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Instructions

MULTIPLEX®

1.　Contents

2. Introduction

We are delighted that you have decided to purchase the MULTIPLEX *ROYALpro* radio control system.

The *ROYALpro* is the result of a consistent programme of development through the *ROYAL* series. The new *ROYALpro* retains many familiar and proven features from the *ROYALevo* in combination with new features suggested and requested by our large circle of users.

Transmission
- Modern HFM-S M-PCM/PPM Synthesizer RF module with convenient menu-based method of changing channels
- Channel display and security query when switching on, Channel-Check / Scanner as retro-fit option *
- Newly developed **M-PCM** modulation offering twelve fast, high-resolution servo channels

*Options:
See the main MULTIPLEX catalogue for available frequencies.

Operation
- Digital trim system
  easily accessible cruciform trim buttons, trims specific to each flight phase, clearly arranged graphic on-screen trim display, audible support, variable trim increments
- Voltage display and battery monitor with variable warning threshold (battery voltage) and audible alarm
- Battery management system
  Transmitter battery monitor with display of residual charge in mAh, plus calculated display of remaining operating time in hours
- Servo monitor
  with graphic or numerical display, for checking model settings
- Code lock PIN (4-digit) for securing the transmitter against unauthorised data access

Hardware
- Modern, ergonomically efficient case design with ultra-precise, individually variable, swivelling ball-raced stick units for use hand-held or in a tray
- Graphics-capable folding screen (132 x 64 pixels) with variable contrast
- Modern FLASH processor technology; simple update via the Internet when new software versions become available
- MULTIPLEX multi-function socket fitted as standard: acts as charge socket, Trainer mode interface, PC interface (PC update, data back-up, flight simulator)
- Selective Trainer mode operations
  facilities provided as standard; unique Quick-Select control assignment

- Timers for total transmitter operating time and model operating time (model-specific)

Programming
- Clearly designed, efficiently structured menus for simple programming
- Optional keypad or two 3-D digi-adjusters for programming
- Clear text menu system, screen texts can be displayed in various national languages

Model-specific settings
- Flight phase switching
  With up to four flight phases for fixed-wing models and helicopters, variable transition time
- Dual-Rate and Expo, variable for each flight phase separately
- Five-point servo adjustment
  Servo travel right / left, centre and two intermediate adjustment points allow compensation for linkage inaccuracies and mechanical travel discrepancies
- Three timers (slot, sum, interval)
  With variable alarm time and audible alarm
- Separate timer for the model's total operating time
- Convenient model memory management
  Unrestricted model names, up to sixteen characters, copy and erase functions
- Comprehensive set-up and mixer facilities for fixed-wing model aircraft and helicopters
- Eight model templates cater for many different model types and help to minimise the programming effort required

Differences between transmitter versions:

	ROYALpro		
	7	*9*	*12*
Channels	7	9	12
Model memories	15	20	36

We are confident that you will rapidly learn to appreciate your *ROYALpro* once you have taken a little time to familiarise yourself with its facilities. These operating instructions are intended to guide you through this process. The system will give your endless hours of pleasure in our mutual and fascinating hobby of model sport.

Yours - the **MULTIPLEX** team

2.1.   The *ROYAL**pro*** philosophy

At the design stage of the *ROYAL**pro*** we placed particular emphasis on high-level user-friendliness, flexibility and maximum standardisation.

The **user-friendly** aspect results from the clearly arranged menu structure, the informative and well laid-out menus and the large number of useful "little touches" which make it easier to program and use the transmitter.

The transmitter's **flexibility** is due to a combination of two features: the large number of facilities which are pre-defined and ready to use, and the ability to vary almost all of them exactly as you wish. Transmitter controls (sticks, sliders and switches) and servos can be assigned without restriction, and the pre-defined mixers can be modified in any way you like.

You can create your own "standard" by fine-tuning the pre-defined mixers and assignment lists to suit your personal preferences and applications.

Standardisation makes it easier and more intuitive to program the transmitter. Pre-defined model templates, mixers and assignment lists ensure that you can set up a new model memory with just a few button-presses, and it is then ready for immediate use.

Chapter **"11. The *ROYAL**pro*** philosophy"** describes the background to the system and related facilities, and is intended to help you understand the way the transmitter works. It is therefore particularly important to read this section.

2.2.   Arrangement of the instructions

In addition to other subjects, **Part 1** (Chapters 1. to 10.) contains important information on the subject of safety ✆. This section also includes all the information you need concerning the transmitter's hardware.

Essential reading!

Part 2 (Chapter 11.) concentrates on the **HOW** and **WHY** of the *ROYAL**pro***'s wide-ranging software functions. This background information makes it much easier to understand the sequence of operations when programming the transmitter.

Part 3 and **Part 4** describe *step by step* how to program a **fixed-wing model aircraft** and a **model helicopter**.

First the basic functions (aileron, elevator, rudder, throttle / collective pitch, roll, pitch, yaw) are "brought into play".

After this the text explains the essential steps required to expand and refine the model's functions.

Part 5 contains a detailed description of all the menus, the model templates, the default transmitter control settings, the switch assignments and much more.

Arrangement of the instructions

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✆ **This character indicates chapters which are safety-related. It is essential to read and observe these sections!**

3. Safety Notes

These operating instructions are an integral part of the product, and contain important information and safety notes. Please store them in a safe place, and be sure to pass them on to the new owner if you ever dispose of the product.

Observe the safety notes!
Read the instructions carefully!
Do not switch the system on until you have studied these operating instructions and the safety notes which follow (either included in the instructions, or supplied separately).

Warning!
Radio-controlled models are not playthings in the usual sense of the term. The construction, the installation of the RC system and the method of operating the models require technical expertise, care and responsible, safety-conscious behaviour. Errors and neglect can result in serious damage or injury. However, since we as manufacturers have no means of ensuring that you build and operate your models competently, all we can do is expressly point out these hazards. We deny all liability.

A model which goes out of control, for whatever reason, can cause severe personal injury and serious damage to property. It is fundamentally essential that you take out suitable insurance to cover this risk.

Under no circumstances is it permissible to carry out technical modifications to your radio control system. Use genuine MULTIPLEX accessories and replacement parts exclusively; this applies in particular to the transmitter battery, aerial, expansion units, additional hardware items, …).

If you operate the transmitter in conjunction with products made by other manufacturers, it is up to you to ensure that they are of good quality and work properly. Every time you set up a new or modified chain of products, you must ensure that all the functions work properly, and carry out a range check before flying the model. Do not be tempted to fly the model if something is not in order: first seek out the problem and eliminate it.

Have your radio control equipment (especially transmitters and receivers) checked at regular intervals (every two or three years) by an authorised MULTIPLEX Service Centre.

Operate your transmitter only within the permissible temperature range (➔ 7.). Please note that condensation can form inside the transmitter if it is subjected to a rapid change of temperature (e.g. warm car, cold flying field). Damp has an adverse effect on the operation of the transmitter and any other electronic items.

If damp is present in any electrical device, cease operations immediately, disconnect the power source, and allow the unit to dry out thoroughly, preferably with the case open. This may take several days. After this, carry out a thorough check of its operation. If you have the slightest doubt, send the device to an authorised MULTIPLEX Service Centre for checking.

This radio control system may only be operated legally on particular channels / transmitter frequencies, which vary from country to country. In some regions official formalities have to be completed before the system can be used. Please read the notes included with the system.

Always program a new model at home in peace, and check all functions carefully. Make sure you are familiar with the methods of programming and using the transmitter before you operate your model outdoors.

Always keep to the correct sequence when switching on and off, as this avoids the possibility of the power system switching itself on unexpectedly: this can be a serious hazard:

1. When switching on:
   first switch transmitter ON,
   then switch receiver ON,
   then connect flight / drive battery
     or switch power system ON.
2. When switching off:
   first disconnect flight / drive battery
     or switch power system OFF,
   then switch receiver OFF,
   then switch transmitter OFF.

3.1. General safety notes

Build your model carefully:
- Install and adjust all control surface linkages in such a way that the surfaces move smoothly and freely, and are not stalled at maximum travel. Don't limit servo travels at the transmitter; it is always better to adjust the system mechanically, i.e. the horns, levers and pushrods. Avoid lost motion (sloppy linkages). These measures are essential in order to minimise the load on the servos. This in turn allows them to perform at their best, and they will also last longer and operate more reliably.
- Provide effective protection from vibration to the receiver, battery, servos and other RC and electronic components (danger of electronic component failure!). Read and observe the advice included in the appropriate operating instructions. Of course, this also includes the avoidance of vibration in the first place: balance propellers and rotor blades before use, and replace them at any sign of damage. Install I.C. engines on vibration-absorbing mounts, and replace motors, engines and motor parts which are damaged or do not run true.

