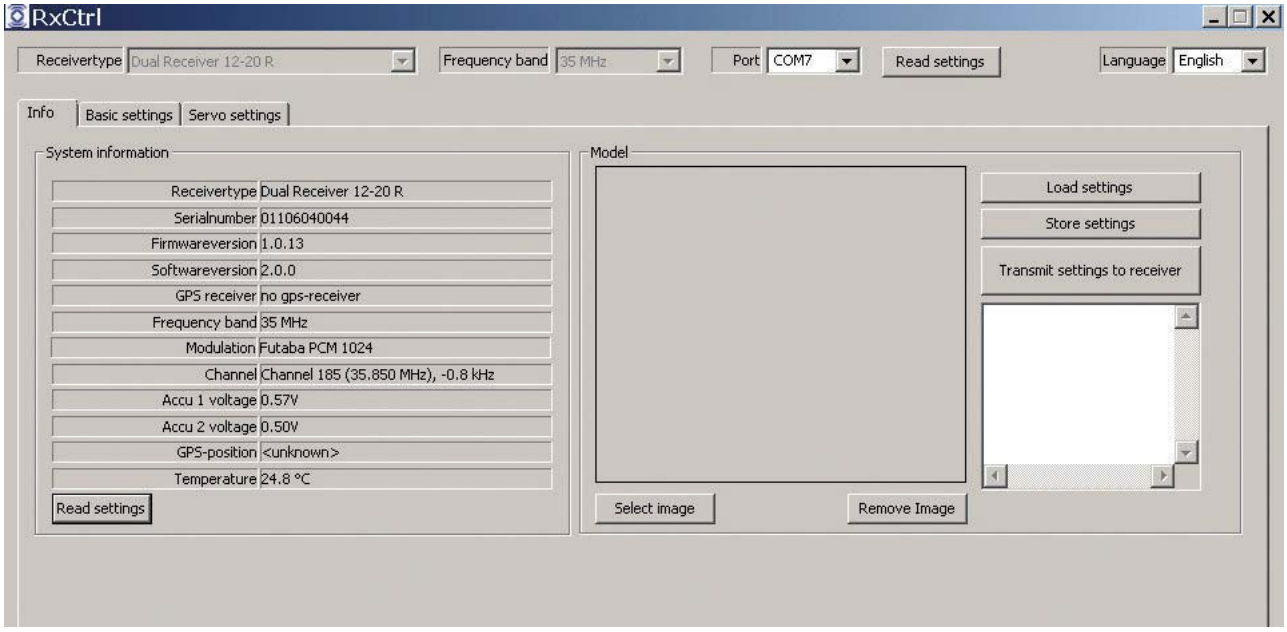
Then choose "**install automatically**" and click on "**next**":



Then "**continue anyway**" as shown on the next screenshot:



Click on "**Finish**". Now the USB Driver for the Dual Receiver is installed and you can use the software RxCtrl and NavView as described in the following chapters.



Starting the configuration software

■ Start the configuration software RXCtrl (**through the weatronic icon in the Start menu or on the desktop**).
The **RXCtrl Start window** will open.

■ First choose the language on top on the right side of the "info" window. Ex factory the language "German" is installed. Shut the program and restart it.

■ Select the correct COM port in the RXCtrl window, above right. If the correct COM port is not known, then it can be determined by checking out (clicking through the list). There are three cases:

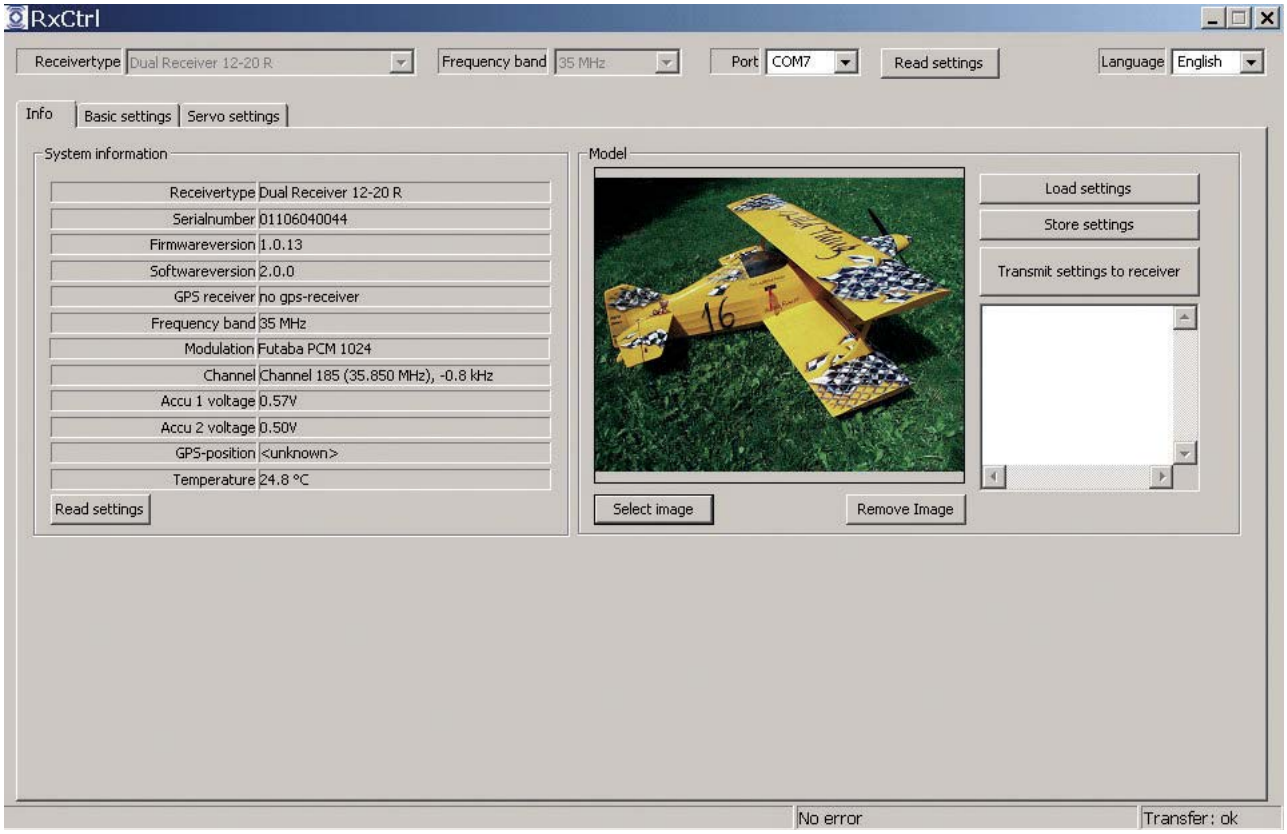
1. The port does not exist: Then there will be a display "**invalid port**", below right.
2. The incorrect port has been selected or the Dual Receiver has not been connected:Then there will be a display "**Transfer: error**" 3. The port is correct and the Dual Receiver has been connected: Then there will be a display "**Transfer: OK**" and the readout of the Dual Receiver is executed. The software stores the port which was selected last - you set this port only once.

2.3.2 "Info" Page

Once the Dual Receiver has been recognized correctly, then you will see on the "**Info**" page to the left the system following information: Receiver type, serial number and other information. To the right you will see information regarding the model. In case of an initial installation, you will not yet see anything there. Here, you can load a picture of your model ("**Select image**") or delete it again ("**Remove image**"). Furthermore, you may enter a description into this text field. By using the buttons "**Load settings**" and "**Store settings**" all Dual Receiver settings including the picture and description are secured or loaded respectively. As location for storing, the software will select the directory C:\Programs\weatronic\Dualreceiver tools\. On your PC, you may of course file the model data at another location also.

After having recognized the Dual Receiver (e.g. after a new start from RxCtrl or after a modification of the COM port), the already saved configurations will be scanned and compared with the existing Dual Receiver at hand of the serial number. If there is a coincidence, then the configuration file concerned will be loaded. Therefore, the following order is of advantage:

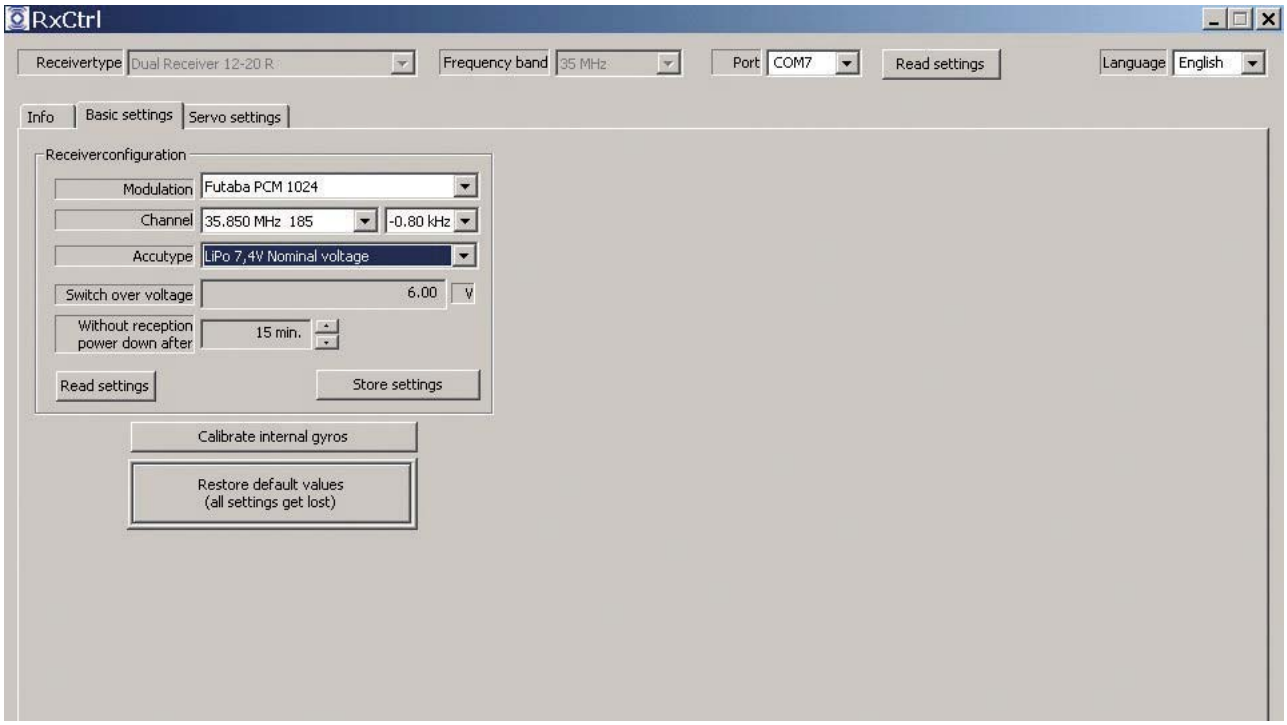
1. Connect Dual Receiver by means of a USB cable
2. Start RxCtrl. Here, the Dual Receiver will be read out first, and the appropriate configuration including the picture will be loaded thereafter. Then you should see the related picture (the photo of your model), without having pushed a single button:



The configuration software during the first start-up

2.3.3 Basic Settings

The page "**Basic settings**" enables the configuration of the Dual Receiver (without servo configuration). The selected settings should be read out of the Dual Receiver automatically; for safety reasons, you may read out the actual configuration anew by using the "**Read settings**" button. In the condition of delivery the modulation PCM 1024 Futaba is installed as well as the use of NiMH batteries.



Modulation

The following types of modulations are available:

■ PPM in 3 versions (MPX, UNI, PPM12). These are differing among each other by a different neutral position of the servos. If you select an inappropriate version, then the center position of all servos is changing, and not the entire stick travel will be transmitted to the servos.
■ Futaba PCM 1024
■ Graupner (JR) SPCM 1024

Select the type of modulation desired or which corresponds to your transmitter respectively (can be read in the transmitter manual).
Channel: though you can choose the channel out of a list manually it is absolutely necessary to scan the transmitter being used. Because the Dual Receiver needs informations from the individual transmitter which it receives during the scan process.

The automatic transmitter finding functions as follows:
■ Place switched on transmitter besides the Dual Receiver.
■ Connect control board with the broad band cable to the Dual Receiver.
■ Plug jumper with the white label - marked Scan - into the three-pin socket at the control board.Now,the transmitter finding begins. At first, the yellow LED at the Dual Receiver is blinking in a slow mode. The frequency band (depending on the type of the Dual Receiver, the 35/36 MHz or the 72 MHz band) will now be searched. The Dual Receiver selects the signals with the highest field strength. These signals are emitted by the transmitter which is located next to the device. After a few seconds, the transmitter was found and a precise fine tuning is executed. This is displayed by a hectic blinking mode of the yellow LED. During this phase the transmitter should not be moved at all. The yellow LED stops blinking as soon as the fine tuning process has been completed. The Dual Receiver has now been set to your transmitter, and you can remove the jumper again.

Type of battery

Here, you can select between NiCd/NiMH and LiPo. This changeover corresponds to the different discharge characteristic curves and to the physical characteristics. After you have executed all settings, you can store them in the Dual Receiver ("Store settings" button). You can reset the Dual Receiver to its delivery condition with the "Restore default values (all settings get lost)" button. This reset function does not only delete the above-mentioned settings, but also the servo configuration.

Calibrate internal gyro

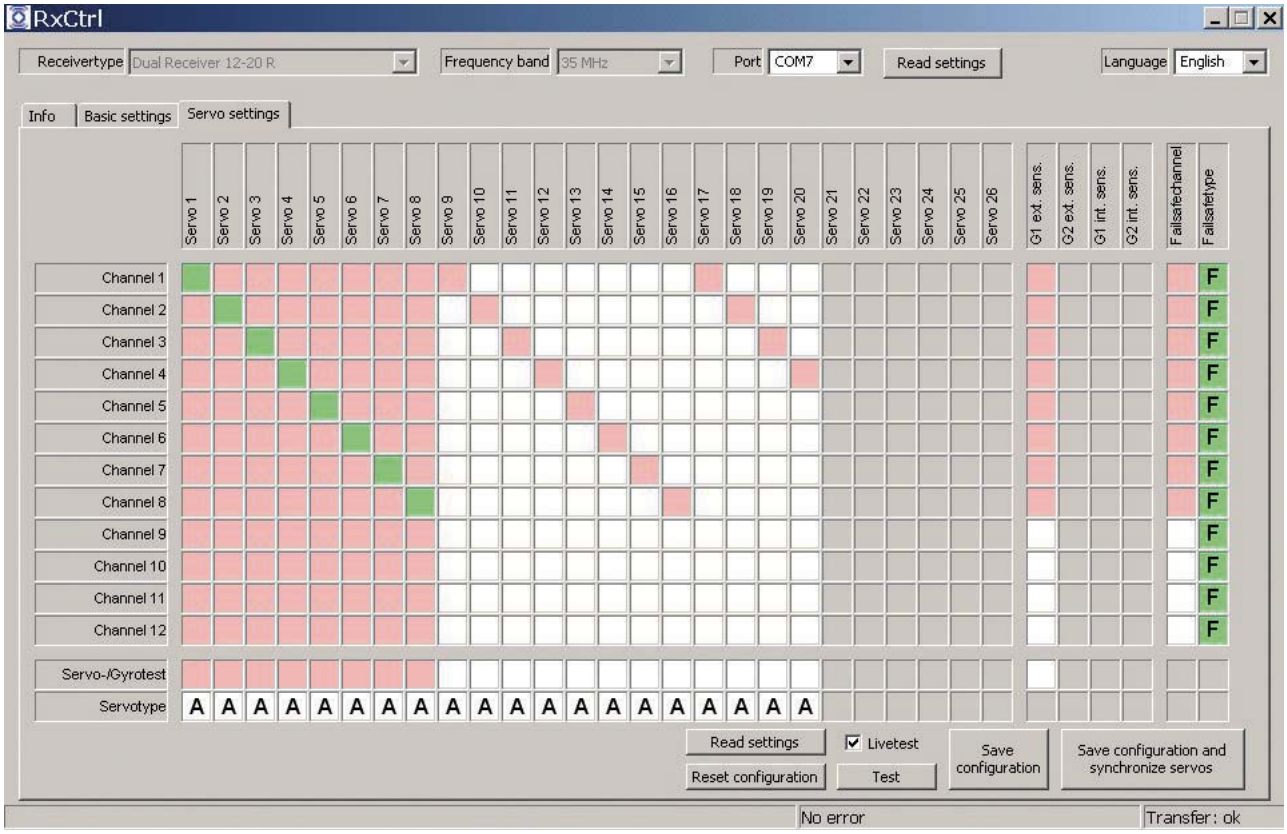
With a click on this button you can calibrate the internal gyro in case of changing of the zero position of the servos operated by the gyro (see more detailed in chapter 2.3.10).

Without reception power down after

This is the sleeping function of the Weatronic Dual Receiver. If the Dual Receiver does not receive any signals it falls into sleeping modus to save energy after the time set. Factory set up is 15 minutes. Data will be recorded until Dual Receiver falls into sleeping modus (see chapter 3). After new setting of sleeping modus you have to click on button "Store settings".