- Do not place leads under tension or kink them; protect them from rotating parts.

- Avoid unnecessarily long or superfluous servo extension leads. Leads longer than about 30 to 50 cm should be fitted with separation filters (ferrite ring # 8 5131 or separation filter lead # 8 5035), and must be of adequate conductor cross-section (voltage loss). We recommend at least 0.3 mm^2.

- Do not shorten or coil up the receiver aerial. Never deploy the aerial parallel to conductive parts such as metal pushrods, or inside fuselages with a shielding effect (made of or reinforced with carbon fibre, metallic painted finish). Do not lay the aerial on electrically conductive model components. Whip aerials are recommended for large-scale model aircraft. **Read the instructions supplied with your receiver!**

- Ensure that the receiver power supply is of adequate capacity. For servos up to about 40 Ncm torque you can estimate the required battery capacity using the following formula:

  Capacity [mAh] $\geq$ Servo count x 200 mAh

  If in doubt, always use the next larger size of battery unless weight or space make this impossible.

- Moving parts made of conductive materials (e.g. metal linkage components or pushrods) must not be allowed to touch each other. They produce metal-to-metal "noise" interference which has an adverse effect on radio reception.

- Interference caused by static charge and powerful electrical or electro-magnetic fields should be avoided by suitable suppression measures (e.g. suppress brushed electric motors with suitable capacitors, fit petrol engines with shielded sparkplug connectors, suppress ignition leads and ignition units), and keep such items well away from the RC system, the receiver aerial, wiring and batteries.

- Maintain an adequate distance between high-current cables (e.g. electric power system leads) and all the receiving system components. In particular, the leads between brushless electric motors and their speed controllers should be kept as short as possible (guideline: max. 10 to 15 cm).

- The receiver can be shielded from interference generated by speed controllers by the use of suppressor filters (ferrite ring # 8 5146 or suppressor filter lead # 8 5057).

Check your model at regular intervals:
- Ensure that control surfaces and their linkages move freely, smoothly, and without lost motion.

- Ensure that pushrods, other linkages, hinges etc. are stiff enough, and are in perfect condition.

- Carry out a visual check for fractures, cracks, possible shear points etc. on the model itself, and in its components such as the RC and power systems.

- Check that all electrical leads and connectors are in perfect condition, and are making sound contact.

- It is essential to examine the airborne power supply and its wiring at regular intervals. This includes the switch harness, and the external condition of the battery.
  Regular maintenance also covers the battery (conditioning by repeated charge / discharge cycles), and regular checks of the voltage curve and capacity. This requires the use of a battery charger and a charge process which is suitable for the type of battery in use.

Pre-flight checks:
- Charge the transmitter, receiver and flight batteries carefully, and ensure that they are in good condition during pre-flight checks and between flights.

- At the flying field your first job is to check with the other modellers present whether your own channel / transmitter frequency is free. If there is a flight director or site warden, be sure to register with that person, and make sure you understand the type of frequency control in use.
  Only then switch ON!
  Ignore this, and you risk a "channel clash" (two transmitters on the same frequency)!

- Carry out a range check with the transmitter aerial fitted, but collapsed. (➔ 3.2.).

- Ensure that the correct model memory is active.

- Check the function and effect of all primary and secondary control systems.

> ❽ **If you discover anything doubtful: do not fly! Locate the fault, eliminate it, then check again.**

When operating the model:
- If you have never flown a radio-controlled model, it is really essential initially to ask an experienced model pilot for help. A Trainer (buddy-box) system is ideal for the first steps in learning to fly.

- Models should only be operated at suitable sites.

- Never fly or drive over or towards spectators.

- Do not carry out any high-risk flying or driving manoeuvres.

- It is tempting to over-estimate your own ability and skill. Don't do it: keep within your limits.

- If you detect any sign of a problem or interference, land or cease operations immediately.

- **Caution: static electrical charges!**
  In extremely dry air (in mountainous terrain, in a mountain bowl, close to weather fronts) static charges tend to build up in the transmitter and / or the pilot. The discharge takes the form of static sparking, which can endanger the pilot, and cause interference or damage to the transmitter.
  Counter-measures:
  Cease operations as quickly as possible, and walk a little way down the mountain in order to find a less exposed location.

- **Keep at least 2 m away from mobile phones!**
  We recommend that you stand at least 2 m away from mobile telephones when operating your model, as the high output of these devices may cause interference to your transmitter or RF module. In general terms we recommend that you switch off mobile phones and any other equipment which could affect the concentration of pilots.

ESD notes for electronic sub-assemblies:

The sub-assemblies of radio control transmitters (main circuit board, RF module, Channel-Check module, Scanner module) are fitted with electrostatically sensitive components. These parts can be destroyed or their useful life shortened if static discharges take place (potential equalisation through electro-static discharge) when the sub-assembly is touched.

The following protective measures are essential if you have to handle electrostatically sensitive sub-assemblies:

- Before fitting or removing such assemblies, equalise the potential difference between yourself and your environment (e.g. by touching a heating radiator).
- If necessary, open the main device and touch it over a large area, in order to equalise the potential relative to the base unit.
- Do not remove the sub-assembly from the conductive anti-static bag until you have equalised the potential. Avoid touching electronic components or solder pads directly. Hold the sub-assembly by the edges of the circuit board only.
- Once removed from the basic device, the sub-assembly should only be stored in the conductive anti-static bag in which it was delivered. Never allow the sub-assembly to make direct contact with a conventional, non-ESD compatible container made of foam, Styrofoam or other plastic.

3.2.   Range checking

Regular range checks are a very important method of checking that your radio control system is working properly, and of detecting changes to the radio system's transmission characteristics. A range check is particularly important if:

- You install new components in a model, change the components, or re-arrange their installation.
- You are using components in the model which have previously been involved in a crash.
- You noticed any irregularity or problem when previously operating the model.

Important:
- Always carry out the range check with a second person to help you; he or she can secure the model and watch what happens (ground vehicles and boats on the appropriate surface).
- Range checks should only be carried out with the telescopic aerial fitted to the transmitter, but collapsed completely. **Do not** use a **helical stub aerial** for range checking!

- During the range check there should be no other transmitters switched on. Large-scale metallic objects such as cars and wire fences will also affect the test result.

This is the procedure:
- Hold the transmitter in such a position that the aerial is as close to vertical as possible.
  Model aircraft:
  Stand or hold the model in such a way that the tip of the receiver aerial is about 1 m above the ground.
  Land-based or water-based models: place the model on the ground or in the water.
  Switch the power system OFF!
- Switch the transmitter and receiver on. Move one control function (e.g. elevator) constantly and steadily. This allows you to check that the receiving system responds to control commands with distinct, regular movements of the control surfaces.
- Walk away from the model to increase the distance between the transmitter and the receiving system.

You have reached the **range limit** when the servos start to jitter, carry out uncontrolled movements, or cease responding clearly and evenly to transmitter control commands.

For standard receivers (without IPD or similar) this rule applies:
For receivers which carry out no signal checking / correction (e.g. Pico 3/4, Pico 5/6) slight servo jitter when close to the range limit is acceptable.

For receivers with IPD, PCM or similar, this rule applies:
If the receiver checks / corrects the signal, it will suppress any servo jitter. At the range limit the servo movements will initially become irregular (faltering movement). Beyond the range limit the servos will switch to HOLD mode (maintaining the last commanded position) or FAIL-SAFE mode (running to a pre-programmed position).

Repeat the check with the motor running!
Secure the model, and repeat the check with the motor running. Test the system at various throttle positions between idle and full-throttle.

Effective range must <u>not</u> be significantly reduced.

The following have a powerful influence on effective radio range ...
... the ambient conditions:
  Range may be reduced by half in mountain bowls or in the vicinity of public service transmitters, radar stations or similar apparatus. The ground characteristics, the type of terrain and the atmospheric conditions also affect radio range.

... receiver technology and sophistication:
  Technically sophisticated receivers have greater range than simple, cheap, small receivers.

... the radio installation in the model:
Radio range is also affected by the position and attitude of the aerial, the distance to batteries, motors, servos, ignition systems, metal / carbon fibre parts, etc.

Important: read the receiver instructions!
Please note the information regarding range contained in the instructions supplied with your receiver. The instructions will also include guideline figures for the range check.

Important, if the model is powered:
Check the range initially with the motor or engine switched off. During the second test, with the power plant running (different throttle settings), the range should not diminish significantly. If this is not the case, you must seek out the cause of the interference (motor or engine, installed position of receiving system and battery, vibration, …).