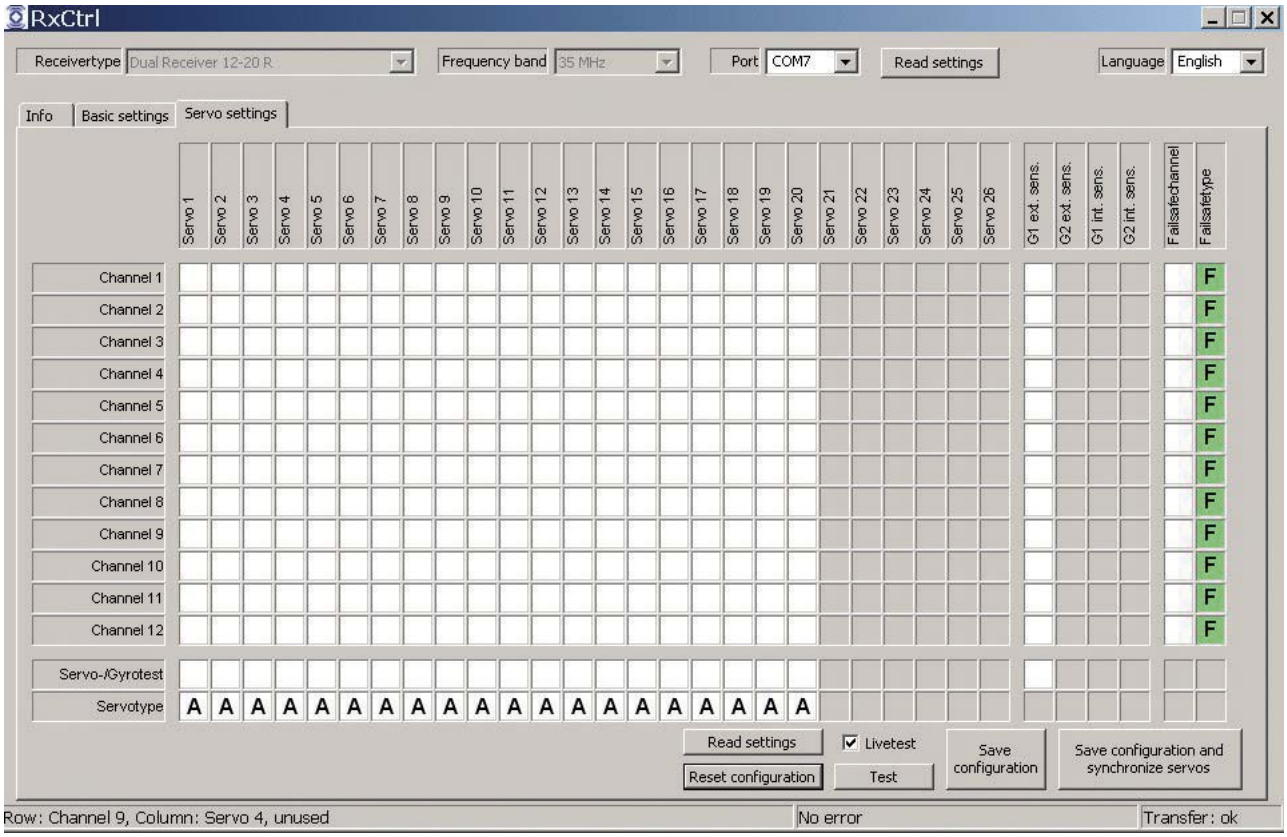
2.3.4 Configuration of servos

One of the most important properties of the Dual Receiver is the possibility, to allocate up to 8 servos to one single channel and to synchronize these servos over a maximum of 15 points. Thus, any plane model, as complex as it may be, can be governed in an optimum way. Factory setting: the first eight channels are connected to the first eight servo/actuator exits. Please click on the button "Servo settings" in order to obtain the allocation desired for your model. In this window the major functions of the Dual Receiver are set (see screenshot below).



Dual Receiver with factory settings

In most cases it makes sense to start with a clean window (without allocation of channels to actuators). You achieve that with a click on the button "**Reset configuration**" on the bottom of the window which looks like the following screenshot:

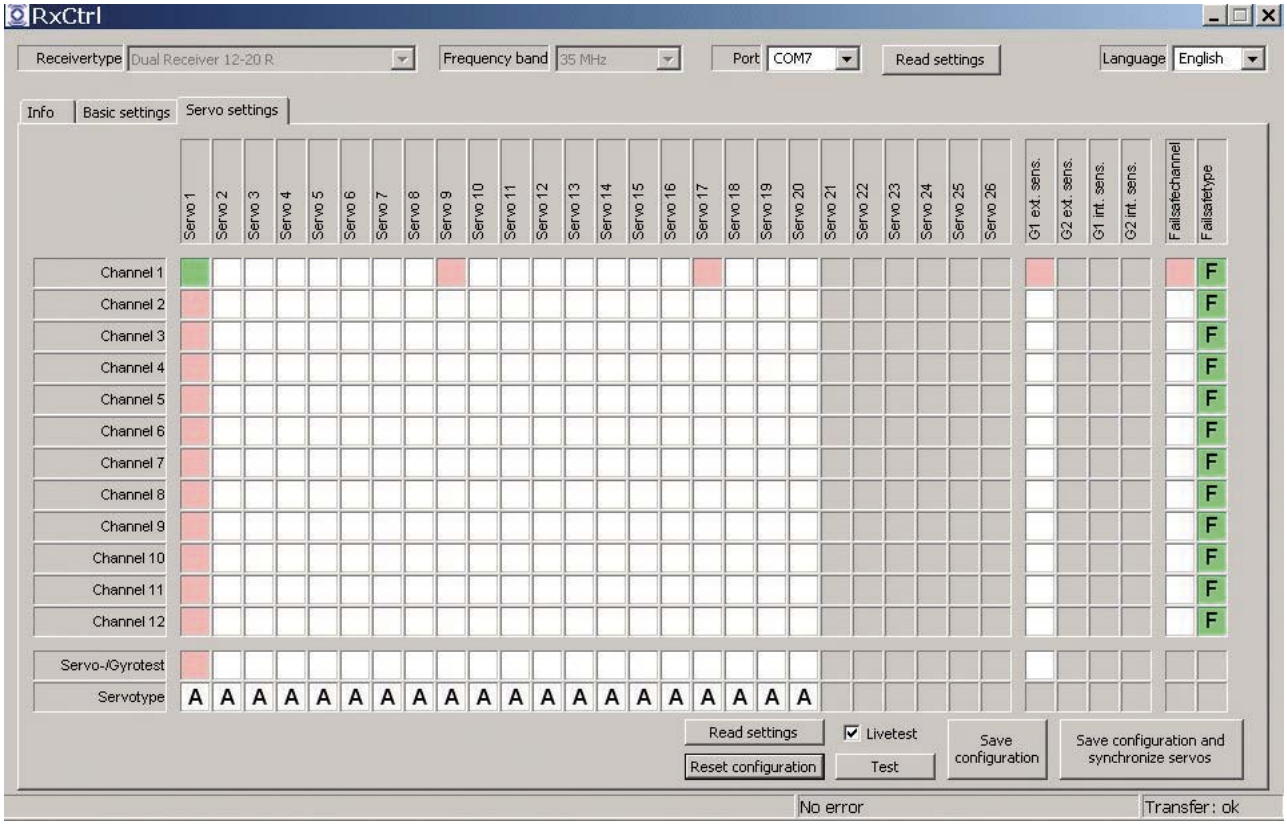


The arrangement on the left column represents the channels. The upper line displays the outputs - servos and for some versions the internal/external gyros as well as failsafe. During the **initial configuration** for the pending model, one must first decide, which functions should be executed by which channels.

The allocation of 1 up to a maximum of 8 servos to the desired channel is simply done by clicking with the left mouse key on the box, in which servo column and channel line are intersecting. Thereafter the box will assume a **light green** color showing that servo output and channel have been allocated to each other. The remaining fields of the column will turn to red color, because one channel can always be allocated to one servo only. Accordingly, every eighth servo in this line will turn to Red (based on the hardware no synchronization could be possible there).

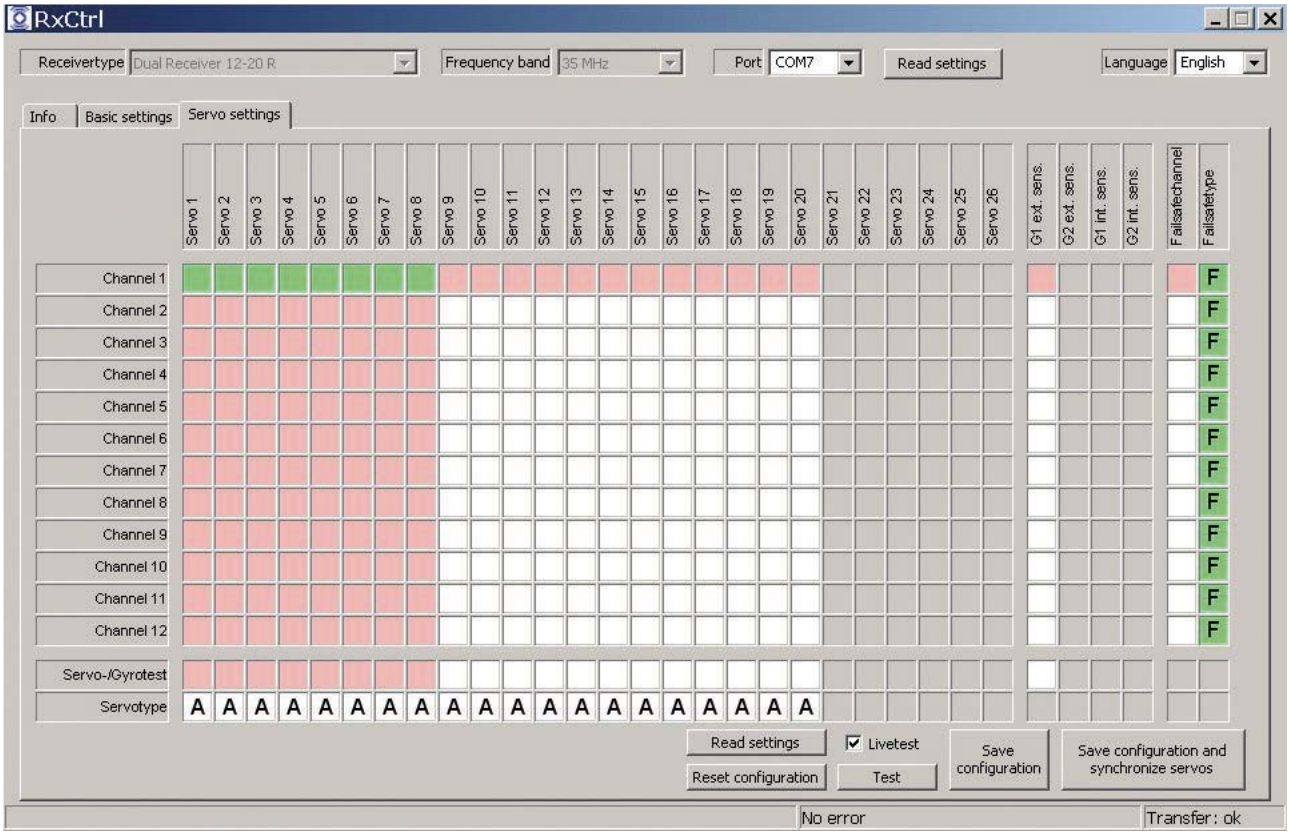
You may save the allocation immediately by clicking on the right border field "**Save configuration**". Also you may first execute all configurations and continue with "**Save configuration**" at the end only.

It is important to save all configurations before you remove the USB cable.



The first servo has been configured

If the maximum number of servos (servos 1 to 8 in this case) had been allocated to channel 1, then this would look as follows:



The servos 1-8 are following Channel 1

For the purpose of an improved marking, you may click (left mouse key) on the boxes with the factory designation Channel 1, 2 etc. and enter your own designation in the just opening window "**Edit channel name**". You may restore the normal designation by means of the button "**Default name** ".

In this same way, you may designate the **servo outputs** new in any possible way (the window now named "**Edit servo name**".

The line "**Servo/Gyrotest**" has a special meaning. Here, you can allocate one servo to one position in a fixed manner. There are only a few reasons for this for normal flight operation:

■ You are using an internal or external gyro, but you have no free channel to set the gyro sensitivity on the transmitter side - then you set the sensitivity to a fixed value by means of "**Servo Test**".
■ You have a governing function which you want to handle comfortably by servo action, but which must not be changed by you during the flight, e.g. an engine-mixture setting.

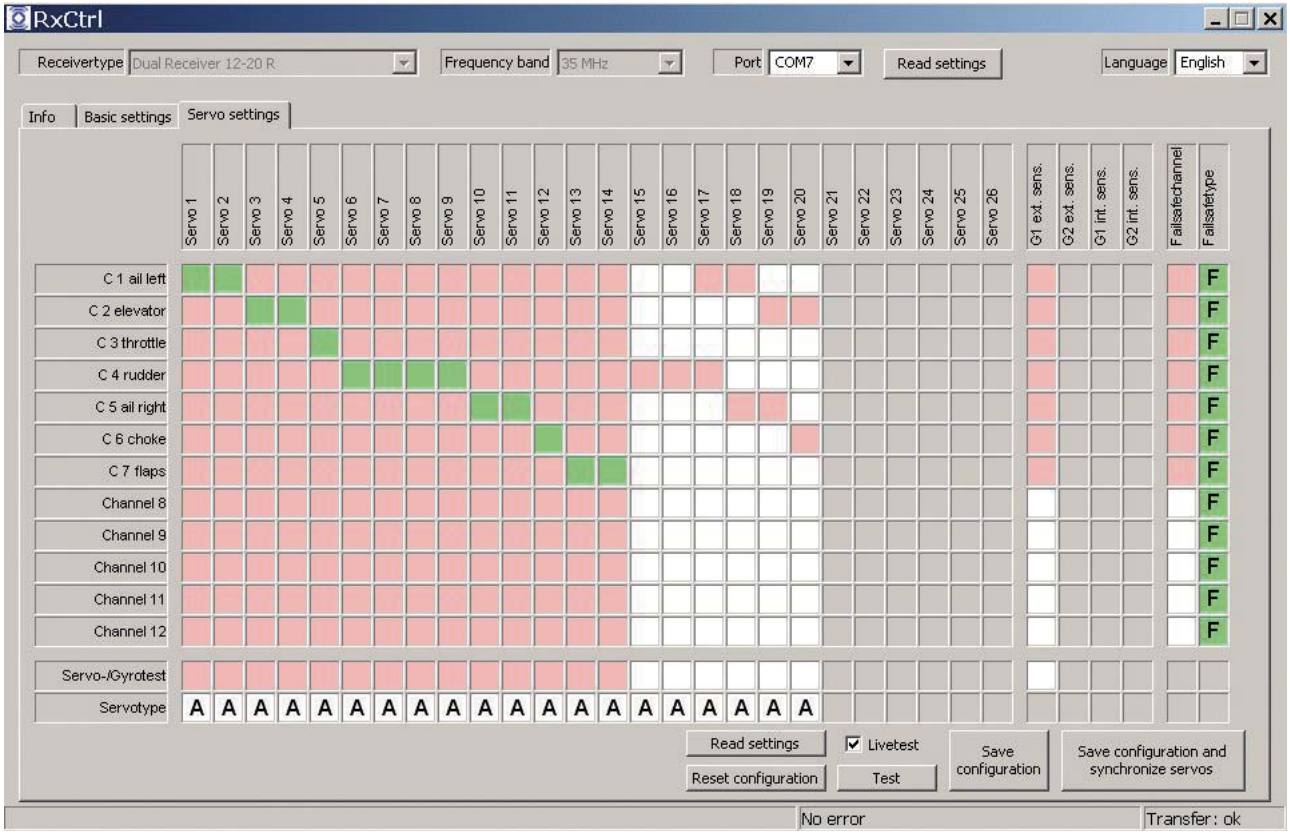
During the configuration you may move one servo manually with this function. A more detailed description can be found in Par. 2.3.10.

The "Test" switch will transmit the selected configuration without saving; the previous configuration is used by actuating the ON/OFF switch of the Dual Receiver. When the "**Live Test**" checkbox is active, any modification of the configuration is immediately sent to the Dual Receiver (but will not be saved, as done by the "**Test**" button).

"**Reset configuration**" will delete all settings (allocation and servo routes), but only in the PC software, not in the Dual Receiver.

2.3.5 Practical Example

Let's take a common Futaba allocation for our example. In case of some Futaba transmitters the aileron is on channel 1 by factory setting, the elevator on channel 2, the throttle on channel 3, rudder on channel 4. For the use of 2 aileron servos Futaba has provided channel 5 or 7 respectively. In the example we have entered the designations "**channel 1 aileron left**", "**channel 2 elevator**", "**channel 3 throttle**", "**channel 4 rudder**". Channel 5 has now been selected for aileron right. Before, the transmitter must of course be set for channel 5 as the second aileron also. In the example two servos each have been allocated to every aileron, two servos have also been allocated to the elevator channel, the rudder works with four servos, the throttle (carburettor actuation) with one, the choke also with one servo, and the landing flaps with 2 servos. This is a common trigger control system as used for larger acrobatic flight or scale models with gasoline engine. The six other outputs of servo 15 to servo 20 are not allocated in this example, they are therefore considered as reserve. The same applies to the channels eight, nine, and ten.



The servo allocation as described above

2.3.6 Servo Groups

Several servos which are acting on the same surface area can be gathered in one servo group. Each channel can include a maximum of 2 groups. Each group consists exactly of one main servo and of at least one secondary servo. Slight differences within the servo-mechanical system are compensated by synchronization, and installation tolerances by small variations of the individual servo travels. Since it is necessary during the synchronization to restrain the surface area, the use of servo groups makes sense only in case of mechanically hard surfaces (including servo attachments, rods, hinges). In case of "soft" surfaces, a group formation should not be used. The secondary servos of one servo group will take over the servo travel and the gyro allocation from the main servo, only the running direction can be inverted in relation to the main servo, e.g. in case of a mirror-image installation of the elevator servos.

Caution: At first, rods/tackle line must be attached to the control levers first, when you have checked, whether the servos of one group are indeed acting in the same direction. If not, the corresponding servos must be inverted.