4. Liability / Compensation

Radio-controlled models are not playthings in the usual sense of the term. The construction, the installation of the RC system and the method of operating the models require technical expertise, care and responsible, safety-conscious behaviour. Errors and oversights, not to mention deliberate negligence, can result in serious damage or injury. You, as operator of the model, are fundamentally responsible for the hazards presented by your model. This liability is not accepted by the manufacturer. The same applies to accidents caused by uncontrollable interference or outside intervention. As operator of the model, you therefore are assumed to have an enhanced obligation of care.

Since we as manufacturers have no means of ensuring that you build, operate and maintain your models and radio control equipment competently, all we can do is expressly point out these hazards. We deny all liability.

MULTIPLEX Modellsport GmbH & Co.KG accepts no liability for loss, damages or costs which are incurred due to the improper use and operation of the product, or are connected in any way with such activity.

Whatever legal argument is employed, the liability of MULTIPLEX is limited to the invoice value of those MULTIPLEX products which were directly involved in the event which caused the damage. This clause is valid unless deemed invalid in a court of law. It no longer applies if liability is accepted due to statutory regulation on account of deliberate or gross negligence.

Moreover MULTIPLEX Modellsport GmbH & Co.KG does not guarantee that the documents which accompany the radio control components are complete or correct in every respect.

Please read the relevant information sheets included in the transmitter documentation!

5. Guarantee

We guarantee our products in accordance with the currently valid legal requirements. If you wish to make a claim under guarantee, please contact the dealer from whom you purchased the equipment.

The guarantee does not cover malfunctions which are caused by the following:

- improper usage, incorrect connections, reversed polarity,

- maintenance carried out incorrectly, carried out late, not carried out at all, or carried out by a non-authorised body,

- the use of accessories other than genuine MULTIPLEX items,

- modifications or repairs not carried out by MULTIPLEX or an authorised MULTIPLEX Service Centre,

- accidental or deliberate damage,

- defects due to normal wear and tear,

- operation of the equipment outside the specification, or in conjunction with equipment made by other manufacturers.

Please read the relevant information sheets included in the transmitter documentation.

6. CE Conformity Declaration

ROYALpro systems have been assessed in accordance with European harmonised directives.

You are therefore the owner of a product whose design and construction satisfy the protective aims of the European Community for the safe operation of equipment.

A detailed Conformity Declaration is available on our Internet site www.multiplex-rc.de from the DOWNLOADS area under PRODUCT INFORMATION.

If necessary you can also request a copy of the conformity declaration from us.

MULTIPLEX Modellsport GmbH & Co.KG
Kundendienst / Customer Service
Westliche Gewerbestraße 1
D-75015 Bretten-Gölshausen

Germany

7. Specification

ROYAL*pro*	7	9	12
Model memories	15	20	36
Channel count	7	9	12

Transmission mode	switchable FM / PPM or FM / M-PCM
Channel spacing	10 kHz

Servo pulse width at +/- 100% servo travel		
PPM	UNI	1.5 ± 0.55 ms
	MPX	1.6 ± 0.55 ms
M-PCM	UNI	1.5 ± 0.55 ms

Power supply	7.2 V, 6 AA cells
Current drain	< 50 mA excl. RF transmission ~ 250 mA incl. RF transmission
Charge current	**max. 1.4 A** (fast charge) 210 mA (normal charge)

Permissible temperatures for	
Operation	− 15 °C to + 55 °C
Storage	− 20 °C to + 60 °C
Battery charging	0 °C to + 40 °C

Weight incl. battery	approx. 900 g
Dimensions (L x W x H)	approx. 220 x 270 x 60 mm excl. carry handle and stick tops, aerial retracted

7.1. Note regarding channels / frequencies

🛑 **Use only the permitted channels / frequencies!**

The ROYAL*pro* may only be used legally on frequencies / transmission channels which are approved in the country in which the transmitter is to be operated.

For detailed information on this subject please refer to the CE information sheet (R&TTE directive) which is supplied with all our transmitters, or on the Internet under www.multiplex-rc.de under DOWNLOADS, PRODUCT INFORMATION (document: "directive R&TTE"). If in doubt, please contact the frequency monitoring authority in the country where you wish to use the equipment.

The four columns in the following table (➔ 7.2.) list all the channels / frequencies which can be set in the relevant frequency band of the ROYAL*pro*.

7.2. Frequency table

35 MHz		40 / 41 MHz	
Channel	[MHz]	Channel	[MHz]
255	34.950	**40 MHz**	
256	34.960	41	40.575
257	34.970	42	40.585
258	34.980	43	40.595
259	34.990	44	40.605
260	35.000	45	40.615
A-band		46	40.625
61	35.010	47	40.635
62	35.020	48	40.645
63	35.030	49	40.655
64	35.040	50	40.665
65	35.050	51	40.675
66	35.060	52	40.685
67	35.070	53	40.695
68	35.080		40.705
69	35.090	54	40.715
70	35.100	55	40.725
71	35.110	56	40.735
72	35.120		40.745
73	35.130		40.755
74	35.140	57	40.765
75	35.150	58	40.775
76	35.160	59	40.785
77	35.170		40.795
78	35.180		40.805
79	35.190	81	40.815
80	35.200	82	40.825
		83	40.835
281	35.210		40.845
282	35.220		40.855
283	35.230	84	40.865
284	35.240	85	40.875
285	35.250	86	40.885
286	35.260		40.895
287	35.270		40.905
288	35.280	87	40.915
289	35.290	88	40.925
290	35.300	89	40.935
291	35.310		40.945
292	35.320		40.955
293	35.330	90	40.965
B-band		91	40.975
182	35.820	92	40.985
183	35.830		40.995
184	35.840	**41 MHz**	
185	35.850	400	41.000
186	35.860	401	41.010
187	35.870	402	41.020
188	35.880	403	41.030
189	35.890	404	41.040
190	35.900	405	41.050
191	35.910	406	41.060
		407	41.070
		408	41.080
		409	41.090
		410	41.100
		411	41.110
		412	41.120
		413	41.130
		414	41.140
		415	41.150
		416	41.160
		417	41.170
		418	41.180
		419	41.190
		420	41.200

Information correct as of 23.01.2008

8. The Transmitter Battery

The **ROYALpro** is powered by a high-quality re-chargeable **PERMABATT+** battery consisting of six AA-size NiMH (Nickel-Metal-Hydride) cells.

Features of the PERMABATT+ transmitter battery:

- Capacity **2100 mAh**
(approx. eight hours' operation possible).
- Self-discharge rate around **25% per year**
(no recharging required even when stored for long periods).
- Fast-charge capable, max. **1.4 A**
The pack must only be charged using a charger with automatic cut-off: Delta-Peak cut-off at < 5 mV per cell.
- Normal charge at **210 mA**
(corresponding to 1/10 C, charge for sixteen hours).
- Integral **over-current fuse**, self-resetting
The battery is ready for use again approx. 1 s after the excessive current is eliminated.
- Avoid deep-discharging the battery (< 5.4 V).
- If the transmitter or transmitter battery is to be stored for a long period (several days), avoid temperatures above 30°C (brief maximum 55°C).

Note:
Like many other technical components, rechargeable batteries are the subject of constant development. For this reason we reserve the right to alter the specification of the battery pack installed as standard, in order to keep abreast of technical developments.

8.1. Safety Notes

- ☻ The transmitter battery is responsible for the power supply to the transmitter, and plays an important role in operational security. For this reason it is essential to heed our recommendations regarding charging and storing the rechargeable battery.

- ☻ The transmitter is fitted with a self-resetting fuse which protects the battery and the transmitter from short-circuit, reversed polarity and excessive currents. The transmitter electronics feature no additional fuse!

  For this reason it is absolutely essential to use genuine MULTIPLEX transmitter batteries in this transmitter!

- ☻ Additional safety notes:

- Batteries are not playthings, and must always be stored well out of the reach of children.
- Check that the battery is in perfect condition before every flying session. Damaged or defective batteries must not be re-used. Dispose of them in the authorised manner / recycling centre (➔ 8.8.).
- Do not heat, incinerate, open or short-circuit rechargeable batteries, do not charge or discharge them at excessive currents, do not overcharge them, and do not charge with reversed polarity.
- Place the transmitter or battery on a heat-resistant, non-inflammable and non-conductive surface for charging, and do not leave it on charge unsupervised.

- Do not modify the battery pack in any way. Never solder or weld directly to the cells.
- Mis-handling the battery incurs a risk of combustion, explosion, corrosion and burning.
Suitable extinguishing agents: water, CO_2, sand.
- **Escaped electrolyte is corrosive!**
Do not allow electrolyte to contact your skin or eyes. In an emergency rinse the affected area with copious quantities of water, and call for medical assistance immediately.

8.2. Charging the transmitter battery

☻ **Never connect the transmitter to a battery charger without a battery in the transmitter!**
High voltages may be present at the charge outputs of battery chargers if no battery is connected. These voltages can easily damage the transmitter.

☻ **Timer-controlled fast-charging, automatic current setting systems and REFLEX charging must not be used with this battery!**

☻ **Fast-charge at max. 1.4 A!**
This also applies if you remove the battery from the transmitter for charging.

☻ **Important when fast-charging:**
The battery charger must be suitable for NiMH cells!
Delta-Peak cut-off sensitivity < 5 mV / cell

☻ **Charging using mains or 12 V chargers:**
It is safe to leave the battery in the transmitter for recharging. The charger should be connected using the multi-function socket on the underside of the transmitter (➔ 9.2.). Use genuine MULTIPLEX charge leads (e.g. transmitter charge lead with banana plugs # 8 6020). Please refer to the current MULTIPLEX main catalogue for information concerning other charge leads and battery chargers.

8.3. The correct method of charging

a. Switch the transmitter OFF.
b. Select a charger suitable for NiMH batteries, switch it on and connect the charge lead to it.
c. Check correct polarity:
red plug = positive terminal (+)
blue / black plug = negative terminal (-)
Connecting the transmitter battery with reversed polarity may wreck the battery (overheating, escape of corrosive electrolyte, cell burst)!
d. Connect the charge lead to the transmitter (back panel, CHARGE (➔ 9.2.)).
e. Select the charge current (max. 1.4 A).
☻ **If you are using an automatic fast-charger, select the current manually!**

f. If the battery becomes hot whilst on charge, to the point where you can no longer touch the pack, interrupt the charge process immediately.

g. When the charge process is complete, first disconnect the transmitter / battery from the charger, and then the charger from the power source.

h. When the charge process is complete, check the charge quantity calculated by the battery management circuit, and correct it if necessary (➔ 8.4.3. a.).

8.4. *ROYALpro* battery management

The term "battery management" means that the transmitter measures the current when the unit is in use **and** when the battery is on charge. From this data the software calculates the actual state of charge of the battery, and displays it on-screen in Status display 4 (➔ Fig. 8.4.1.) and in the main menu ⟍Setup under Transmitter (➔ Fig. 8.4.2.).

When the RF module is operating (LED flashes red) the expected **residual operating time** is calculated and displayed in Status display 4. This indicates how long the transmitter should be able to operate if the current drain remains the same:

```
ROYALpro12  2.53 DE/EN
CH:    063    35.030MHz
Modulation      FM/PPM 9

Batt. voltage     8.20V
Battery charge 1998mAh
Remaining time     7.7h
Operating time    12.4h
```

Fig. 8.4.1.: Status display 4

8.4.1. Self-discharge

When the transmitter is stored, the system also takes into account the battery's rate of self-discharge, and corrects the available battery charge quantity accordingly.

The *ROYALpro* uses transmitter batteries of the type **PERMABATT+**. The new manufacturing process used for these batteries has reduced the rate of self-discharge to around **0.07%** per day (approx. 25% self-discharge annually). The self-discharge rate of conventional NiMH batteries is around 1.5% per day.

For this reason the menu ⟍Setup, Transmitter includes the menu point SlfDsCharge (self-discharge):

```
⟍Transmitter
⌃Battery
  Alarm        7.10V
  Capacity   2100mAh
  Charge     1900mAh
  SlfDsCharge    low
  Display
▾ Contrast        0
```

Fig. 8.4.1.1.: Menu: Setup, Transmitter

In this menu point it is possible to switch the self-discharge rate between "low" (approx. 25% **per year**) and "normal" (approx. 1.5 % **per day**). The factory default setting is "low".

🔵 **Battery management only provides supplementary information!**

Battery charge and residual time represent **additional** information relating to the condition of the transmitter battery, and are intended to provide additional security when handling the transmitter. However, major discrepancies may occur due to production tolerances, battery ageing and the effects of battery maintenance. In any case the system only works properly if the capacity and battery charge quantity (➔ 8.4.3.a.) are set correctly when the battery is initially charged.

8.4.2. Unchanged features
Voltage display:

Virtually all modern transmitters display the actual battery voltage as a numerical value and / or in graphic form (bar graph).

Battery alarm:

If the battery voltage falls below a certain minimum value, the transmitter emits an audible alarm. On many transmitters the alarm threshold is variable.

As you would expect, the *ROYALpro* also includes these two functions (Setting the alarm threshold (➔ 14.1.3.)).

8.4.3. This is important

To ensure that the battery management function displays values which are as close to "the truth" as possible, it is essential to observe the following points:

a. **Correcting the battery capacity**
    The battery management function assumes that the transmitter is fitted with a battery of 2100 mAh capacity. When the transmitter battery has been conditioned (more than five charge / discharge cycles) you can correct any discrepancy from the nominal capacity as follows:

    Menu: ⟍Setup, Transmitter,
    Parameter: Battery Capacity.

    At this point you can set the value determined by the battery charger (in increments of 50 mAh).

    🔵 **When the battery voltage falls below 6.5 V, the available charge quantity is set to 0 mAh.**

b. **Correcting the available battery charge quantity**
    If you fit a new transmitter battery, or charge it directly (i.e. not via the socket on the back panel), then the available battery charge quantity must be corrected manually:

    Menu: ⟍Setup, Transmitter,
    Parameter: Battery charge.

    🔵 **If the battery voltage is above 8.6 V when the transmitter is switched on, the battery charge quantity is set to the value which is set for battery capacity in the menu ⟍Setup, Transmitter.**

    🔵 **If the battery voltage falls below 6.5 V, the available charge quantity is set to 0 mAh.**

c. Charge the battery via the charge socket!
The battery management system can only calculate the available charge quantity if you recharge the battery via the charge socket.

d. Normal charging at constant current (210 mA)
If you leave the battery connected to the charger for longer than the period calculated according to the formula in Section 8.5.1, the battery management system still displays the charge quantity which you have set as the capacity in the menu `Setup, Transmitter`.

8.5. Terms used in battery charging

Full capacity and potential performance ...
… are achieved by NiMH batteries only after several charge / discharge cycles (~5 cycles). The initial charge / discharge cycles should be carried out at 0.1 C (210 mA). Don't fast-charge the battery until you have first conditioned the pack in this way.

Charging at 1 C ...
... feeds 100% of the battery's nominal capacity into the pack in one hour in the form of charged-in energy. For a battery of 2000 mAh capacity a current of 2000 mA is required to achieve this. If this current is used for charging, we speak of a 1 C charge. This current value is found by simply taking the nominal capacity in mAh (or Ah), and omitting the "h" (hours).

8.5.1. Normal charging …
... means that the battery is charged at a current within the range 0.05 C and 0.2 C. For a 2000 mAh pack, for example, this means a charge rate of 100 mA to 400 mA.

To ensure that a rechargeable battery really is fully charged, it is necessary to feed more than 100% of its nominal capacity into the pack. The amount of the additional charge is defined by the charge factor.

The charge time for a flat battery is calculated as follows:

$$\text{Charge time [h]} = \frac{\text{Capacity [mAh]}}{\text{Charge current [mA]}} * \text{charge factor}$$

> � **Note the charge factor for normal charging!**
> For **PERMABATT+** type batteries of 2100 mAh the charge factor is 1.6. Using a charge current of 210 mA (1/10 C) a flat battery must therefore be charged for sixteen hours if it is to be charged fully.

8.5.2. Fast charging …
... means that the battery is charged at a current in the range 0.5 C to 1 C.

> 🔆 **Observe the maximum charge current!**
> For **PERMABATT+** type batteries of 2100 mAh the maximum approved fast-charge current is 1.4 A.

In this case the charge time is determined by the fast-charger's automatic cut-off circuit.

8.5.3. Trickle charging …
... means that the battery is charged at a current within the range 0.03 C to 0.05 C.

> 🔆 **Observe the maximum trickle charge current!**
> For **PERMABATT+** type batteries of 2100 mAh capacity we recommend a trickle charge current of 20 mA to 100 mA. At a trickle charge rate of max. 105 mA the battery can safely be left connected to the charger for up to a year.

Many automatic battery chargers switch to a trickle charge current when the main charge process is terminated. If this is the case, we recommend that you switch off the trickle charge no later than 24 hours after the charge process is complete.

8.6. Replacing the transmitter battery

If you replace the transmitter battery by a pack **other** than a **genuine MULTIPLEX battery**, please note the following:

> 🔆 **Maximum current via the charge socket: 2 A!**

> 🔆 **Be sure to follow the charging instructions provided by the battery manufacturer!**

> 🔆 **Set the self-discharge rate to suit the battery type you are using! (➔ 8.4., Fig. 8.4.2.).**

8.7. Transmitter battery care and storage

NiMH batteries should always be stored **fully charged**. This avoids the danger of deep-discharging.

Store NiMH batteries at temperatures in the range 0°C to 30°C, in dry conditions, away from direct sunshine.