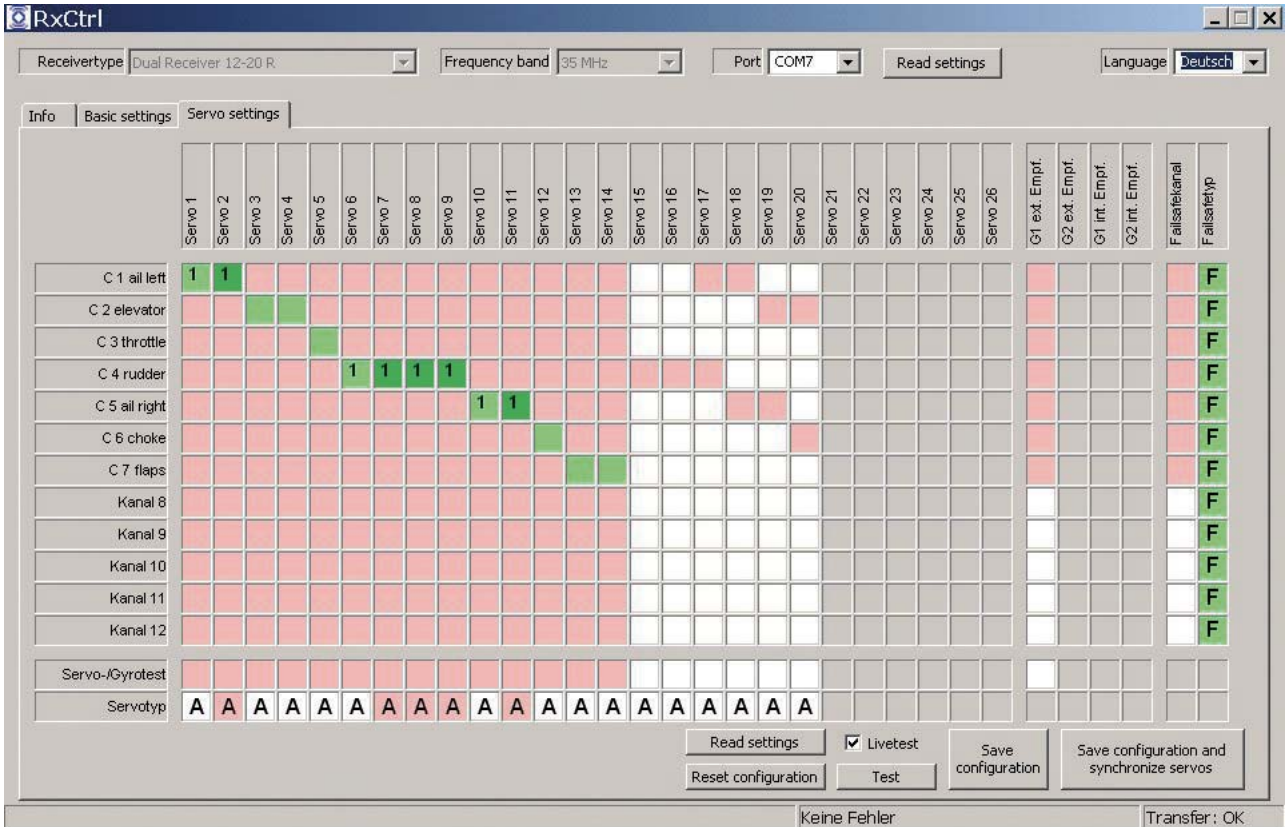
Now, the previous example will be extended by adding servo groups. For this purpose, click with the right mouse key on the first green box "**Channel 4 Rudder**", for which you want to form the servo group out of four servos. A window with the designations "**Group**", "**Gyro**", and "**Configure**" opens. Move the mouse to "**Group**" and a submenu will open with the following items:

- "**Single Servo**" - the servo will not be allocated to any group and can be configured freely.
- "**Masterservo group 1**" - the servo becomes the masterservo of the first group of this channel. All settings of this servo (servo travel and gyro allocation) are acting on all slaveservos of Group 1 of this channel.
- "**Slaveservo group 1**" - the servo becomes the slaveservo of the first group and takes over servo travel and allocation from the masterservo.
- "**Synchronize**" - synchronizes only the 1st group of this channel
- "**Masterservo group 2**" - masterservo of the 2nd group, everything else as before.
- "**Slaveservo group 2**" - slaveservo of the 2nd group, everything else as before.
- "**Synchronize**" - synchronizes only the 2nd group of this channel
- "**Inverted compared to masterservo**" - active only in case of masterservos. The servo concerned is moving as mirror image in relation to the masterservo

"**Single Servo**" has been ticked, because this corresponds to the factory setting. Now you click with the mouse key on "**Masterervo 1**" on the list. The tick is now there. This means that all other servos in this group will orient themselves according to this masterservo, when the synchronization is conducted or when a travel characteristic curve is set. Figure 1 appears in the green box. At the second green box you select the item "**Slaveservo group 2**" from the menu, and in the same way at the other two boxes for the servos 8 Rudder and Servo 9 Rudder, while still following the example. The boxes of the slaveservos have changed their color to **dark green** and also contain the figure 1, meaning, that they all belong to the same Group 1.

A slaveservo, inverted in relation to the main servo, will be symbolized by an opposite coloring: dark green letters over black background instead of black letters over dark green background. Now you can save the allocation permanently in the Dual Receiver by clicking on the button "**Save configuration**" The synchronization will be conducted later, when the servos have indeed been installed in the model and connected to the Dual Receiver.

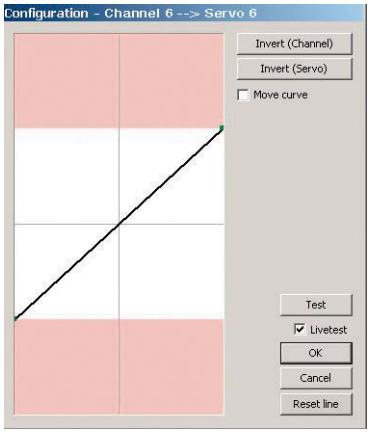
It is basically possible to provide any running direction to each servo. Thus, mirror-image rod arrangements can also be chosen when forming groups. But you should always arrange the servos of one group in such a way that the length as well as the front part of the control horns are identical, as well as the length and arrangement of the control horns at the servos.



The example with complete group configuration

2.3.7 Servo Travel Setting

The Dual Receiver allows the generation of a suitable setting curve (subsequently called servo travel) for each single servo, but also for servo groups.



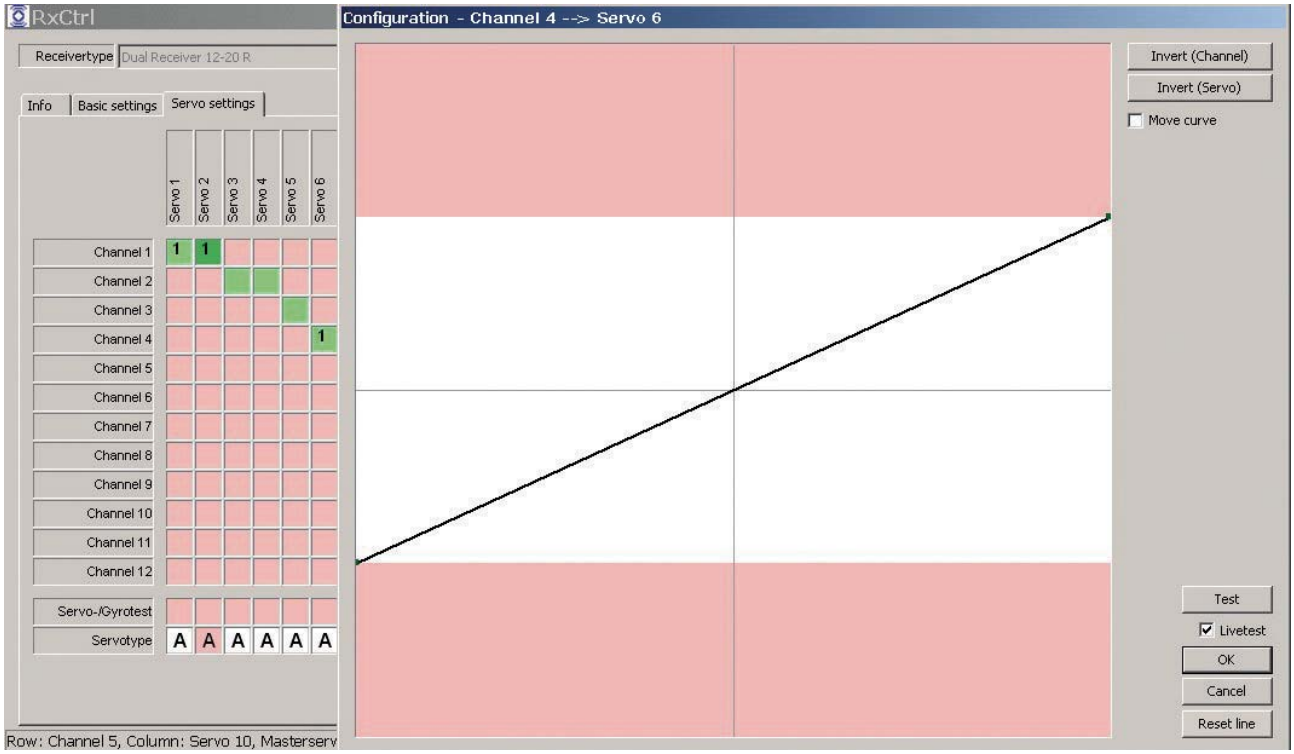
This window appears when you click with the right mouse button on the green box of the channel, the connected servos of which you want to adjust. At first the above window appears when you click on "**Configure**" with the left mouse button. In case of servo groups you must click on the light green box of the main servo, because all other servos are following this main servo with their orientation.

Normally, the servo travel is one straight line as can be seen from the figure at the left. This means that stick position and servo travel are proportional. The white field covers the servo travel up to 100 %, within which you should normally be moving. The upper and lower red fields extend the setting range of the servo theoretically up to 200 %.

But Caution! Each servo is different and can cope with a certain percentage of travel only. Important: You must carefully advance in the red area during adjustment of the curve, and the servos must absolutely be connected to the Dual Receiver in advance. Other-wise, the servo could be damaged. Please take care of the instruction of the servo manufacturer.

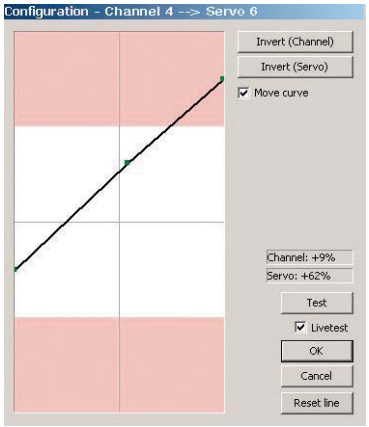
The neutral position (zero layer) of the respective servo can be adjusted very simply. Click into the small box "**Move curve**" that a hook appears in the small box. You can move the curve along the y-axis vertically and bring the servos into line with each other. That way you are able to adjust two ore more separately working servos precisely. E.g. flaps or elevators.

Please enlarge the servo line window by tearing the window in the edges with the left mouse button depressed.

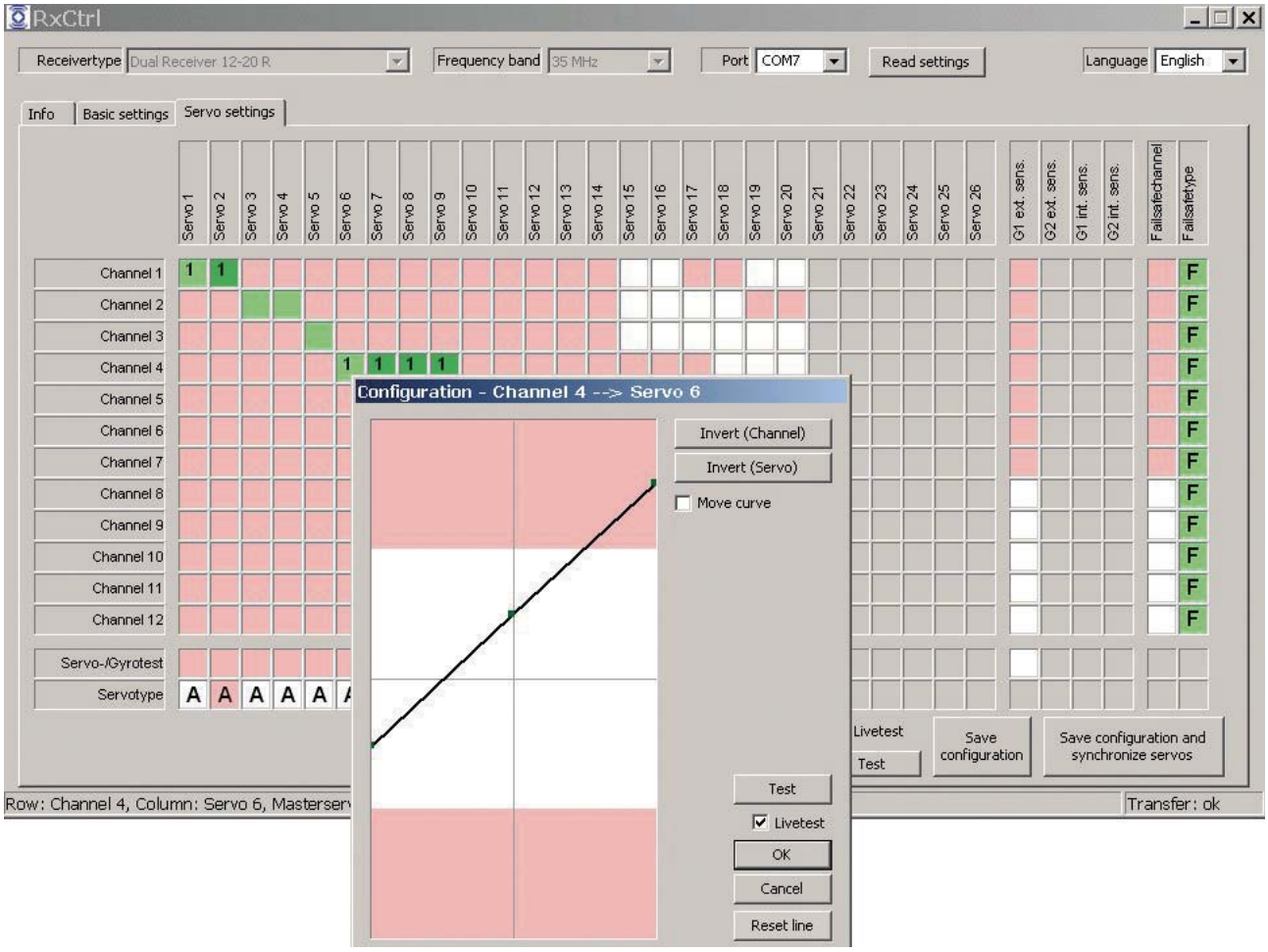


The changes of the servoline can thus be executed more precisely.

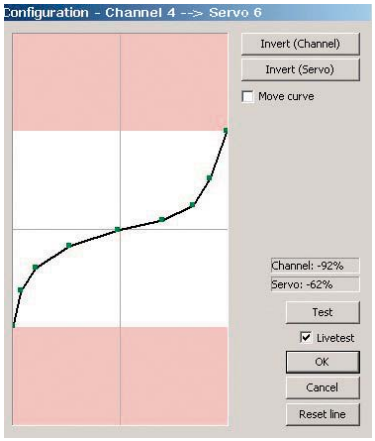
Adjustement of zero position:



If you have formed a servo group as described under Chapter 2.3.6 you can adjust the zero position of the masterservo substitutionally for the whole group. That means that the slaveservos act synchronically to the masterservo.
Before you start changing the servoline, please enlarge the servo line window by tearing the window in the edges with the left mouse button depressed.



Adjust the zero position by moving the whole servo line

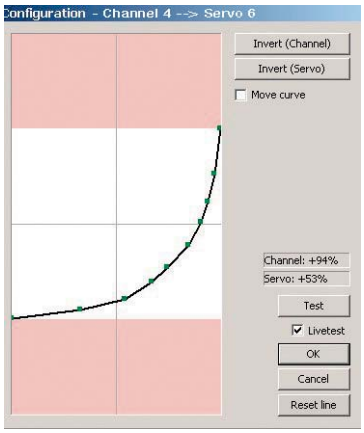


The following example shows the adjustment curve set to 100 percent; the curve shows an exponential characteristic course for a soft control effect near the neutral position. You may add new points with the left mouse button (by clicking in a free area) or you may move existing points (click near one item and pull).

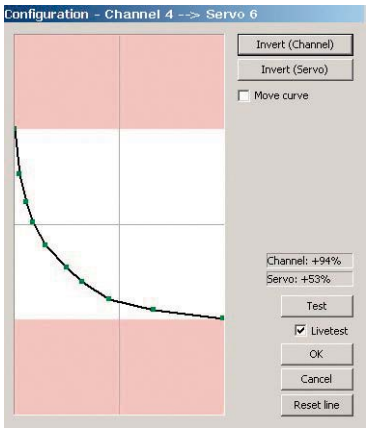
The right mouse key can be used to delete points (click near one point).The two extreme points cannot be deleted. In cases of doubt, you leave the straight line with 100 percent servo travel. At the transmitter, you should in any case hold on to 100 percent in the Servo Travel menu. You must in addition decide, if you want to set a certain servo course in the transmitter or in the Dual Receiver (Expo for example). Otherwise, transmitter and Dual Receiver settings would cause superpositions and generate illogical results.

Regarding the remaining buttons of this window:

■ "**Invert**" - the servo travel will appear as mirror image - at first sight, both buttons will seem identical. To explain the differences, the following servo travel is suited best:
■ **Test** - transmits the new servo travel to the Dual Receiver
■ **Live Test** - as already shown with the servo configuration, any change will be transmitted here to the Dual Receiver immediately, and one can observe the change immediately.
■ "**OK**" takes over the changes and closes the window, "**Cancel**" rejects them

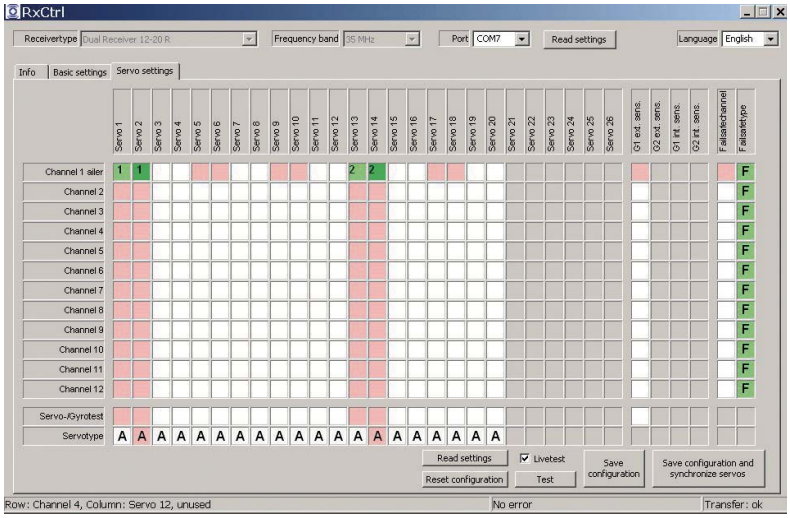


This servo travel may eventually be suited for an accelerator servo or for spoilers with an improved sensitivity in the lower area.



The button "**Invert (channel)**" creates a mirror image of the curve so that the stick at the transmitter must be moved in opposite direction - i.e. the channel position transmitted by the transmitter is inverted. The same effect can be obtained by reversing the servo direction at the transmitter.