Top up (recharge) unused NiMH batteries every six to twelve months. This compensates for the self-discharge effect, and avoids the danger of the cells becoming deep-discharged.

Batteries which have been stored for a long period should be conditioned (multiple charge / discharge cycles). Note that the usable capacity of such batteries may diminish after a long period of storage.

8.8. Recycling

Do not dispose of exhausted rechargeable batteries in the ordinary domestic waste. Take your old packs to a suitable recycling centre. Make sure the batteries are completely discharged beforehand, and insulate the terminals to avoid the danger of short-circuit.

9.   The Transmitter

9.1.   Front face of the transmitter

Fig. 9.1.1.: Front face of transmitter
(Switches K and P retro-fitted; not included as standard.)

The front face of the transmitter features the following elements:

① Two extremely accurate, ballraced **stick units** for controlling the four primary axes. Stick ratchet for throttle / spoiler can be activated right or left (➔ 9.4.5.). Both stick units can be swivelled to suit the pilot's ergonomic preferences (➔ 9.4.7.). The stick tops rotate and are infinitely variable in length; various types of stick top are available.

② Two permanently installed proportional controls (**sliders "E" and "F"**) with centre detent; available for use with freely assignable channel functions and / or switched functions.

③ Two **cruciform trim groups** below the stick units for digital trimming of the primary control axes. They consist of pairs of buttons for left / right and up / down.

④ **Audible sounder** (piezo beeper).

⑤ When the transmitter is switched on, the **RF status indicator / LED** (red LED) indicates whether an RF (Radio Frequency) signal is being transmitted:

    LED glows constantly
    → no RF transmission
    LED flashes every two seconds
    → RF being transmitted

The LED is controlled by the current drain of the RF module. If the RF module is not drawing the corresponding current, or is not installed, the constantly glowing LED warns you that an RF signal is not being transmitted.

⑥ **Keypad** consisting of eleven buttons in two rows. The six buttons in the top row provide fast, direct access to the six main menus (direct menu access buttons). The five buttons in the second row are used for programming the transmitter.

With the exception of the "**ENTER**" button, all the buttons have a dual function for text input. Text is entered in a similar way to mobile telephones (➔ 11.1.1.c.).

⑦ **OFF / ON switch** ("O" / "1").

⑧ The **screen** is a modern, UV-stable, non-reflective graphic LCD unit (132 x 64 dots) featuring variable contrast (➔ 14.1.4.). The screen can be hinged through around 40° to optimise the viewing angle.

⑨ Two **3-D digi-adjusters** are used for programming and set-up tasks. They are fitted as standard, and are permanently installed. For programming, both adjusters work in parallel with the "**ENTER**" button and the "▲" (UP) / "▼" (DOWN) buttons. When using the transmitter it is possible to allocate many different settings / parameters to the 3-D digi-adjusters, enabling the pilot to adjust the settings quickly and easily while the model is in the air (➔ 20.1.).

⑩ **Neckstrap lug** for attaching a support strap (e.g. # 8 5161 or # 8 5646).

All the remaining control elements ...
… (switches / buttons "G" to "O", apart from installation wells "K" and "P" (➔ 20.6.6.)), are installed as standard in easily accessible locations. They cannot be altered or interchanged.

The switch and button designations are neutral ("G", "H", "I", ... "O", "P") and are only intended for identification purposes, as they can be assigned to any channel and / or switched function (transmitter control or switch) (➔ 14.3.).

9.2. Rear face of the transmitter
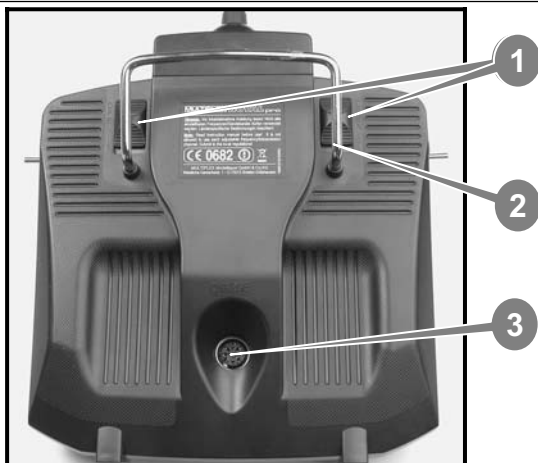
Fig. 9.2.1.: Rear face of the transmitter

① Two **sliding latches** (marked "OPEN") provide a fast, easy method of opening and closing the transmitter, e.g. for changing the RF module (➔ 9.4.3).

② The robust **carry handle** provides a safe method of carrying the transmitter, and also protects the rear face when you set the transmitter down.

③ As is usual with MULTIPLEX, the *ROYALpro* is also fitted with a **MULTIPLEX multi-function socket** installed as standard (marked "CHARGE"). It is used as:

- charge socket for the transmitter (➔ 8.2.)
- socket for Trainer operations
  (➔ 14.4.1. and 14.4.2.)
- PC interface for backing-up model data
  (➔ 20.3.)
- PC interface for updating the transmitter
  (➔ 20.3.)
- PC interface for flight simulators
  (➔ 20.4.)
- interface for a 'closed-loop' receiver connection (without RF transmission) for programming and adjustment work using a Diagnosis lead (➔ 20.2.).

④ The **TORX® screwdriver** (size T6), which resides in clips in the transmitter's back panel, is used for various tasks such as adjusting the stick ratchet, friction and centring spring force, swivelling the stick units, and for installing supplementary switches in the installation wells "K" and "P".
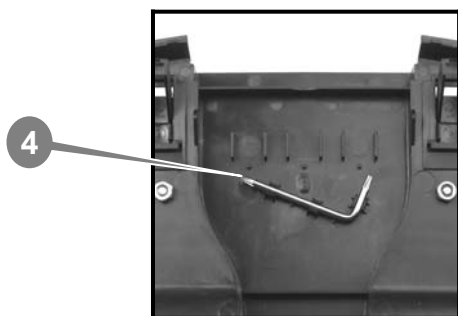
Fig. 9.2.2.: TORX screwdriver in the transmitter back panel

9.3. Interior of the transmitter
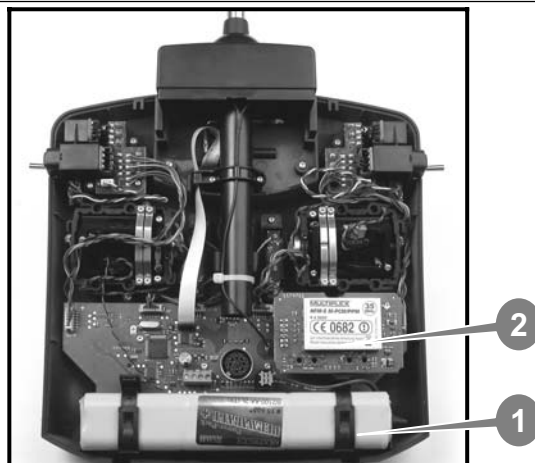
Fig. 9.3.1.: The interior of the transmitter

① The **transmitter battery** fitted as standard consists of six environmentally friendly, high-capacity AA-size NiMH (Nickel-Metal-Hydride) cells. For safety reasons the individual cells are permanently interconnected and protected by a heat-shrink sleeve.

❽ **Use genuine replacement batteries only! Always heed the charging instructions! (➔ 8.2. and 8.3.)**
The transmitter battery is fitted with a thermal fuse which protects the battery - and above all the transmitter - from short-circuit, reversed polarity and excessive currents. The transmitter does not feature a separate fuse. For this reason it is essential to use genuine MULTIPLEX transmitter batteries designed for this transmitter.

② **RF module** (Radio Frequency module). The RF module is simply plugged into the main circuit board, and can easily be changed if you wish, for example, to switch to a different frequency band (➔ 9.4.3.). The *ROYALpro* is fitted with the HFM-S M-PCM/PPM RF module:

HFM-S M-PCM/PPM, 35 MHz A- and B-band
                                       # 4 5600

HFM-S M-PCM/PPM, 40 / 41 MHz   # 4 5601

➔ Modern Synthesizer RF module with software-selected channel / transmitter frequency.

❽ **Only RF modules of this type may be fitted to the *ROYALpro*!**

❽ **Scanner with power-on guard can be fitted (➔ 20.6.2.).**

9.4. Mechanical details

9.4.1. Opening / closing the transmitter case

Switch the transmitter OFF before opening the case (short-circuit hazard)!

Opening the transmitter case:

Fig. 9.4.1.1.   *Fig. 9.4.1.2.*
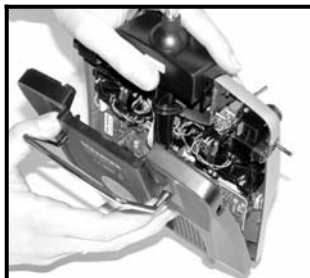
a. Hold the transmitter in both hands, and push the rear-mounted sliding latches down with both thumbs (towards "OPEN") (➔ Fig. 9.4.1.1.).

b. Carefully remove the rear case panel (➔ Fig. 9.4.1.2.).

Closing the transmitter case:
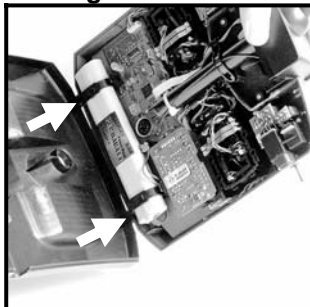
Fig. 9.4.1.3.   *Fig. 9.4.1.4.*

c. Carefully stand the case at an angle on its rear edge, and engage the two retaining lugs on the back panel in their recesses (arrows in ➔ Fig. 9.4.1.3.).

d. Carefully close the back panel (➔ Fig. 9.4.1.4.).
   Ensure that no wires are trapped, and that the transmitter aerial has not slipped out of its guide tube. It should be possible to fit the case back easily, without using force.

e. Push the sliding latches up as far as they will go (opposite direction to "OPEN").

9.4.2. Adjusting / replacing the transmitter aerial

The transmitter aerial is permanently installed in the case. For transport it can be completely collapsed and recessed into the transmitter. For adjustment and programming work the aerial can be left in this position. The RF section will not be damaged if you do this.

Always extend the aerial to full length when you are controlling a model. This will ensure that the system works reliably, with maximum radiated power and effective range.

Fig. 9.4.2.1.   *Fig. 9.4.2.2.*

The aerial can also be moved and locked in a second position (angled up and left) for controlling a model:

a. Pull the aerial outward until you feel a noticeable resistance (➔ Fig. 9.4.2.1.).

b. Pull the aerial past the resistance (approx. 3 - 5 mm further), then swivel the aerial upward and to the left (➔ Fig. 9.4.2.2.). At this point there is no resistance to overcome.

c. Tilt the aerial as far as it will go
   ⇒ the aerial locks itself in the new position.

To swivel the aerial back to the original location you must first unlock it as described under a.

At regular intervals check the aerial for good contact. Contact problems relating to telescopic aerials are a frequent cause of poor transmitted power and therefore reduced range, and have an adverse effect on reliable operation. Aerials with intermittent contact, bent aerials or aerials which extend and retract too easily (wear) should be replaced.
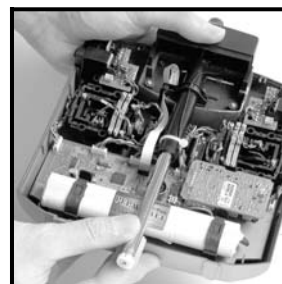
Fig. 9.4.2.3.

If the aerial is damaged, it can easily be replaced: simply remove the transmitter back panel and slide it down and out of the aerial guide tube (➔ Fig. 9.4.2.3.). Replacement **ROYAL pro** aerial: # 89 3001 or # 89 3006.

9.4.3. Removing / installing the RF module

The HFM-S M-PCM/PPM RF module is not protected by a case. For this reason:

• Do not touch the main circuit board or components.

• Do subject the main circuit board to mechanical stress.

• Do not place the RF module itself under mechanical stress.

Do not touch components on the RF module (➔ 3.1. ESD notes).
Do not change any settings.
If the setting of any component on the RF module is changed accidentally, or if any parts are damaged, have the module checked / repaired and re-adjusted by a Service Centre or the main MULTIPLEX Customer Service.

Removing the RF module:

a. Switch the transmitter OFF!

b. Open the transmitter (➔ 9.4.1.).

c. Lay the transmitter down on a soft surface, open face towards you. Take care not to damage the sticks and switches!

d. Hold the RF module by all four corners using your thumbs and index fingers, then carefully and evenly pull it straight up (see picture below).

Installing the RF module:
Hold the RF module as just described, and place it on the contact pins. Check carefully that all the pins are engaged in the right position, then carefully and evenly press it into place.
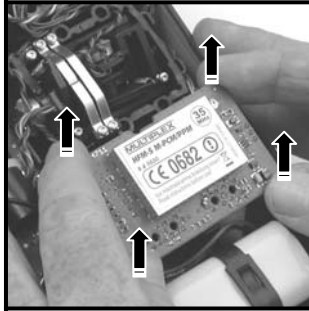
Fig. 9.4.3.1.: Removing and installing the RF module

9.4.4. Replacing the transmitter battery

a. Switch the transmitter OFF!

b. Locate the snap-catches of the two plastic battery retainers, pull both of them back in the direction of the battery, then fold them up (➔ Fig. 9.4.4.1.).

c. Remove the battery and withdraw the battery connector and lead from the socket on the main circuit board (➔ Fig. 9.4.4.2.).
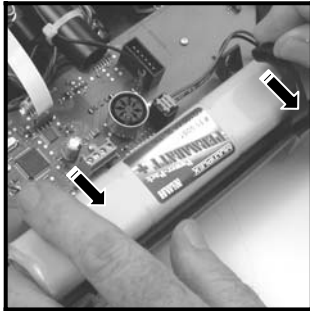
Fig. 9.4.4.1.
Opening / closing the retainers
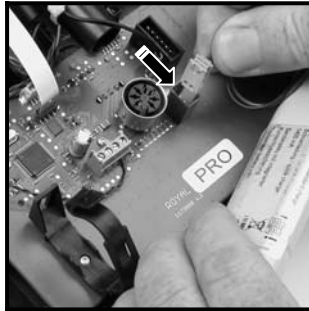
Fig. 9.4.4.2.
Connecting the battery

When installing the battery ensure that the connecting lead is neatly deployed, so that it cannot become trapped when you close the transmitter back.

Note:
No model data is lost when you swap batteries.

9.4.5. Disabling the stick centring spring, activating the ratchet / friction system

ROYAL*pro* transmitters are supplied as standard with self-centring sticks. The springs for use with a ratchet or friction system are already fitted to both stick units, and can be activated quickly and easily as follows:

Switch the transmitter OFF and open the case.

a. Locate the TORX screwdriver on the inside of the transmitter back panel, and use it to tighten (turn clockwise) the TORX screw on the appropriate (please check!) neutralising lever (1) to the point where the stick centring action is completely disabled. **Don't screw it in too far! On no account remove the neutralising lever and centring spring!**

b. The screws (2) hold the springs, while the screws (3) adjust the hardness of the ratchet / friction action: the further you tighten the screw, the harder the ratchet or friction.

If you wish, you can set a superimposed ratchet / friction action by activating both springs on one stick. This is simply a matter of personal preference.
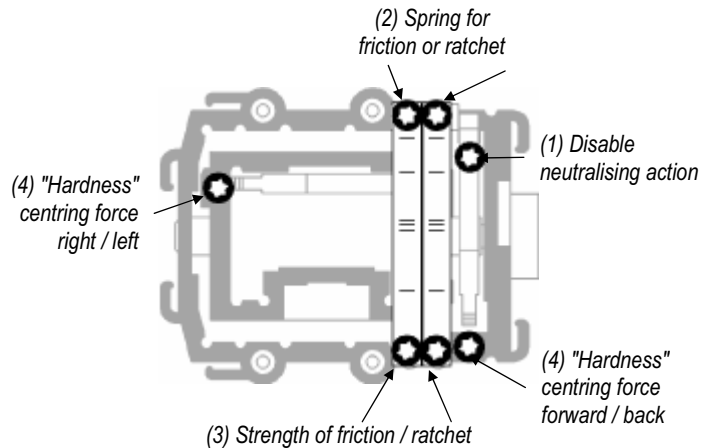
Fig. 9.4.5.1.: Adjuster screws on the stick unit

9.4.6. Adjusting the "hardness" of the sticks
This term applies to the centring force of the neutralising spring on any one stick axis.

The **ROYAL*pro*** allows you to adjust the "hardness" for each of the four stick axes separately. The picture above shows how adjustments are made. The stick axes become "harder" when you tighten the screws (4) (turn them clockwise).