The button "**Invert (Servo)**" creates a mirror image of the curve so that the **servo** moves by way of mirror image. The same effect can be obtained by attaching the rod system to the other servo arm. Any **slaveservo** inverted in relation to the masterservo will always be **inverted by this way of mirror image.**



The above example, but with one aileron channel only

2.3.8 Synchronization

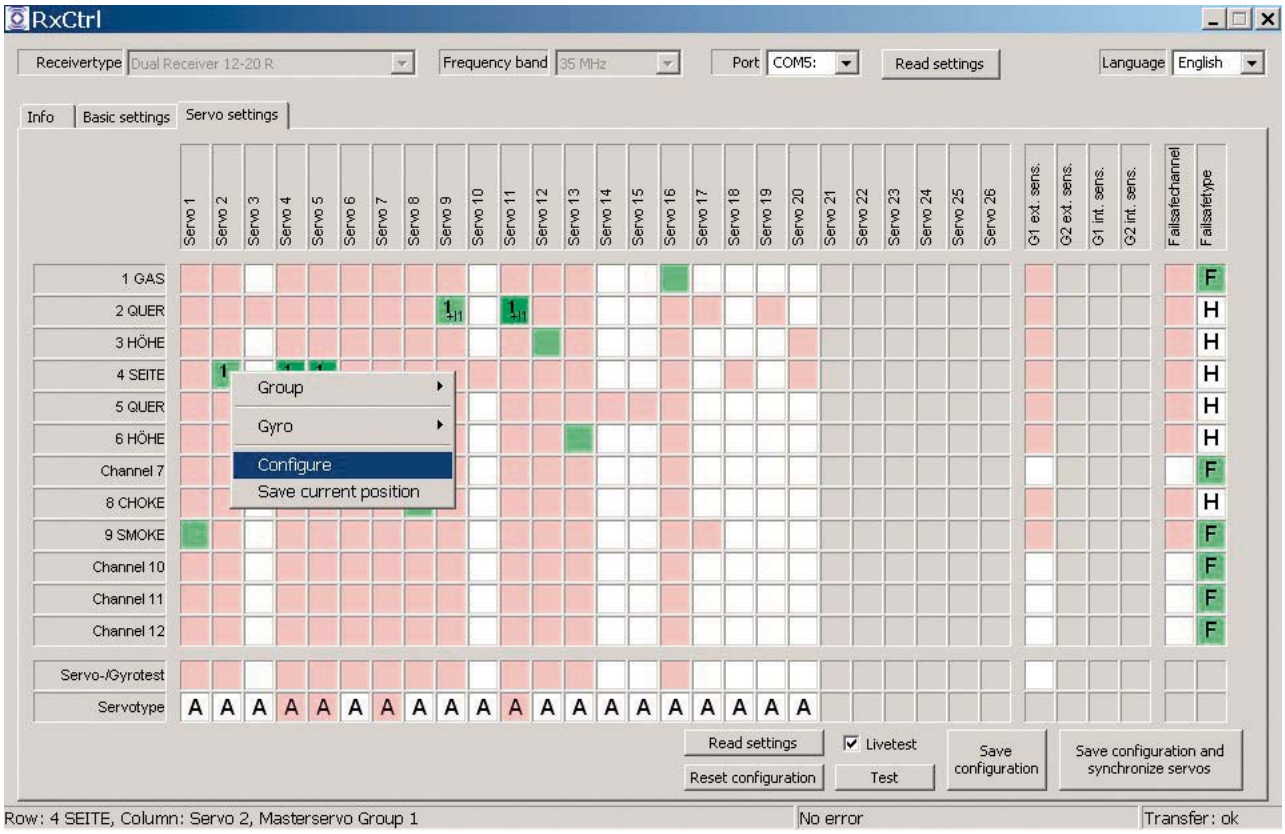
The capability to synchronize several servos on one channel or on one control surface respectively is one major characteristic of the Dual Receiver. Furthermore, this feature saves you an expensive servo programmer.

Start the synchronisation procedure as follows:

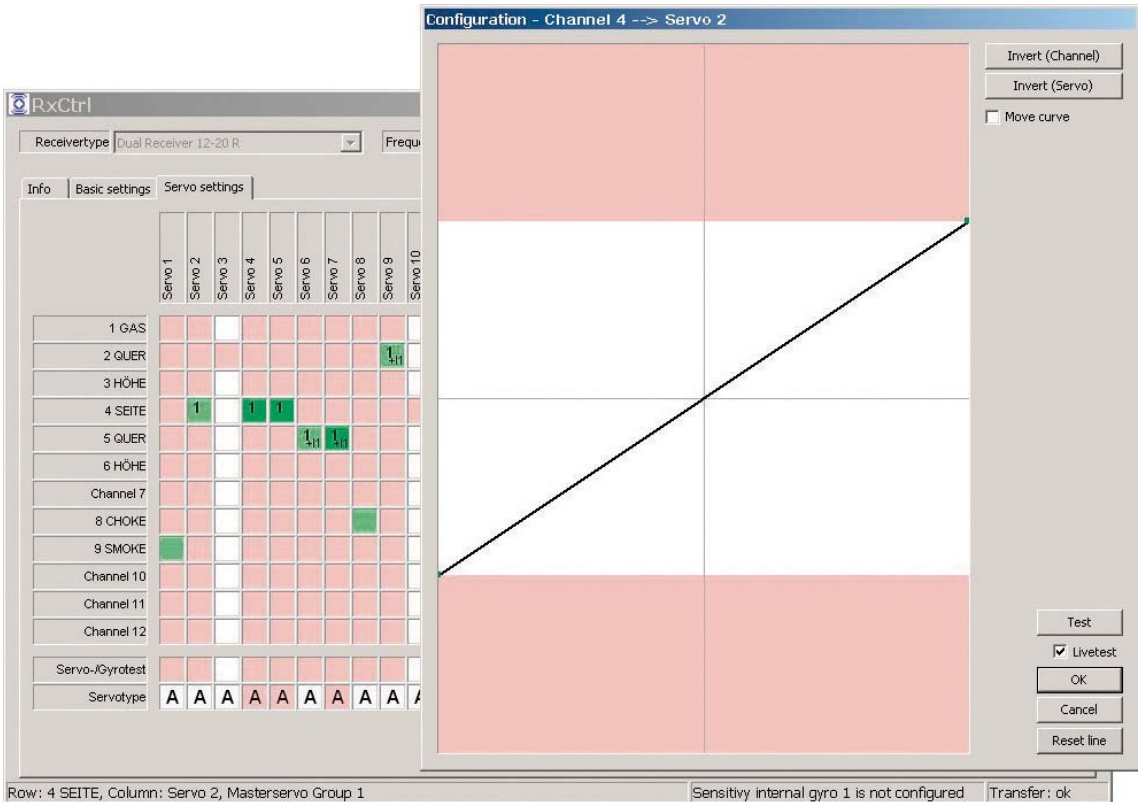
■ If the servo group consists of analogue servos, choose on the under most row "**Servo Type**" "A" under the column for the master servo

■ If the servo group consists of digital servos, choose "D" under the column for the master servo

■ Choose the servo group to be synchronized by clicking into the box of the master servo with the right mouse button

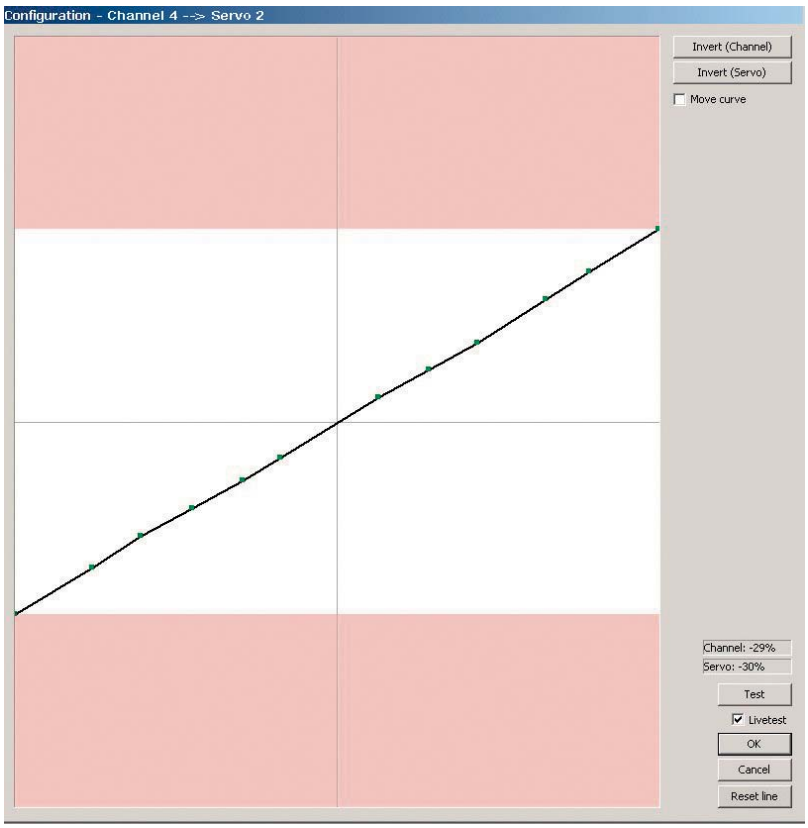


Click with left mouse button on "**Configure**" in the new window. The configuration window for this servo group opens.



Click on "configure", then next window opens

Before you start marking the points on the servoline, please enlarge the servo line window by tearing the window in the edges with the left mouse button depressed. The changes of the servoline can thus be executed more precisely.



Before you start the synchronisation process by choosing the window **group** and clicking on "**Synchronize**"

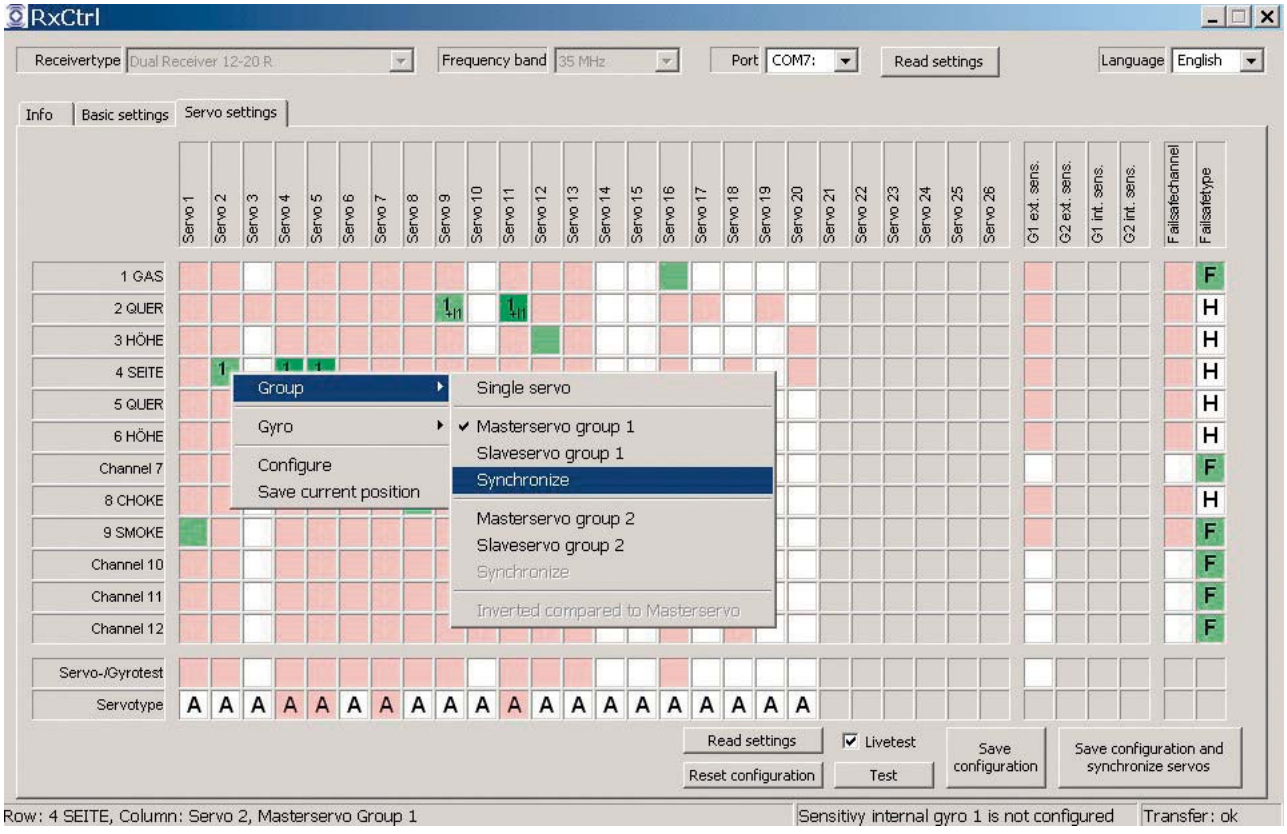
Because of a minimization of the current in these marked points the following measures are resulting thereof, in order to avoid damaging the model rsp. the servos by the synchronization:

■ All servos of one group must be connected mechanically - therefore both ailerons must not be united to form one group. If you want to actuate several servos per aileron with one channel, then you must form one Group 1 (aileron 1) and one Group 2 (aileron 2).

■ All points of the servo travel must be reachable in the non-synchronized condition - therefore the servo synchronization does not replace the necessary precision during the installation of the servos and when dimensioning the rod system.

■ Measurable forces must be generated by the subsequent slight restraining of the surface area. Therefore, soft surfaces (Balsa without planking, Depron etc.) are not suited.

■ The attachment of the servo, the rod system and the control horns must be able to withstand the acting forces.



The synchronisation starts for the marked servo group

You may conduct the synchronization either for one single group (click on "**Synchronize**" in the submenu of the main servo) or for the entire model (button "**Save configuration and synchronize servos**"). During the synchronization of the entire model you will see a progressing display, which channel and which group is just being synchronized.

Any mixing on the transmitter side will be taken over by the Dual Receiver and transmitted to the servo groups. For the channel allocation please see your transmitter Manual. Servo groups have identical behaviour as found on single servos of traditional receivers. Any mixing of several channels, to trigger several servos for one and the same control surface is superflous and senseless.

2.3.9 Failsafe

Under unfavourable receiving conditions (range limits or massive interferences) the Dual Receiver cannot receive any valid signals from the transmitter any more. To prevent the model from continuing its flight in an uncontrolled way, the Dual Receiver has been equipped with a multi-stage Failsafe Device.

To use this device please deactivate the Transmitter failsafe settings first.

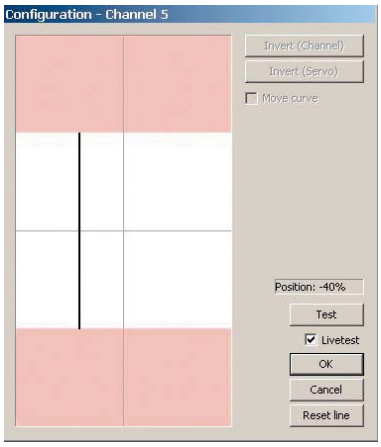
■ In the first phase lasting approximately 0.25 sec those servo positions will be maintained (Hold) which were valid as the last ones. If during this period a reception becomes possible again, then the Hold status will be left, and the new servo positions will be used.
■ After another 0.25 sec. the Dual Receiver falls back into the Failsafe mode. In this case, all servos are moving within the positions as stored before.

In the PPM mode the servos will begin to jitter slightly at the range limits, but they do not show uncontrolled deflections. In the PCM mode they remain completely still. When using PCM transmitters, their fail-safe programming must be switched off.

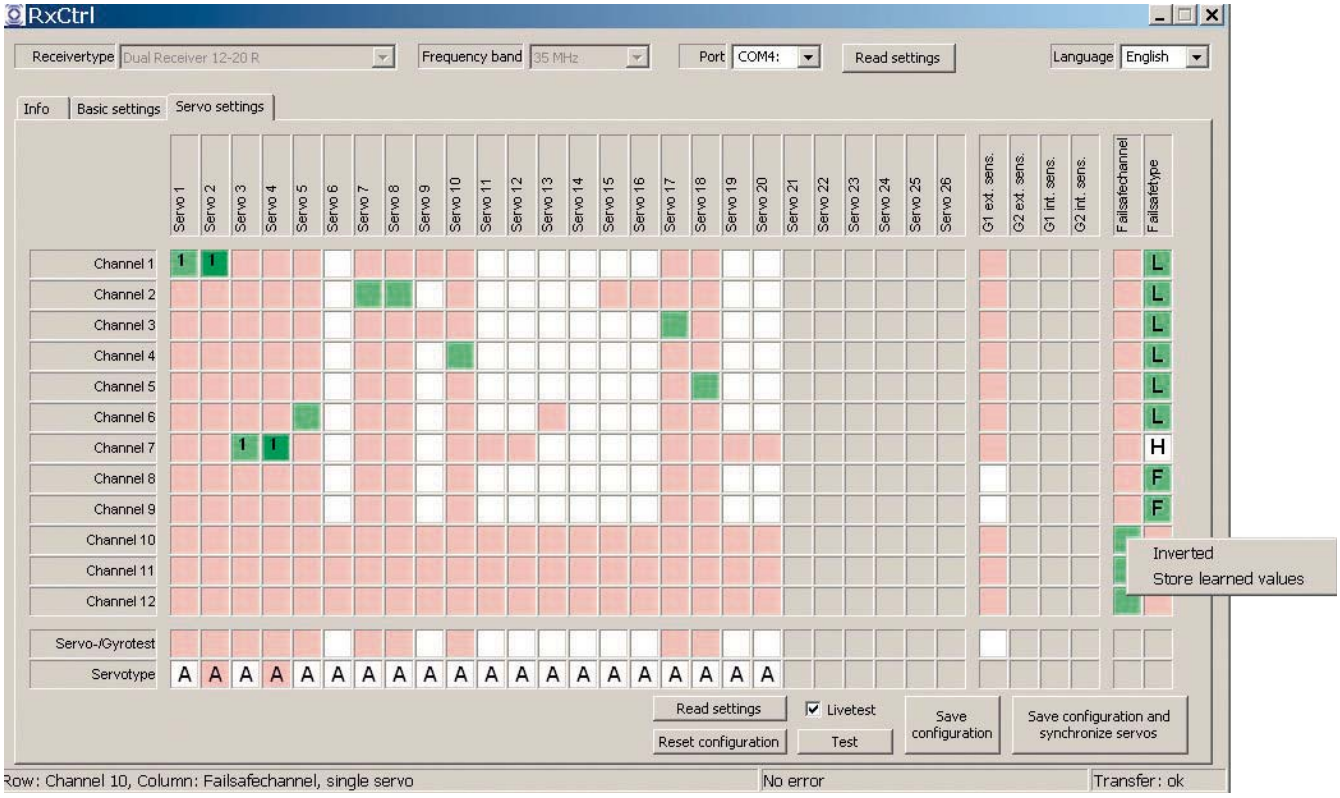
Weatronic Dual Receivers can be configured for each single channel individually as far as their failsafe characteristics are concerned. The right column in the window Servo Configuration allocates a green box with the initially issued designation F to each channel, which opens a new window when clicking with the right mouse button. There are three types of Failsafe which can be activated on this list: F for fixed position in the Failsafe, **L** for Learning, a learnable position for Failsafe, and **H** for Hold.

■ H "**No Failsafe**", or explained differently: Hold means: The position which the servo or the consumer element respectively has held will be maintained under Failsafe, the green box will turn into white and assume the designation H (for Hold). This is a common and reasonable setting for the Failsafe of ailerons, elevators and rudders of acrobatic aircraft and other non stable model aircraft. This setting must absolutely be combined with a fixed idle position of the engine channel, as described below.
■ F "**Fixed Position**". This means, any position can be allocated to the servo (or the connected consumer element) which the servo is approaching when the Dual Receiver switches on Failsafe. Click on "**Set Position**" and the following window opens.