9.4.7. Swivelling the stick units
A unique feature of the **ROYAL*pro*** is that its stick units can be swivelled to improve the ergonomics of the transmitter. This is particularly advantageous if you operate the transmitter hand-held, and use your thumbs to control short sticks. In this case the "natural working axis" is not exactly horizontal and vertical relative to the transmitter, but at a more or less pronounced angle. Both stick units of the **ROYAL*pro*** can be swivelled to any angle up to about 15° from the nominal position.
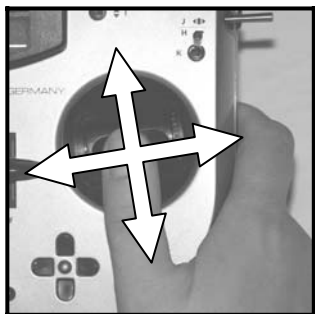
Fig. 9.4.7.1.

a. Using the T6 TORX screwdriver (located in clips in the transmitter back cover) (➔ Fig. 9.4.7.2.), loosen the three TORX screws which retain the appropriate stick unit until the unit can be swivelled.

b. Rotate the stick unit to the angle which seems most natural to you (➔ Fig. 9.4.7.3.), then tighten the TORX screws again. Don't over-tighten them, or you might strip the threads in the plastic.
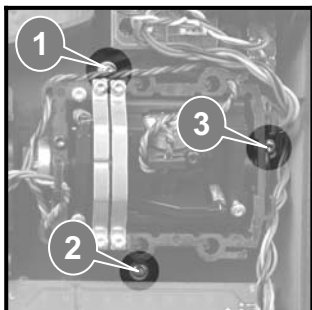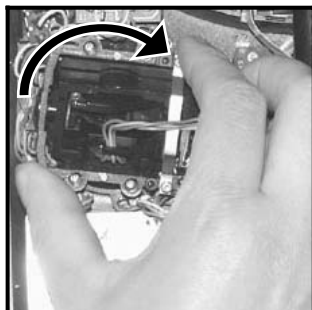
Fig. 9.4.7.2.   *Fig. 9.4.7.3.*

9.4.8.   Adjusting / replacing the stick tops

The ***ROYALpro*** is supplied as standard with three pairs of stick tops of different lengths. They are easily changed, rotated and adjusted in length:

a. Place the transmitter on a flat surface.

b. Hold the stick top in one hand, and loosen the locking nut by turning it clockwise with your other hand (➔ Fig. 9.4.8.1.).

The stick shaft is smooth, so the stick top can now be rotated or adjusted in length. If you wish to change the stick tops, unscrew the locking nuts and use them to secure the alternative items (➔ Fig. 9.4.8.2.).

Before fitting the stick tops please ensure that the shafts are clean and devoid of grease or oil. If you neglect this, the stick tops may not stay in position.
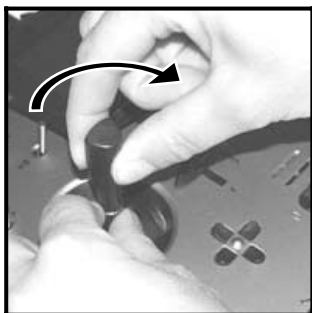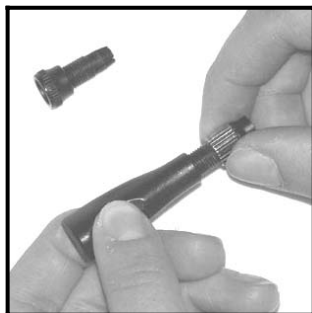
Fig. 9.4.8.1.   *Fig. 9.4.8.2.*

9.5.   Plastic stick top with three buttons: installation and functions

If your model features important supplementary functions, the long stick top with push-button / switch (# 7 5303, supplied with the transmitter) may be useful, as it provides a fast, simple and reliable method of operating such functions without having to let go of the stick.
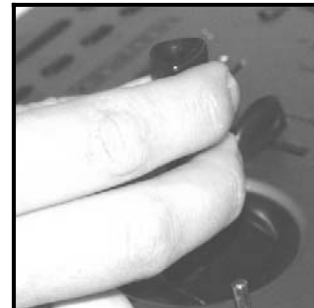
Fig. 9.5.1.   *Fig. 9.5.2.*

The top button KTa has a momentary function.

The two side-mounted buttons together form the switch KSw.

This stick top is connected to the transmitter electronics by means of two wires. The button and the switched function can be assigned to transmitter controls and switches using the same procedure as for the other buttons (H and M) and switches.
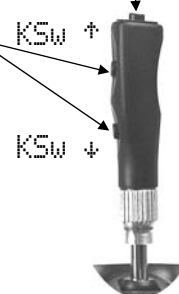
Fig. 9.5.3.

Fitting this stick top is quick and simple, and requires no soldering:

a. Switch the transmitter OFF and remove the stick top.

b. Locate the two connecting wires attached to the stick top with the push-buttons, slip them through the locking nut and the stick shaft (➔ Fig. 9.5.4.), then install the stick top exactly as described in Chapter 9.4.8.

   Tip:
   You will find it easier to thread the wires through the stick shaft if you curve the cable ends slightly and hold the stick in one corner position.

c. Clip the wires from the stick unit in the holders designed for them. Check that the cables have plenty of 'elbow room' when you move the stick, are never under tension, i.e. they cannot become trapped at any position of the associated stick.

d. Locate the appropriate screw clamp terminal block on the main circuit board, and run the bare wire ends to the clamps (➔ Fig. 9.5.5; small slot-head screwdriver required) from the transmitter battery side; you will need to remove the battery before doing this. The two wires can be connected to terminals C and D either way round.

Fig. 9.5.4.
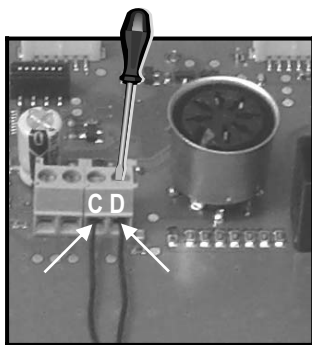
Fig. 9.5.5.

Note: calibrating the stick buttons
When a stick top with push-buttons is first connected to the transmitter, the software carries out an automatic calibration process. If you need to replace the stick top for any reason, a re-calibration must be carried out; this will only occur if you reset the original calibration using the PC program "ROYALpro-DataManager" (➔ 20.3.). For more information on this procedure please refer to the instructions supplied with the "DataManager".

9.6. Digital trims

9.6.1. General information
The term "trimming" refers to the following procedure:

For example, you want your model aircraft to fly straight and level when you leave the sticks exactly at centre. If this is not the case, and the model always tends to turn in one direction, you can adjust the neutral point of the corresponding control function (in our example Rudder) to "trim" the model accurately.

The ***ROYALpro*** features digital trims on all four axes of the primary sticks.

The ***ROYALpro*** exploits the "Centre Trim" principle, i.e. trim corrections only affect the area around the centre point of the transmitter control, without affecting the end-points of the travel. Compared with "standard trims" this offers the advantage that full transmitter control travel (and thus servo travel) is always available, because no reserve has to be provided for trimming:
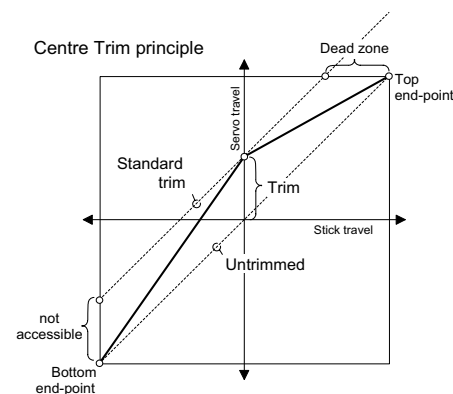
Standard trims:
If you move a stick with standard trims to the right, the servo reaches its upper end-point before the stick reaches its own end-point, as shown in the diagram above. This means: a dead-zone at the stick.

When the stick is moved to the left, the servo does not reach full travel in the "down" direction. This means: available servo travel which cannot be exploited.

Centre trims:
The servo runs to both end-points regardless of the associated trim setting.

Tip:
Since Centre Trims alter the effect curve of the transmitter control, it is important to limit trim corrections to small values. If a large correction is required, it is always best to adjust the mechanical linkage.

9.6.2. Advantages of digital trims
Digital trims offer two significant advantages:

1. The physical position of a conventional trim (with trim slider) corresponds to the actual trim value, but digital trim buttons do not. Instead the digital trim position is displayed on the screen, and the trim values are stored in the model memory. If you switch model memories, the correct trims are immediately available, i.e. there is no need to move the trim sliders to the correct position to suit the model.

2. If the ***ROYALpro*** is used with a model for which you have set up multiple flight phases, each flight phase has its own trim memory, i.e. it is an easy matter to trim each flight phase accurately, and independently of the trims in the other phases.

9.6.3. The cruciform digital trims
In the case of the ***ROYALpro***, trimming is carried out using the buttons arranged in a cross-shape below and to one side of each primary stick unit. They are located in an ergonomically efficient position, and are easily reached when you are using the transmitter, whether hand-held or in a tray.

The effect of each button-press is to shift the trim of the associated control axis in the corresponding direction. If you hold the trim button pressed in for longer than about 0.5 sec., the trim value changes continuously until you release the button once more (AUTO-REPEAT function).