The ideal adjustment e.g. for turbine idle of for the revolution of a gasoline engine can be set as follows: Switch off the transmitter and modify the failsafe position manually by shifting the vertical graph to the left or to the right while keeping the mouse button pushed down - the throttle servo or the turbine ECU respectively will then change the Position/Speed "live". Set the desired, slightly increased speed for engine or turbine respectively. Then click on OK and do not forget to click on "**Save configuration**" later.



L "**Learn Position**". When a Failsafe position must be "generated" in flight operation, this requires a free switching channel of the transmitter - best suited is a 3-stage switch (up, center, down). The allocation of this channel is done in the servo configuration. In the right column prior to the last ("**Failsafe Channel**") you must allocate a channel to the Failsafe function.



Configure "Failsafe" in the very right column

The following functions have been allocated to the three positions of the failsafe switch:

■ Up - in this position the actual position of all channels/servos which have been configured to **L** in the last column is stored. To determine a favourable failsafe position, you place the fail safe switch in this position, bring the model in a stable, slow flight condition, and thereafter place the switch back to center position.
■ Down - in this position you can test the stored failsafe positions. All servos are moving into the failsafe position, and control signals from the transmitter are ignored. To leave the test mode, bring the switch back to its center position.
■ Center - normal operation.

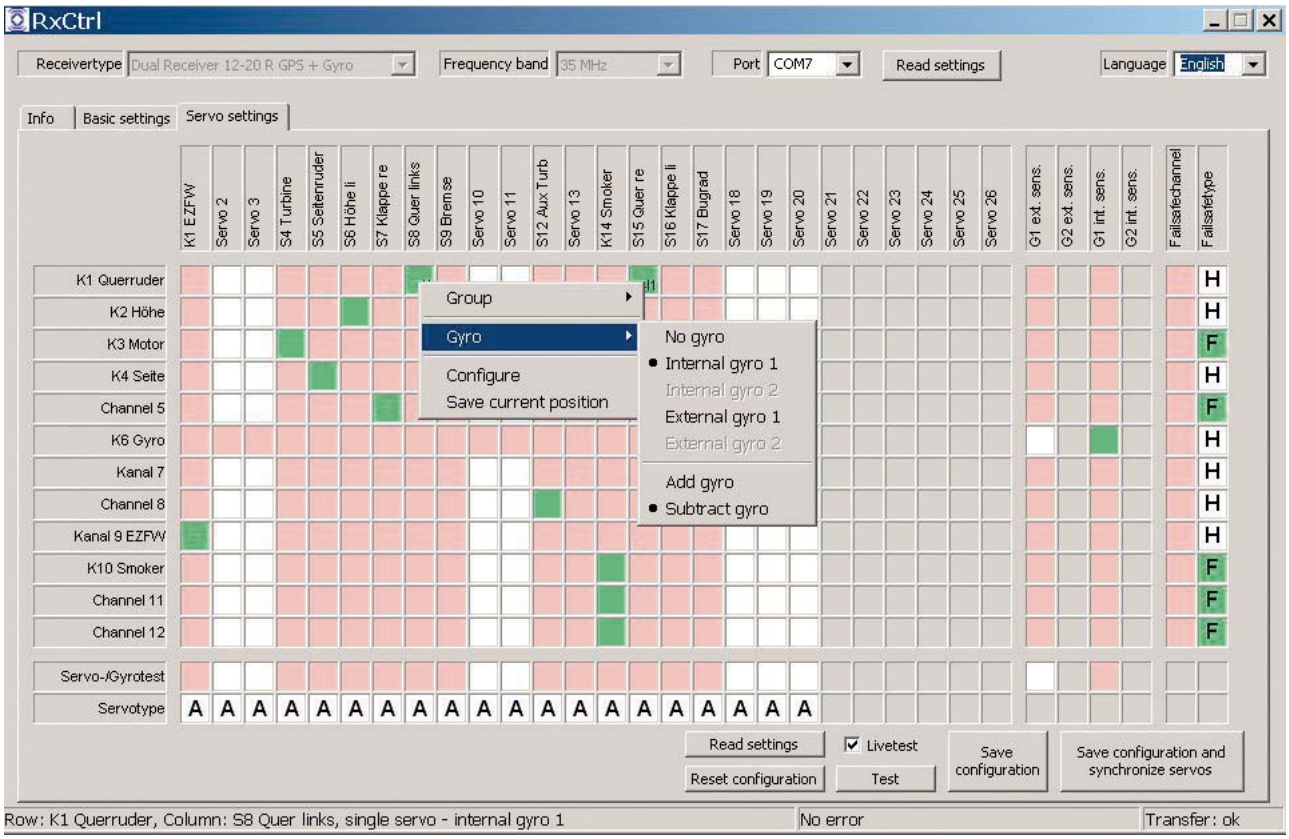
If you do not like this allocation or if your transmitter shows an inverted switch allocation, then you may invert the switching function (exchange "**Up**" and "**Down**"). For this purpose, you click with the right mouse button in the servo configuration on the green box in the Failsafe column and select "**Inverted**". This type of Failsafe configuration is suited for gliders or for self-stabilized trainer models, **not for jets or artistic airplanes!**

After landing connect the Dual Receiver with the PC and open the table "**servo settings**". Click on the field that is activated for the failsafe channel with the right mouse button. Click on "**Store learned values**". The learned failsafe positions have been stored now, the fields in the very right row change from **L** to **F**. The failsafe channel is now free and can be used for other functions.r

2.3.10 Gyro Allocation

This function has been integrated in the Dual Receiver versions 12-20 R Gyro, 12-20 R Gyro + GPS and 12-26 R Gyro II + GPS. If the Dual Receiver has been installed horizontally, the stabilization is acting on the lateral axis (aileron) of the plane model (in case of 12-26 R Gyro II + GPS the transversal axis is stabilized too) The gyro configuration is very simple. In the following example we have allocated the two left aileron servos to Channel 1, the two right aileron servos to Channel 5. To simplify, we have, in the example, given up the practical designation of the channels and the servos. **Now, upon the command Aileron Right (stick deflection to the right), at the transmitter, the right aileron (viewed in flight direction) must deflect upward, the left one downward.**

First, form two groups again with one masterservo and one slaveservo. In the example, this can be seen from the light or dark green boxes showing the figure 1 inside. **Should both control surfaces deflect upward or downward in the same sense, then the corresponding servo control curve of Channel 1 or 5 must be inverted.**

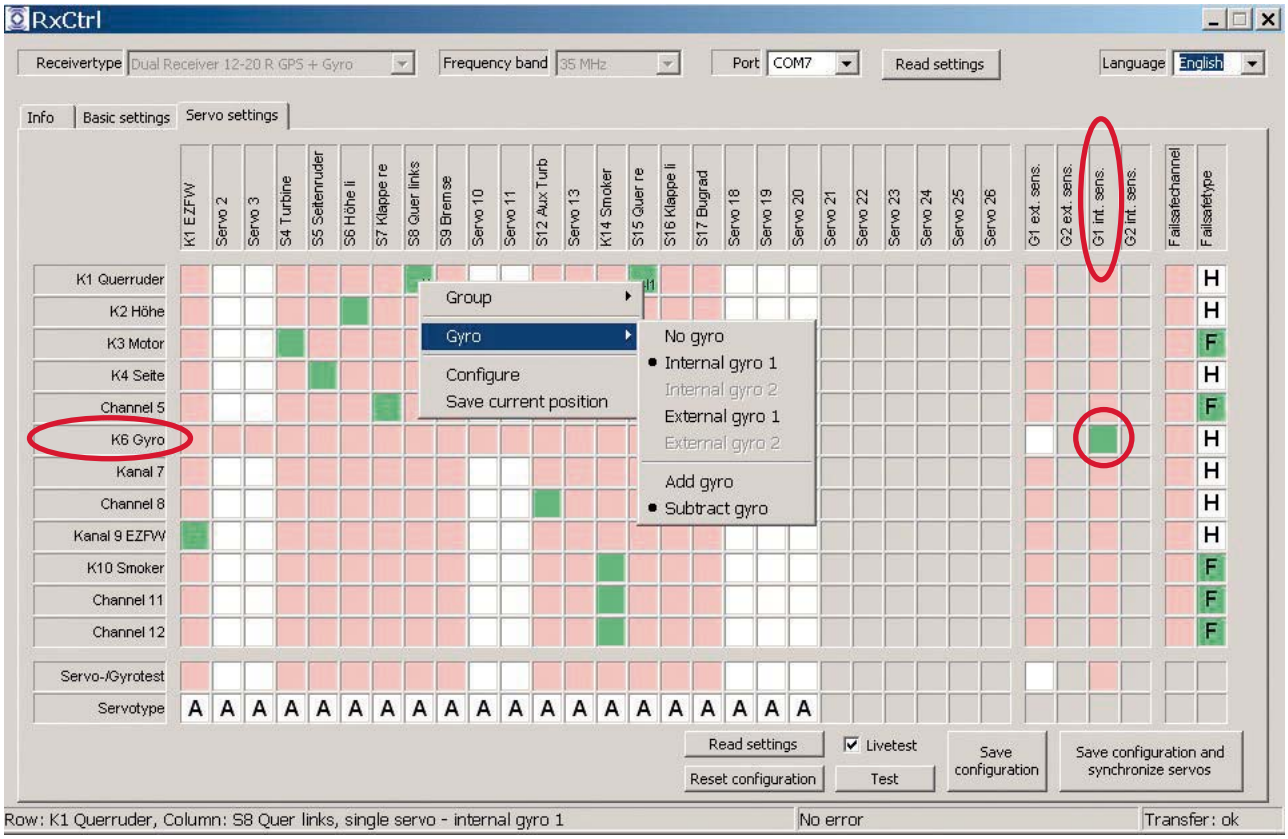


Internal gyro acts on 4 aileron servos - but only one channel is needed

Then move to "**Add gyro**" for the masterservo in the same Table. The entire group will take over the gyro, which is displayed by the sign **+I1**.

Now, it must absolutely be verified, if the stabilization function of the gyro on this wing is acting in the corrrect direction. For this purpose, turn the air plane model (viewed in flight direction) clockwise in a jerky movement and observe the aileron deflection of the corresponding wing. The aileron of the right wing must at first show a downward deflection, unless otherwise you must click on "Substract gyro" (sign -I1) instead of "Add servo". Conduct the same procedure with the other wing. The left aileron must deflect counter-clockwise upward when the fuselage is making a right turn. Otherwise, set gyro allocation from add to subtract.

It is reasonable to use a free channel for the setting of the gyro sensitivity during the flight. A slide or shaft encoder is ideal for this purpose. According to the example below the eighth channel has been selected for the internal Gyro 1. Now, during the flight the sensitivity can be set which is best suited for the model and the pilot by means of the slide/shaft encoder. When the ideal sensitivity setting as obtained from the in-flight operation should be programmed into the Dual Receiver as a fixed value, in order to obtain a free channel for other functions, then you may act as follows: The item "**Save current position**" appears in the servo configuration in the context menu under "**Configuration**". If this item is selected, then the software has access to the momentary servo position, switches the channel over to "**Servo Test**", and sets the read-out value.



Adjust sensitivity of gyro – channel 6 in this case

Condition:

- the receiver must be switched on (with at least one battery connected!)
- the transmitter must be switched on also
- the encoder position for the gyro sensitivity as obtained from in-flight operation must not have been modified.

Procedure:

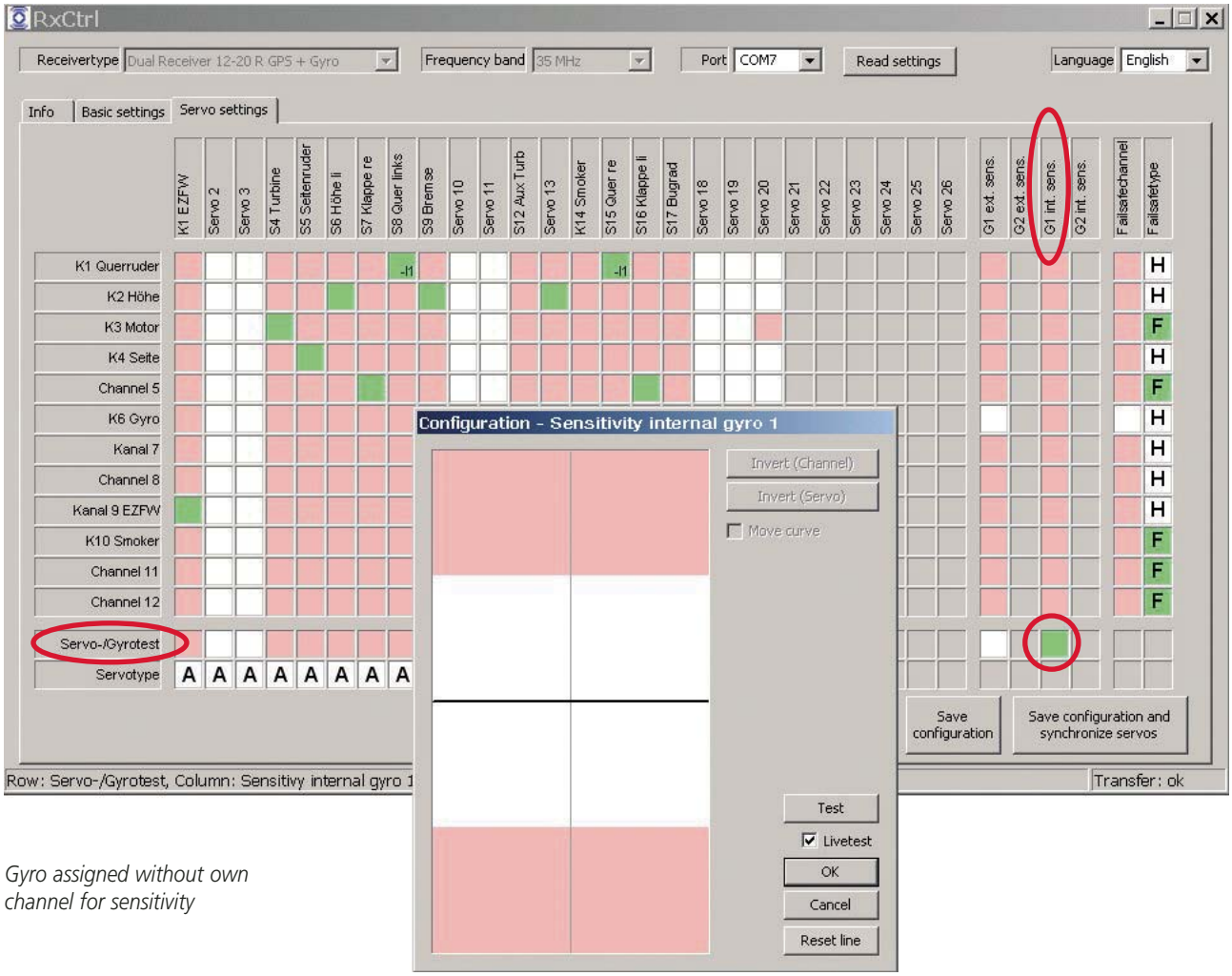
- Place gyro sensitivity to one channel
- Obtain optimum value from in-flight operation
- Land model, do not modify the gyro sensitivity
- Connect receiver with USB cable to the PC
- Switch on transmitter and receiver (if switched off in the meantime)
- Servo Configuration -> right click on the corresponding box
- and select "**Save current position**"
- Store settings

Now, the Dual Receiver has been programmed to the desired gyro sensitivity. The channel used for this purpose is free and can take over other functions.

2.3.11 Servo/Gyrotest

In the lowest line of the servo configuration a fixed position which cannot be varied through the transmitter can be specified for a servo. For this purpose you will at first establish a connection between the servo and the line Servo/Gyrotest line (click with the left mouse button), and then select the item "**Configure**" from the submenu with the right mouse button. A window opens which is very similar to the servo travel setting. But here, you can only displace a straight line and not define any points. If "**Live Test**" is active, then you can observe the changes at the model immediately. This function is ideal to determine the usable moving range of your servos. Furthermore, you can adjust the sensitivity of internal or external gyros with this function, without blocking any one channel for this purpose.

If no separate channel had been used for the gyro sensitivity, Servo/Gyrotest must in any case be connected with the individual gyro, and a suitable configuration must be conducted (green box in the screenshot below).



Gyro assigned without own channel for sensitivity

2.4 Instructions for Use

2.4.1 Switch on/off

Please first switch on transmitter and hereafter switch on Dual Receiver. In reversed order Dual Receiver gets into failsafe position because it can`t receive a valid signal. That might implicate that the gear retracts or the drive of a big glider flips open. Both is undesirable.

2.4.2 Status Displays at the Dual Receiver

The Dual Receiver has three colored status displays:

■ The red LED with the designation LOG directly above the SD/MMC card slot displays the accesses and the internal memory as well as error messages:

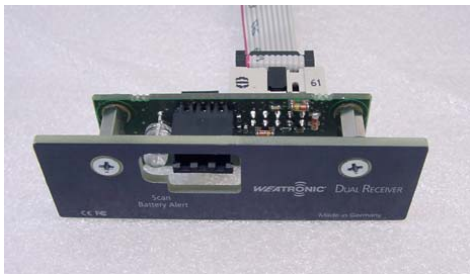
- ■ If flight data are written onto the SD/MMC card, then the LED is blinking one time every second
- ■ If a new SD/MMC card has been inserted, then the LED will be on (illuminated) continuously
- ■ If errors are occurring directly after the insertion of an SD/MMC card, then this will be displayed by a blinking in sequences:

Number of pulses	Error
2	The card is defective. Should this error not disappear even after several attempts, then replace card
3, 4	The card must be formatted in FAT-16 format (under Windows XP also abbreviated as FAT). Never use the FAT-32 format, even if this has been proposed in case of larger cards.
5	The card is full. No further data can be stored. Delete some files or format the card.

■ The **yellow LED** with the designation SCAN indicates the condition of the channel finding
■ The **green LED** with the designation GPS is blinking as soon as the internal GPS receiver has indicated a valid position. You should wait with the start of the flight until this LED is blinking. Otherwise the recorded flight data will be incomplete.

2.4.3 Status Displays at the Control Board

At the control board there is only one flashing LED which displays the used battery: One single flash for battery 1, one double flash for Battery 2.



Mount the switchboard on the wall of the fuselage with cover plate

2.4.4 Electronic Switch

In opposition to a traditional switch the Dual Receiver is not activated by means of closing a contact, but by the **removal** of a plugin bridge with the red label and the designation "**Remove before Flight**". This "Switch" does not switch any current, but only the switch-on signal; the switch-on procedure itself is done by the internal electronic switch. Thus, interferences due to vibrations or bad contacts are excluded. For switching off the Dual Receiver, the bridge must be plugged in again.

If the Dual Receiver has been connected to the PC via USB, then the switching ON/OFF is executed with a slight delay of approx. 0.5 sec.

2.4.5 Automatic Transmitter Finding

The transmitter finding is initiated by a second plug-in bridge at the operator's unit and works as follows:

■ Place switched-on transmitter next to the Dual Receiver.
■ Connect the Control Board to the Dual Receiver by means of the ribbon-type cable.

■ Plug at least one loaded battery of the type as set before into one of the two green multiplex sockets at the Dual Receiver (it has been recommended for safety reasons to use an original weatronic battery set (see E Shop under www.weatronic.com/shop).
■ Plug the bridge with the label and the designation "**Scan**" at the Control Board into the socket. The transmitter finding begins with a delay of approx. 0.5 sec. **The yellow LED at the Dual Receiver is blinking at first in a slow mode**. The frequency band (depending upon the type of the Dual Receiver, the35/36 MHz or the 72 MHz band) is now being searched. The Dual Receiver selects the signals with the highest field strength, which are emanating from the transmitter positioned next to the device. After a few seconds it has found the transmitter and is conducting a fine tuning. This is displayed by a **hectic blinking** of the yellow LED. During this phase the transmitter should in no case be moved. When the fine tuning procedure is completed, **the yellow LED goes out**. The Dual Receiver has now been adjusted to your transmitter, and you can remove the jumper again.

After every scan procedure it is very important to carry out a range test especially when you stay on the airfield where other transmitters are present. That way you make sure that your transmitter is scanned on your Dual Receiver and not on the one of your colleague. It is absolutely necessary to scan the transmitter frequency again, if you have changed the modulation from PCM Futaba to S-PCM of JR or to PPM or from PPM to one of the PCM modulations.

2.4.6 Direct Servo Control

The available output of weatronic's Dual Receiver makes it possible to directly connect a transmitter to the Dual Receiver with a cord, thus there is no likelihood that the transmitter transmits high-frequency. Simply connect the appropriate DSC-cord (go to Webshop www.weatronic.com/shop or dealer) with the last unlabeled adapter/connection (below Servo 16) and finally switch on Dual Receiver. Now, you can change the transmitter settings without distracting other pilots. It is perfect suitable for flight events or busy airports. Please read instructions of transmitter`s manufacturer carefully.

3 Flight Data

3.1 Flight Data Recording

The Dual Receiver is able to store flight data on a SD/MMC card. Suitable cards are available in the weatronic webshop (www.weatronic.com/shop) or contact your local dealer.

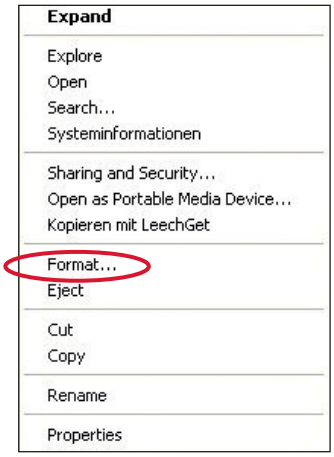
The following data will be stored:

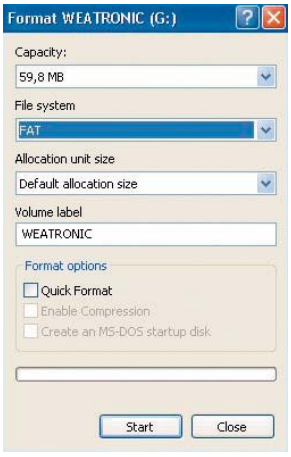
Data Recorded	Recorded Data Records per Minute
MemoryTime,Date (GPS reception only)	60
GPS Position (GPS reception only)	60
Speed (GPS reception only)	60
Altitude (GPS reception only)	60
Course (GPS reception only)	60
Temperature	60
Valid and Failsafe Frames	60
Battery Utilized	60
Receiving RSSI of Both Antennas and Preferred Antenna	600
Voltage of Both Batteries	600
Position of All Servos	600
Overall Current	60000

3.2 Data Recording on the SD/MMC-Karte

The MMC card (SD cards with a minimum of 32 MB can also be used) must be formatted with the FAT-16 file system. In case of smaller cards Windows is selecting this file system automatically, in case of larger ones FAT-16 must be specified manually (under Windows XP this is called FAT only) instead of FAT-32.

Formatting of SD/MMC cards:
- Insert SD/MMC card in card reader and take care that the write protection is not activated. Small slider on the side of the SD card must be in the forward position (in direction to the contacts)
- Under Windows Explorer click on SD/MMC drive with right mouse button
- Go to "Format"
- Select FAT, and not FAT32





The card is checked when inserted into the Dual Receiver, and eventually an error code will be issued (see Par. 2.3.1 Status Displays on the Dual Receiver). The flight data will be stores in individual files with running numbers. With each switching on of the Dual Receiver or with each SD/MMC card change a new file is set up. Thus, you can distinguish several flights easily from each other. Data is available on the SD/MMC card in the proprietary, but very space-saving NAV format and can be read out on the PC by means of an SD/MMC card reader (in the webshop available: www.weatronic.com/shop).

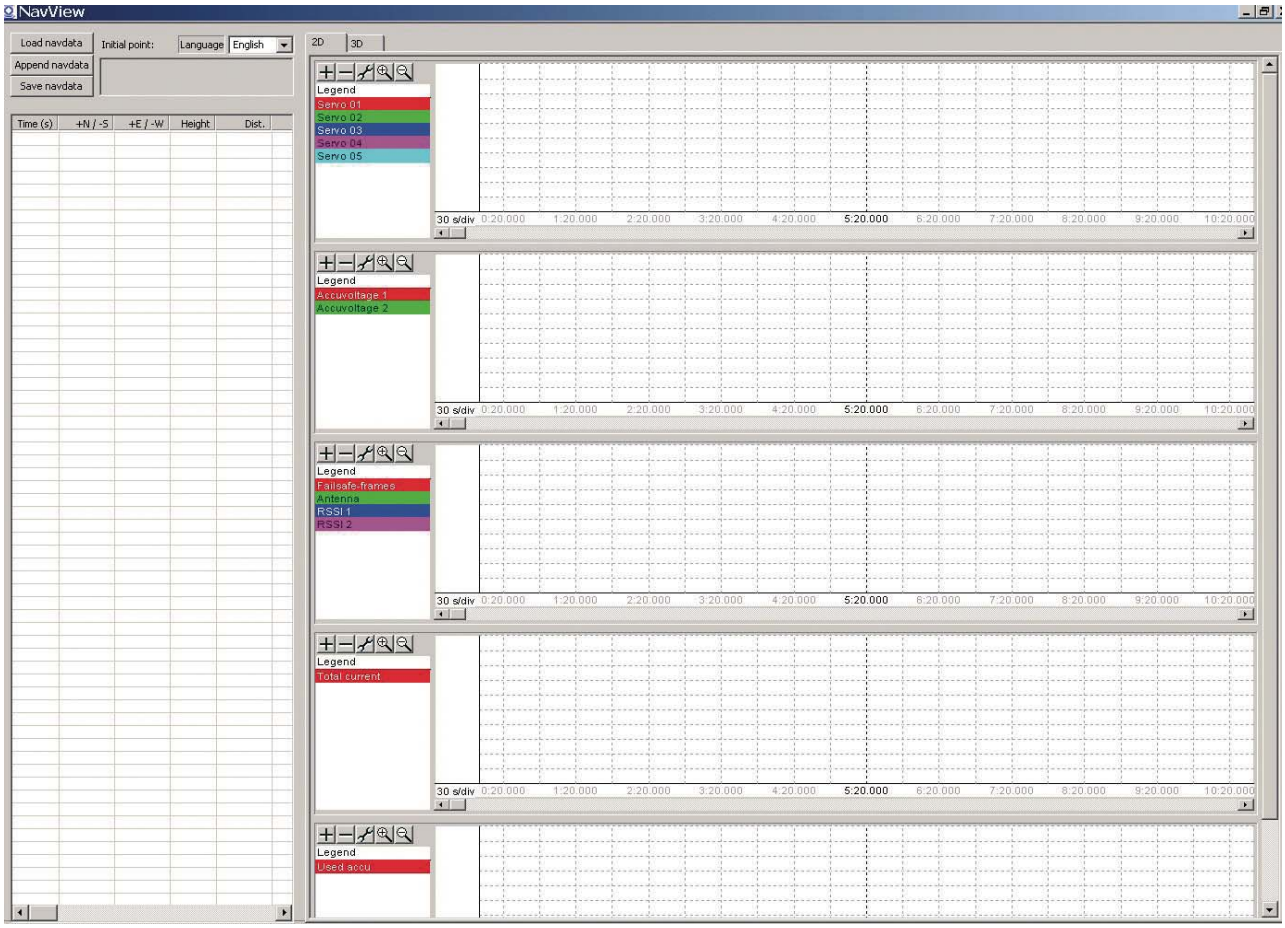
It may happen that log files on the SD card cannot be sorted out any more. You can avoid that by sticking the red Jumper "Remove before flight" into the switchboard but not by interrupting the battery connection. If log files cannot be read out any more, please format SD card again with FAT16. Don't take the SD card out of the Dual Receiver being in operation.

3.3 The Visualization Software NavView

With NavView the recorded flight data can be visualized either as diagram or as a 3D representation. For the latter function the installation of DirectX-9.0 is absolutely required.

3.3.1 Start of NavView

After the installation you will find a binding logic to NavView on the desktop as well as in the Start menu. In addition, NavView is registered as viewer for .nav files - in general, therefore, a double click on a nav file suffices to open it in NavView.



NavView (first version)

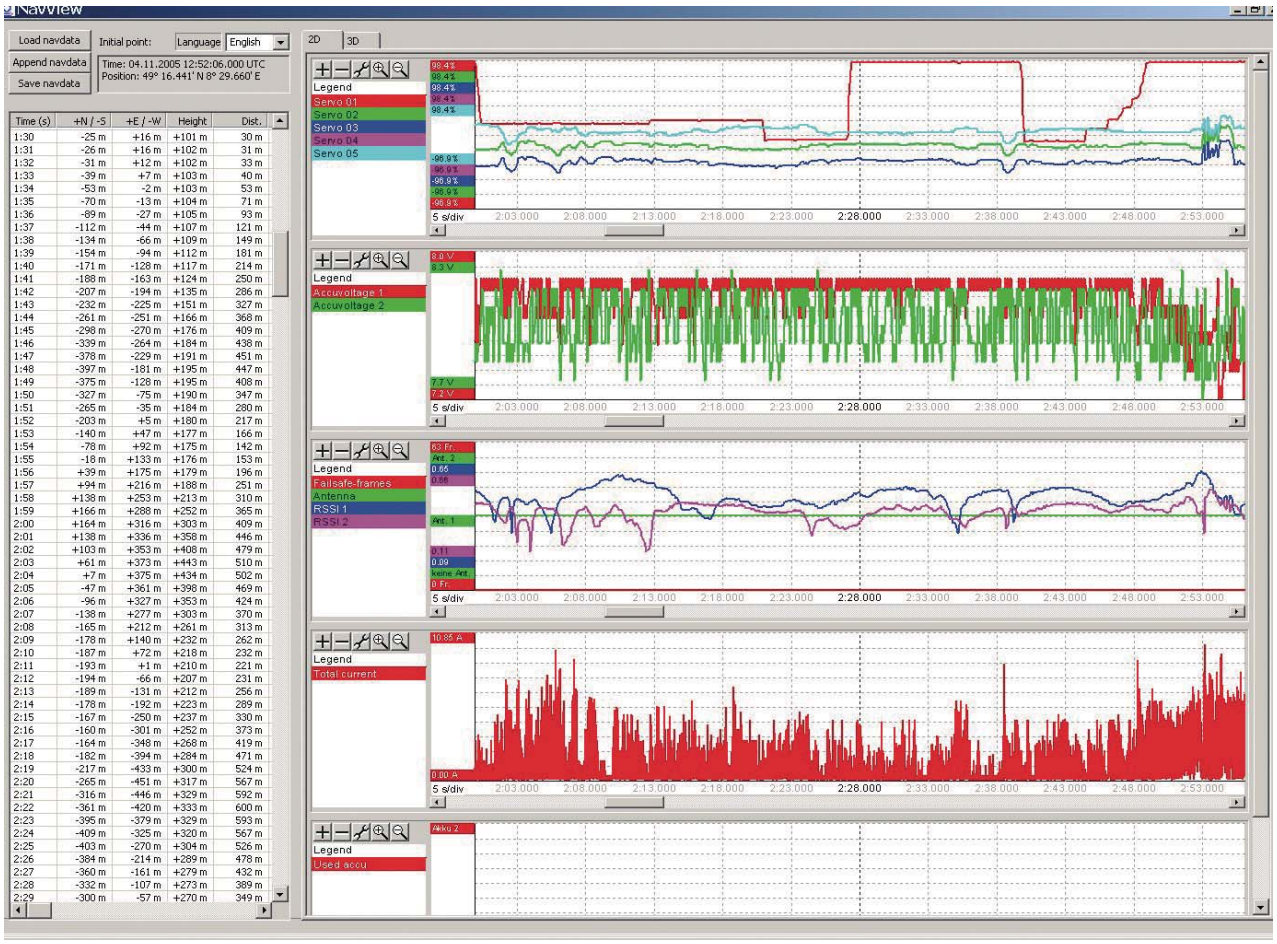
The application is grouped into three parts:
■ A table representation of the measuring data is found on the left half. Here, you can navigate within the recorded data and delete individual measuring data or entire data blocks. Some table entries are not displayed with their absolute values, but in their relation to the Start point: Time and position. Above the table you can find the absolute time, date, and position of the Start point.
■ On the right half you can see either a 2D representation (diagram) or a 3D representation. The display has been centered onto each table entry selected.

3.3.2 Loading and Storing of Log Data

You can load stored log files (e.g. directly from the SD card with the "**Load navdata**" switch. Since the GPS receiver is quite often providing illogic data at the beginning, you have the possibility, after selecting one file, to filter certain data only:

Select the first field, to filter out data records without GPS position. These cannot be used for a 3D representation at all. Select the second field, in order to filter out the date jumps occurring quite often at the beginning. When the automatic filtering is deleting too many entries, then you simply de-activate both fields and delete the superfluous entries thereafter manually.

If you have a Dual Receiver without GPS receiver available, then you de-activate both fields. The "**Append navdata**" functions in an identical manner, yet the already loaded data is not deleted here. You can store your reworked flight data again with the "**Save navdata**" switch and e.g. make them available to other model pilots.



3.3.3 2D Evaluation

Select the page "2D".

On the right half of the window you will see a 2-dimensional evaluation of the recorded flight data. This is represented in one diagram or in several (up to 16) diagrams. Each diagram can show up to 10 values - you alone may determine which these are. The number of diagrams, the mixed-in graphs as well as all options are stored and restored upon the next program start. Each diagram has 5 switch buttons:

Menu Switch	Function
"+" Add intem 	In this menu you determine which values should be displayed in the diagram. If 10 graphs are already active, then one will be deleted. In addition, you can insert another diagram into this menu or insert it under the actual one. If 16 diagrams are already active, nothing happens.
"-" remove item 	With this menu you can either delete one or all displayed values or the entire diagram. Graphs not indicated have been marked in grey.

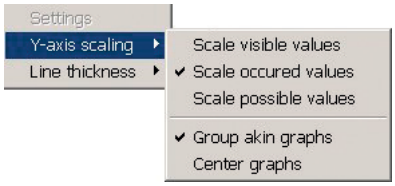
The legend is under the switch buttons - one clear color is allocated to each graph.

The diagram represents the time on the X-axis, and the recorded value on the y-axis. In the center, the x-axis shows the log entry selected on the left table. If another entry is selected, then all diagrams are moving to the new position. On the other hand, the diagram can also be drawn with the mouse - thus changing the selected entry on the table and the position of all other diagrams. The axis designation indicates the time in minutes, seconds, and milliseconds. The time per frame is found directly below the y-axis.

The axis designation of the y-axis displays the minimum and maximum measuring values only. Thus, there is space for 5 values on each diagram page - in case of 1-5 measuring values, the inscription is on the left side, and then beginning with the 6th value on the right side.

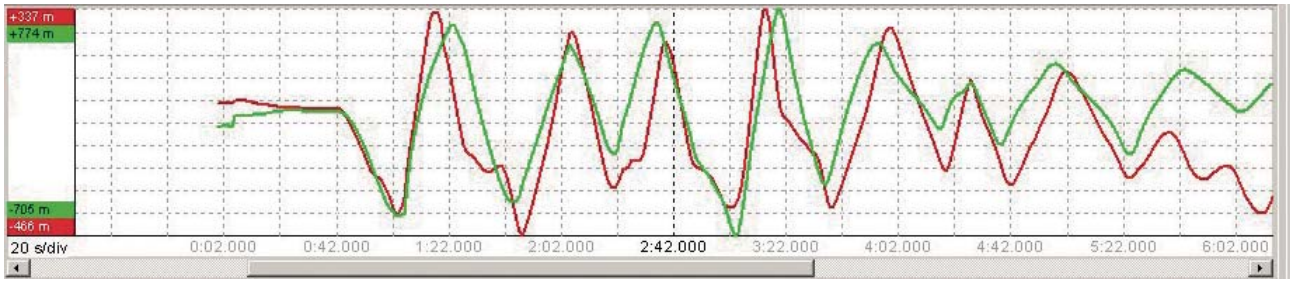
The following two switches are acting on all diagrams:

Switch, Menu	Function
"Zoom +"	This switch is for the zooming in, into the diagram - the time range displayed will therefore become smaller
"Zoom -"	This switch is for zooming out - the time range displayed will become larger



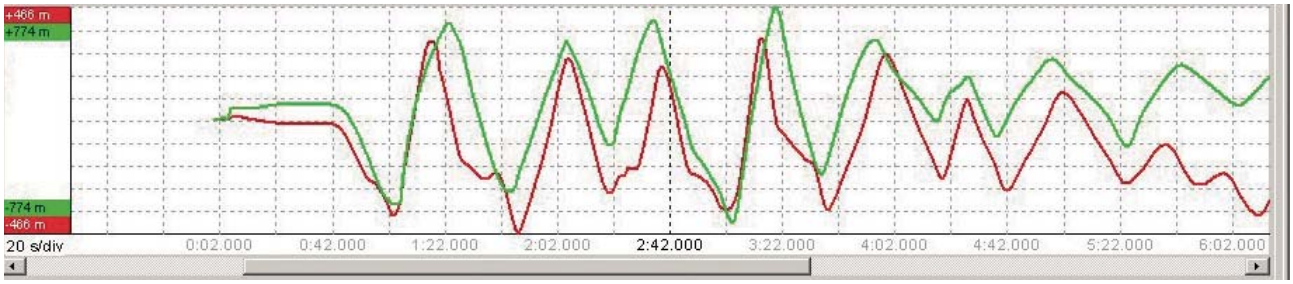
The remaining switch "**Settings**" (key symbol) opens a menu with two sub-items:

Menu Switch	Function
Maximum visible values	The y-axis scaling shows the occurring minimum and maximum values within the visible part of the diagram. If the contents of the diagram is displaced, then the axis designation will be adapted.
Maximum incurred values	The y-axis scaling shows the occurring minimum and maximum values during the entire flight.
Maximum possible values	The Y-axis scaling shows the maximum possible values (as far as this is reasonable).
Group formation	If the diagram contains similar graphs, then these graphs receive an identical y-scaling, i.e., the maximum value of all graphs is the highest maximum of all individual graphs (minimum value accordingly). (See Fig.)
Centering	The Y-scaling is selected such that minimum and maximum value are symmetrical to 0, i.e. 0 is in the diagram center (See Figure).



Beginning of flight from start point. Shown are the distances in N/S direction and in E/W direction. **Group Formation and Centering have been de-activated**. It can be discerned from the axis designation only, that the left half of the diagram represents the starting point of the flight.

Same situation, but **Group Formation is active**. It can be seen already, that the distance from the start point is almost identical at the beginning, and that the flight was then directed to the Southeastern direction.



Situation as before, but here the **Centering only is active**. It can be seen clearly, that the left half of the diagram is at the start point. But the right half is distorted, because both curves have a different Y-scaling.

Situation as before, but **Group Formation and Scaling** are active. The start position can be recognized on the left half and the moving direction on the right half. Not all the graphs are responding to the "**Scaling**" and "**Group Formation**".
Here is a list of the graphs responding:

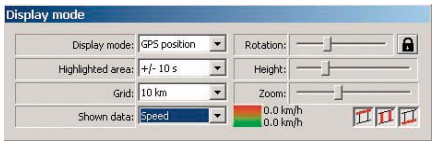
Group Formation	Centering
N/S and E/W Deviation	N/S and E/W Deviation
Battery 1 and Battery 2 Voltage	
RSSI-1 and RSSI-2	
Servo Positions	Servo Position

The line width for all graphs can be adjusted in three steps through the second menu item.

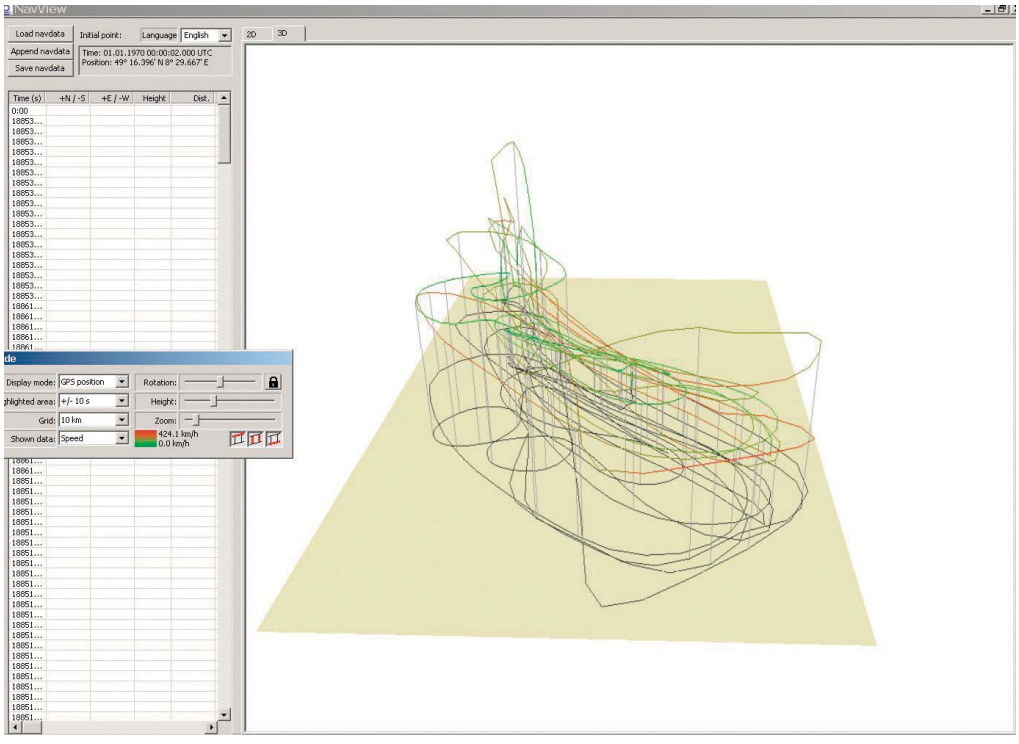
3.3.4 3D Evaluation

Select the page "**3D**".

After opening the 3D window, an additional small window is mixed in, by which all viewing options will by set. In the 3D window you can only rotate and tilt the 3D representation

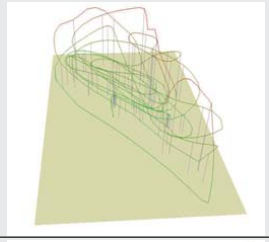
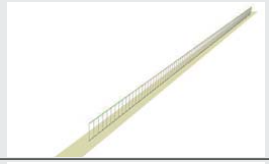
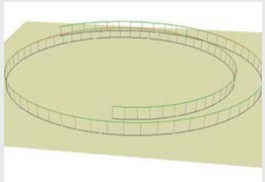


Configuration Window



The display has been centered to the selected point and cannot be displaced. In addition, this point has been marked by an arrow within the highlightened area.

But now, please see the possibilities of the Options window:

Option	Description
	Here you can switch between the three modes of representation:
Mode	representation 1. GPS-Position X, Y, and Z coordinates of the displayed curve are provided by the GPS receiver. You see the actual flight path (this requires a Dual Receiver with GPS Receiver (12-20 R Gyro + GPS) 
	2. Straight Line The data displayed are drawn up on a straight line (time line). The actual GPS position is ignored. 
	3. Spiral Representation Similar to the straight-line representation. Here, the straight line is "wound up". One round corresponds to 5 minutes of flight time. 
Highlightened area	The entire flight path is always drawn as a fine line. An adjustable area around the entry selected on the table will be highlightened in bold. With this field you can set the length of this highlightened entry, completely de-activate it or highlighten everything.
Grid pattern	The background of the 3D representation has been equipped with a grid pattern (slightly different coloring). This field allows the setting of the size of the grid field. The maximum number of grid fields has been limited, in order not to exceed the PC load - if you choose a grid pattern which is too fine, then only one part of the background is displayed.
Displayed data	Here you select which flight parameters will be displayed. Only one value can always be displayed. Next to the right of this field you see the minimum and maximum value as well as the color allocation.
Rotating angle	This slide control rotates the view around the z-axis.
Anchoring	If this switch is active, then a constant rotation angle relative to the selected list entry is being (lock symbol) maintained. If the flight path describes a curve, then the entire view rotates when running through the data points (therefore, you can "fly with" the situation).
Viewing angle	Changes the angle between ground and camera.
Zoom	This control allows you to modify the distance between the camera and the point selected.
Viewing switch	The flight path is composed of three components: ■ the colored data line (with highlightening) ■ the support lines (vertical, between data line and ground) ■ the projection line (on the ground) With these three switches you can activate or de-activate any of these lines.

4 Power Management

4.1 Operation Procedures

The weatronic Dual Receivers have an integrated high-value power unit which has been designed for the current requirement of the strongest digital servos. Current is fed from a twin battery system. During normal operation a peak-current main battery provides the energy. Only in an emergency, i.e. in the event of a cell defect, a short circuit, if empty or in case of other defects there is a switching over to a safety battery (back-up). This changeover procedure is displayed by the **red LED** at the control board which is mounted at the fuselage and which can be clearly seen from outside. Another extremely bright LED can in addition be connected to the control board (available at the E-shop under www.weatronic.com/shop).

Normally, when operating with the main battery, the **red LED** is blinking at a **2-second cycle**. If the electronic system switches over to the back-up battery because the main battery is empty or has become defective, then the red LED generates **double flashes every two seconds**. It has been recommended, to use the battery packs offered by weatronic for safety reasons.

The following battery types area available at weatronic (www.weatronic.com/shop):

- six-cell peak-current battery in NimH execution (rated voltage: 7.2 Volt, different capacities)
- two-cell peak-current Lithium-Polymer battery (rated voltage: 7.4 Volt, different capacities)

All weatronic batteries are high-quality, peak-current batteries with minimum interior resistance. They have been wired with silicon cables (0.5 mm^2 cross section) and fitted with multiplex peak-current connectors. You may of course use batteries of other offerers/manufacturers batteries, as far as they are peak-current cells with minimum interior resistance. In case of NCad or NiMH types their minimum size is Sub C.

Mignon cells must never be used, neither second quality. You are on the safe side, if you choose those cells which are also used for brushless drive systems. Lipos should at least guarantee a current load of 12 C.

The capacity of the main battery is the decisive criterion with regard to the dimensioning of the power supply. Also, you can connect additional cells parallel, in order to increase the capacity. But the rated voltage must be between 7.2 and 7.4 Volt. Normally, a capacity of 1500 mAh – 1800 mAh is sufficient for the backup battery, because it must supply the current for the duration of one flight in the worst case.

In case of large models or models equipped with a large number of servos, it has been recommended to also increase the capacity of the backup battery, so that an entire flight can be completed including sufficient safety reserves (+ 100 percent minimumly)

The red LED at the control board shows that the Dual Receiver has eventually switched over to the back-up battery. Now, the defect in the power supply system can be checked and eliminated or the batteries can be charged respectively.

4.2 Battery Maintenance / Charging

The correct treatment of the batteries is of major importance, because improper treatment or negligence may have expensive consequences and may cause the failure of the on-board electronic system. The probability of a failure of both battery packs is by far lower than when using one battery pack only. But today, and besides any pilot errors, not properly maintained batteries are still one main reason for crashes. For safety reasons weatronic recommends to use the original NiMH or Lipo battery packs, and to service and charge them with the released PC chargers.

Attention: disconnect batteries from the Dual Receiver during charging process. High voltage at the beginning of charging process may disturb the Dual Receiver.

4.2.1 NiMH Batteries

NiMH batteries do not have a remarkable memory effect, but a distinct self-discharging effect instead. Therefore, please make sure: **Discharge NiMH battery packs after the use by means of the PC charger until final charging voltage has been reached, and apply shortterm charging directly before use.** After a longer period of storage - more than four weeks - the batteries should be subjected to several charging/discharging cycles. This can be done automatically with the appropriate program of a released charger. Otherwise, the full capacity is not available any more.

Longer-term storage (possible over the winter period): Discharge NimH battery packs and store them at a temperature of + 10 to + 30 °C.

After a crash replace battery packs, even if no damage is visible from outside.

4.2.2 Lithium-Polymer Batteries

LiPo battery packs do not have a memory effect nor a remarkable self-discharging effect (less than 5 percent per year).Therefore, they can be stored in a half-charged condition without problem. They must not be discharged and then charged again before use, but they can be charged directly and completely. Ideal is the storage at 50 - 70% capacity, corresponding to a cell voltage of 3.7 to 3.9 Volt. This is also the condition in which they are delivered. The cells should be discharged before storing until their final discharging voltage only for the winter period or during very long storage. Storing in cool environment (basement) increases the service life. After three years, a capacity reduction of 20 percent must be considered.

Due to the fact that the cell voltage of the individual cells (two in case of the weatronic battery packs) is drifting apart over time, you should at best charge them by using an interim balancing device. The weatronic charger cable is ready for use including balancing device. The charger cable is connected to the battery pack at the white five-channel connector.

When charging LiPo batteries, the following items must absolutely be observed, otherwise there is a fire hazard:

- Absolutely avoid any short circuit. The terminals of the LiPo pack must in no case come in contact with metallic objects. In case of a short circuit, there will be a high current within milliseconds, which may cause immediate cell fire.
- Never cause mechanical injury of the cells, never expose them to high mechanical loads.
- Do not damage soldering lugs and do not conduct any soldering at the lugs yourself.
- If you want to be 100% sure, take the LiPo packs out of the model before the charging and store them during the charging procedure in a ceramic or metal container.
- Use exclusively those chargers which have suitable charging programs especially for LiPos.
- Make sure that the number of cells or the charging voltage respectively as well as the final charging voltage have been set correctly. Observe the Operator's Manual for your charger in this regard.
- Replace the LiPo batteries after a model crash, even if there is no damage visible from outside.
- Use charger cable with built-in balancer. See webshop www.weatronic.com/shop/

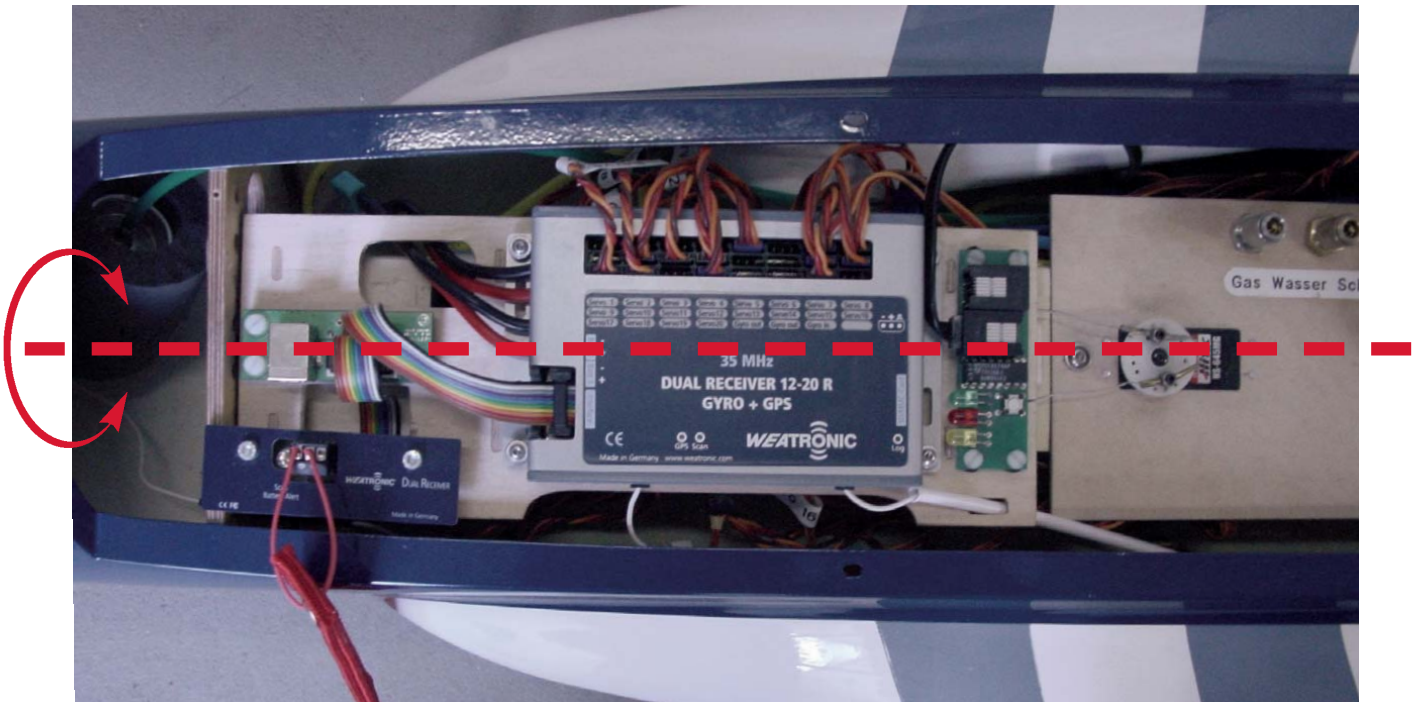
5 Unit Installation

5.1 Installation of the Dual Receiver

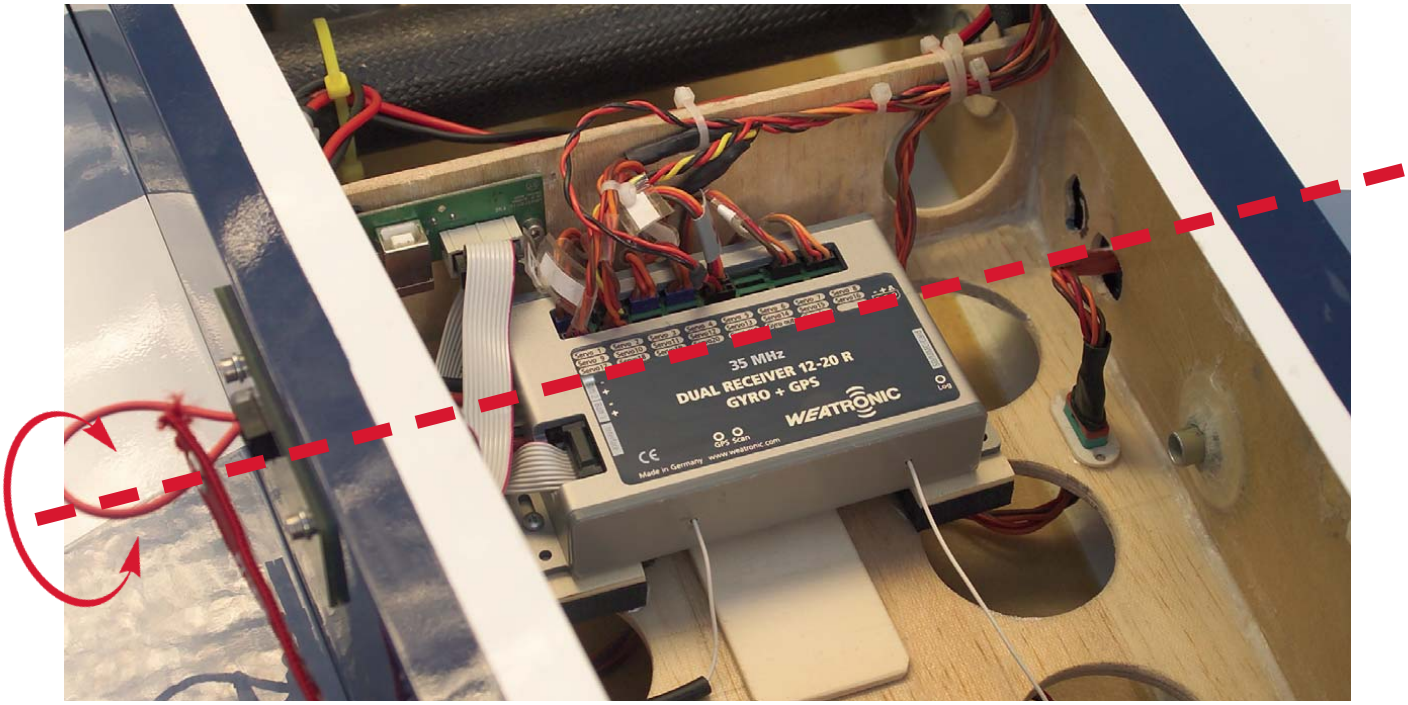
Weatronic Dual Receivers have been tested for extreme vibration loads and thermal loads. Nevertheless, the unit must be protected against permanent mechanical loads such as those from a combustion drive unit and those from the heat of an exhaust system. The most vibration-sensitive components of any receiving device are crystal elements. Dual Receivers are also using built-in crystal elements. Do not install a Dual Receiver in the direct neighbourhood of the exhaust system.

For best solution, attach the Dual Receiver with sponge rubber on a base plate in the fuselage in horizontal position. In case of "floating" installation, however, you have to calculate a restricted function of the gyros (in the versions 12-20 R Gyro, 12-20 R Gyro + GPS and 12-26 R Gyro II + GPS). It is import to install the device horizontally and parallel to the fuselage middle axis.

If installed in the way as shown on the next foto gyro operates on the longitudinal axis (ailerons). The 12-26 R Gyro II + GPS operates on both transversal and longitudinal axis.



Thus installed the gyro operates on longitudinal axis



Now operating on transversal axis

5.2 Installation of Batteries

Install the two battery packs always before the Dual Receiver, viewed in flight direction, because they will develop a high destruction potential due to their weight, in the event of a crash or a rigid impact. Ideally install them in vertical position at one rib by means of cable fixtures and an interim layer of at least 10 mm (in thickness) cellular rubber. Make sure that the battery cables are not bent nor routed in two tight bends. They must have sufficient clearance and, if required, be attached by another fixture at half of their length.

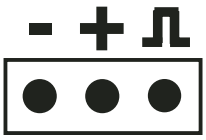
5.3 Connection of Batteries

Choose a suitable battery pack from the weatronic accessories offer. Plug in the green multiplex socket or the larger battery, i.e. the main battery at the terminal BATT 1 of the Dual Receiver. Any reversing is not possible due to the projecting rib in the plug/socket housing. Connect the back-up battery, i.e. the smaller one with BATT 2. In case of LiPo batteries connect those with the Dual Receiver in the same way - main battery to BATT 1, smaller one to BATT 2. **It is better to charge Lipos while kept outside of the model.**

5.4 Connection of Servos

Simply plug servo cable to the desired servo outputs of the Dual Receiver and conduct the desired allocation.

Important: The servo connectors must be plugged in as specified by the symbol on the plug board



A reversing is possible and can be recognized by the non-functioning of the corresponding servo. But there will be not damage to the servo or the Dual Receiver.

It is absolutely necessary to use **twisted cable** with 0.35 mm^2 cross section. The servo cables - e.g. for the control machines installed in the elevators - must be routed at maximum distance from the antenna cables. Better than using a plug connection is to solder the extension cable and to insulate and stabilize it with a shrink hose. Besides, observe the Operator's Manual for the servos. Before conducting the servo travel setting and the synchronization, the servos including rod system or tackle lines should be installed correctly.

Caution! In case several servos are acting on one control, then do not yet attach rods at the control!! First test direction of servo rotation and reverse running direction if necessary (See Par. 2.2.6).

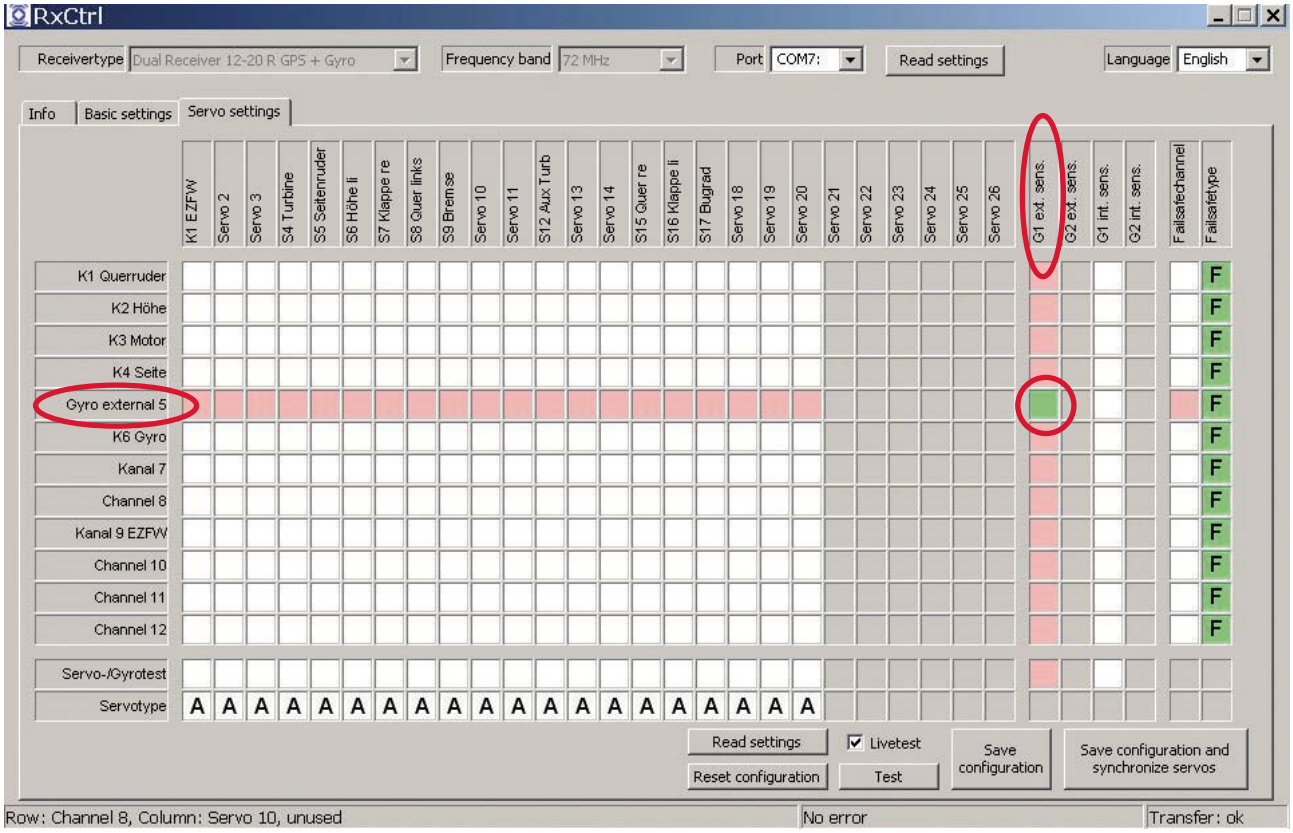
5.5 Connection of External Gyros

External gyros have in general three connections: The setting input, the sensitivity input (which is connected to the receiver), and the servo output (to which the servo to be triggered will be connected). But this connection variant is not compatible with the group formation of the Dual Receiver. Therefore, all three connections of the external gyro are connected to the Dual Receiver:

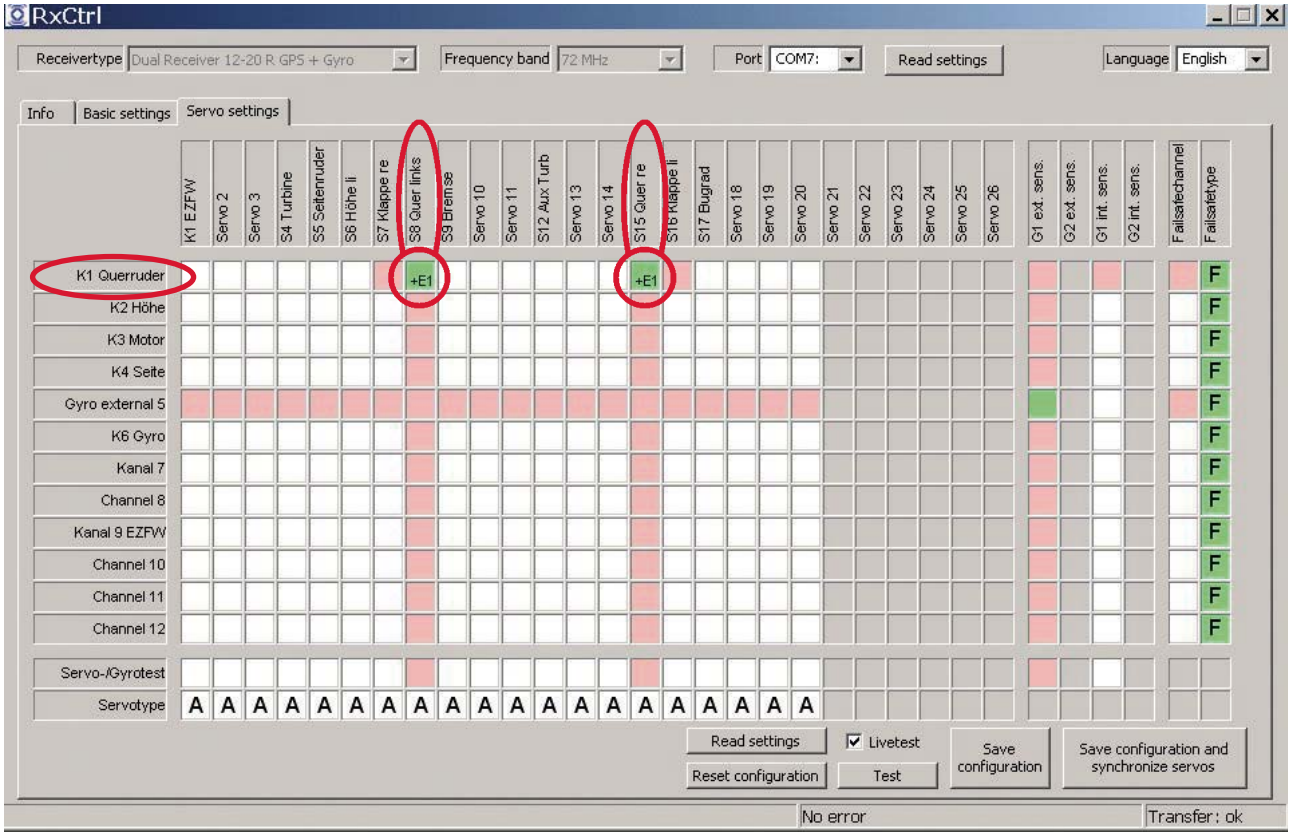
- Both external gyro inputs are connected to the gyro-OUT connections of the Dual Receiver. Both connections are equal, i.e., it does not matter which of the two connections you are using for the control and the sensitivity input of the gyro.
- The external gyro output is connected to the Gyro-IN connection of the Dual Receiver. Therefore a connector cable is needed with female connectors on both ends.

The servos to be stabilized will not be connected to the external gyro, but to the Dual Receiver, as with all other servos as well. The allocation of one external gyro to one or several servos is executed in the servo configuration (as described in Par. 2.3.4 Servo Allocation).

You can also connect an external gyro as usual between servo and Dual Receiver. In this case you have to choose a free channel as well as a free servo exit to operate the sensitivity. See next picture.



Sensivity of external gyro on channel 5...



....and in this example operating on channel 1 for both servos (ailerons)

5.6 Routing of Antennas

Dual Receivers have two antennas, which should be mounted in a not too narrow angled position to one another, in order to obtain optimum receiving conditions. **The best possibility for plane models**: Use a rod-type antenna on the fuselage. Cut stranded wire of antenna cable by the length of the whip. Solder stranded antenna wire with plug connector and protect against rupture from vibration by means of a shrink hose.

Caution! In case of carbon fiber fuselage the rod-type antenna must be electrically insulated. In such a case it should be bolted to a small plywood board which is glued onto the fuselage.

The second stranded antenna wire must be routed inside the fuselage to the rear. Best is to use a plastic tube (but not made of carbon fiber at all !!!) with a sufficiently large interior diameter (minimum 2.2 mm) and glue it inside the fuselage with superglue or a artificial resin glue. Insert antenna. If length of fuselage is not sufficient, then let excessive antenna cable look out of the fuselage, hanging downward. If there are cables and stranded control wires leading inside the fuselage towards the rear, then it may be more reasonable to route the second antenna cable in one of the wings, because cables or stranded wires running parallel to the antenna will cause antenna interferences.

In case of carbon fiber fuselage the second antenna must be routed outside the fuselage also! Otherwise there will be no reception !!

In a helicopter the antenna should be routed to the rear inside the fuselage, the exceeding end part should be guided out of the fuselage.

Let second antenna hang out of the fuselage downward, near to the Dual Receiver. The overall length of the antenna should not be less than 1 meter, no problem if longer.
Caution!!! Antennas must never be routed inside of carbon fiber fuselages or carbon fiber wings, because carbon fibers are electric conductors, and they would screen the antenna completely.

5.7 Checking of Cables and Soldering Joints

We recommend to check all cables routed in the model regularly for damage and inspect those areas that include a breaking hazard, and to replace in case of doubt. Cables include a strong breaking hazard especially on the soldering joints in vibration-loaded models with combustion engine. Always protect soldering joints with a shrink hose of suitable diameter.

6 Safety Instructions

6.1 Debugging of Electric Motors

Conventional electric motors with brushes must be debugged with suitable capacitors, because sparks could be generated which may then interfere with the functions of the on-board electronic system. Especially the pump motors for the fuel supply of jets must be debugged. Please observe the related instructions in the Operator's and Installation Manual of the motors / pump.

6.2 Electronic / Magneto Ignition

Electronic ignition systems and magneto ignition systems of combustion engines are causing interferences which may considerably deteriorate the remote control function and which may extremely reduce the range.

Always supply the electronic ignition systems by a separate battery, which should be placed next to the engine using a short line. Use debugged spark plugs, spark plug connectors, and screened ignition cables only. Keep the on-board electronic system in sufficient distance from the ignition system.

6.3 Cable Routing for Jets

The ECU should not be placed directly next to the Dual Receiver (minimum distance 10 cm = 1/3 foot). The cables of the ECU (battery, pump, data bus, cable to turbine) should be routed separately from other cables of the on-board electronic system and the servo cables!

6.4 Range Test

Before the first flight on unknown airfield locations as well as upon installation of new components into the model, a range test is absolutely necessary. Have the model secured by an assistant and start engine or turbine. Go away from the model, while the transmitter antenna is not pulled out (i.e. one antenna element pulled out) and directed toward the model, until the controls do not respond any more and remain in the prior position. If Failsafe has been configured, the servos are moving into the set positions, when the Dual Receiver does not receive any usable signals any more for more than half a second. Uncontrolled deflections do not occur with the Dual Receiver, only in the PPM mode the servos will start to tremble slightly in the limit range. If the accelerator function has been programmed to Idle in the failsafe, then the engine or the turbine respectively must change to Idle, as soon as the range limit has been reached. The range, up to which all functions are still working properly should be at least 80 meters on the ground. Otherwise the cable system and/or the arrangement of the electric and electronic components in the model must be improved.

The transmitter battery must of course be charged. Older transmitters should be sent to the manufacturer every two years for review. Especially the transmitters with high-frequency synthesizer modules have quite often a clearly smaller range than the crystal versions.

7 Exclusion of Liability / Damages

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Weatronic gmbh cannot supervise the observation of the Installation and Operations Manual, nor the conditions and methods during installation, operation, application, and maintenance of the components of the on-board electronic system. Therefore, weatronic gmbh does not take over anyliability for loss, damage, or costs resulting from any incorrect utilization and operation, or being related hereto in any way As far as legally permissible, the obligations of weatronic gmbh for any compensatory damages, notwithstanding for whatever legal reason, are limited to the invoice value of the number of goods from weatronic gmbh which have been directly involved in the event that caused the damage.

Annex 1

Technical Data Dual Receiver

Double DDS Diversity Double Superhet Synthesizer
Automatic frequency finding
Operating voltage: 6 to 9 V
Current consumption: 250 mA, standby: 30 µA
Channel grid: 10 KHz
Finding grid: 50 Hz
Sensitivity: 1.5 µV / -104 dBm
Channels: 12
Servo outputs: 12/20/26, max. 8 servos per channel
Type of modulation: Futaba PCM 1024, Graupner/JR SPCM, PPM UNI, PPM-12, PPM MPX
Resolution of control channels: 1024 steps
1 internal gyro for longitudinal axis, adjustable sensitivity[1]
2 internal gyros for tranversal and longitudinal axis, adjustable sensitivity[2]
Programmable Failsafe
Programmable servo characteristic curves
Automatic servo synchronization
Frequency: 35 A+B, 36 MHz, 72 MHz
Electronic switch ON / OFF
External control board
USB connection
Data memory: SD/MMC card
Memory capacity: 1 h internally, 8 h on 64 MB SD, 48 h on 512 MB SD
Memory data: RSS1+2[3], battery voltage 1+2, current consumption, valid frames, failsafe frames, battery changeover switch, servo positions, antenna changeover switch, service temperature
GPS data logging[4]: Position, speed, altitude, distance, flight path recording
Operation software RXCTRL
2D/3D graphics software NAVView
memory software NAVtoCSV
Double power supply: Two six-cell NimH batteries each or two two-cell Lithium-Polymer batteries
Temperature range: 0°C to 60°C
Antenna length: Two times 1,000 mm
Dimensions: 110 x 77 x 25 mm
Weight: 170 - 182 g (depending on the version)

System requirements of the PC for the operation software:

Processor: Intel Pentium, min.200 MHz
Free RAM: min. 32 MB
Free disk space: 5 MB
USB connection (V1.1 or better)
DirectX-9 compatible graphics card
Operation system: Windows-XP
Screen resolution: min. 1024 x 764 pixel
CD drive (as of 1x)
SD/MMC card reader

[1] valid only for 12-20 R Gyro and 12-20 R Gyro + GPS

[2] valid only for 12-26 R Gyro II + GPS

[3] RSSI = relative signal strength indicator

[4] valid only for 12-20 R Gyro + GPS and 12-26 R Gyro II + GPS

Annex 2

Firmware Update of weatronic Dual Receiver

1. Format SD card with FAT16 (under Windows-XP called "FAT"). Don`t use FAT32-system. Unlock write protection of SD card and insert in USB cardreader. Format card by clicking in Windows Explorer with right mouse button on correspondent drive, choose FAT in list "Format" with left mouse button, not FAT32.

2. Copy file FIRMWARE.BIN on SD card. Don`t rename FIRMWARE.BIN under no circumstances.

3. Insert SC card into Dual Receiver without connecting to batteries or to computer (neither batteries nor USB bord is allowed to connect).

4. Switch on Dual Receiver by means of USB connection to computer. Log LED (red) blinks for some seconds. Hereafter all LEDs start blinking for a while. When all LEDs have stopped lighting update was successful.

5. Switch off Dual Receiver and take SD card out of slot. Do not take SD card out if batteries are connected with Dual Receiver.

6. If you need to update more units, continue with step 3.

Possible problems

In some rare cases it might happen that update was interrupted and Dual Receiver is unable to update the firmware.

Then follow procedure above – step 1 till 5 - with an older version of firmware first, then with new firmware.

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