Each trim increment (step) is accompanied by an audible beep. When the trim reaches Centre or either end-point of the trim range, the transmitter emits different beeps to inform you of the position. The trim beeps can be switched OFF and ON (➔ 14.1.1.).

The trim of the fourth stick axis ($\downarrow\!\top\!\uparrow$) always acts as throttle idle trim!
This also applies to gliders (powered gliders) if this stick controls Spoiler, or model helicopters if this stick controls Collect. (collective pitch).

9.6.4. On-screen trim display
The trim positions are displayed in graphic form at both sides and the bottom of the screen in Status displays 1 - 3:
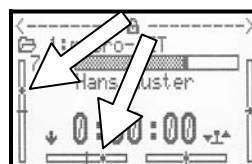
Starting from the trim centre position, the maximum trim range is twenty increments in both directions. The trim increment (step, or adjustment rate) can be set to any of four magnitudes (0.5%, 1.5%, 2.5%, 3.5%) (➔ 15.4.2.).

🖐 **Note regarding increment size and trim range: the number of steps remains the same even if you change the size of the trim increment, with the result that both the trim range and the absolute trim value also change! This means: if you alter the trim increment size, you must remember to re-trim the model.**

The current trim value is displayed in graphic form on the screen, but can also be read off as a numeric value for each transmitter control (Parameter Trim ➔ 15.4.1.).

The type of graphic display can be selected in the Status screen (Parameter Trim graph (Trim graphic) ➔ 14.1.4.).

👆 **Tip!**
Resetting the trim to Centre:
Simultaneously pressing both trim buttons for any stick axis resets the trim for the currently active flight phase to Centre. This also applies to throttle trim.

10. Switching on, using the transmitter

🖐 The *ROYAL pro* is supplied with the transmitter battery partially charged. The pack must be fully charged before you use the transmitter. Please refer to the charging notes (➔ 8.).

10.1. Switching on for the first time

The very first time you switch the *ROYAL pro* transmitter on is a special case. When switched on, the transmitter displays the following menu:

```
ROYALpro12  2.53 DE/EN

Select language:
Sprache wählen:

 skip/später
 English
 Deutsch ( ENTER ▲ ▼
```
Only these buttons are active!

In this menu you select the language which the transmitter will use for the menus **and** the names of the pre-defined mixers and assignment lists. We recommend that you select the appropriate language when you first switch the transmitter on:

Select the appropriate language using the ▲ and ▼ buttons, then press **ENTER** to confirm your choice.

If you select English:
a. **English** will be used as the menu language.
b. The pre-defined mixers are defined using English terminology:
ELEVATR+, AILERON+, …
The mixer inputs are also described in English:
Aileron, Elevator, Rudder, …

If you change the selected language to German (Deutsch) in the menu Setup, User, then the names of the pre-defined mixers will continue to appear in English, but the German terms will be used for the mixer inputs:
Quer, Höhe, Seite, …
It is possible to change the names of all the fourteen free mixers to anything you like (Name parameter). This is accomplished in the menu Setup, Mixer def..

If you select Deutsch (German):
a. **German** will be used as the menu language.
b. The pre-defined mixers are defined using the German terminology:
HöHE+, QUER+, …
The mixer inputs are also described in German:
Quer, Höhe, Seite, …

If you select skip/später (not recommended):
a. **English** will be used as the language.
b. Next time you switch on, the same menu will appear, and you can repeat the language selection.

10.2. Switching on "normally"

10.2.1. RF module <u>excl.</u> Scanner installed
If the transmitter is fitted with an RF module <u>**without**</u> the optional Scanner, one of three possible sequences will occur when you switch on; they are described below:

Pre-condition: The RF Check parameter is set to `ON` in the menu `Setup`, `Transmitter`.

a.) RF module switched on for the first time: no RF channel has been set. Switch on with the ➴ button pressed in, and select an RF channel (➜ b.).	No channel set! To set channel: 1.Switch OFF TX 2.<➴ >&tx ON <u>Start with RF OFF:</u> ➴ ⊥ Σ ⊟ ⊕ ⊡ ENTER
b.) Use the 3-D digi-adjuster to select an RF channel, then switch the transmitter OFF - ON <u>**or**</u> press any menu button or **ENTER** to activate operation without RF transmission.	CHANNEL: `073`⇕ Frequence 35.130MHz <u>Start with RF Off:</u> ➴ ⊥ Σ ⊟ ⊕ ⊡ ENTER
c.) Activate RF transmission by pressing any menu button or **ENTER**.	CHANNEL: 073 Frequence 35.130MHz <u>Use channel?:</u> ➴ ⊥ Σ ⊟ ⊕ ⊡ ENTER

❽ If Check RF is OFF:
If you have set the RF check to `OFF` in the menu `Setup`, `Transmitter` (not recommended), the selected channel confirmation described under b.) does not occur before an RF signal is broadcast.

10.2.2. RF module installed, Scanner installed
If your transmitter is fitted with an RF module <u>**with**</u> the optional Scanner, the following two possibilities arise.

Pre-condition: the parameter `Check RF` is set to `ON` in the menu `Setup`, `Transmitter`.

a.) The selected channel was already in use when the transmitter was switched on. An RF signal is **not** broadcast. Start the Scanner by pressing any menu button or **ENTER**.	CHANNEL: 073 Frequence 35.130MHz Channel used Use scanner? ➴ ⊥ Σ ⊟ ⊕ ⊡ ENTER
b.) The RF channel is already set, and is free for use. Activate RF transmission by pressing any menu button or **ENTER**.	CHANNEL: 073 Frequence 35.130MHz Channel free Use channel?: ➴ ⊥ Σ ⊟ ⊕ ⊡ ENTER

❽ If Check RF is OFF:
If you have set the RF check to `OFF` in the menu `Setup`, `Transmitter` (not recommended), the selected channel confirmation described under b.) does not occur before an RF signal is broadcast.

10.3. Switching on when no RF module is installed
If the transmitter is switched on with no RF module fitted, these two screen displays appear in turn:

ROYALpro12 2.53 DE/EN V268 *ROYALpro12* **MULTIPLEX**	! NOTE ! No RF **MULTIPLEX**

Fig. 10.3.1.: Transmitter type, Firmware version, languages   *Fig. 10.3.2: No RF modul installed*
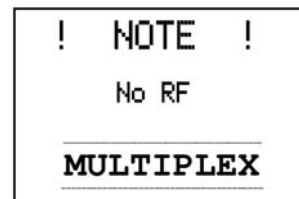
The message `No RF` remains on the screen for about one second.
After this the program continues with the throttle check (➜ 10.4.), or moves on directly to the last used Status display (➜ 10.6.).

10.4. Switching the transmitter on with throttle-check active
Throttle-check is a safety function. If you are about to fly a powered model, the throttle check (throttle lock) prevents an electric motor bursting into life unexpectedly if you switch the system on when the throttle channel is <u>**not at idle**</u>.

You will find the parameter `Check Thr.` in the menu: `Setup`, `Transmitter`:

```
➴ Transmitter
 ⬑ Exit
 Sound          All
 Safety
  Check Thr.    ON
  Check RF      ON
```
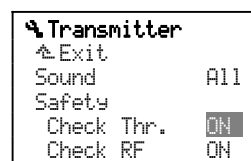
The factory default setting is `ON`. The conditions for throttle-check are different for fixed-wing model aircraft and helicopters; for this reason they are described separately in the next two sections.

10.4.1. 🛩 Throttle-check for fixed-wing models

```
!  NOTE  !

      THR
   Move to idle
      ⊽⊥⊼
  Throttle release
     REV/CLR
```

Indicator for throttle control (throttle stick in this case)

This warning appears if:

- Throttle-Check (`Check Thr.`) is set to `ON` (see above) <u>**and**</u>
- the throttle control is <u>**not**</u> in the idle position (or at the motor OFF position) <u>**and**</u>
- the Throttle CUT switch has <u>**not**</u> been operated.

As long as the on-screen warning is visible, …
- the servo assigned to throttle (or the speed controller) remains in the Idle position (or motor OFF), **and**
- all other control functions can still be operated normally.

The throttle lock is terminated when …
- the throttle control is moved to the Idle position (or motor OFF), **or**
- the Throttle CUT control is operated (default button H) **or**
- you press the **REV/CLR** button.

> ☻ **Caution! The motor might start to run!**
> **If you override the throttle lock using the REV/CLR button or Throttle CUT, the throttle channel will jump to the value defined by the assigned throttle control.**

10.4.2. 🗗 **Throttle-check for model helicopters**
Helicopter throttle is affected by the following transmitter controls:

a. Throttle CUT switch (default: button H).
b. Direct Throttle switch (DTC = Direct Throttle Control, default: switch N).
c. Collective pitch stick via the throttle curve.
d. Throttle limiter (default: slider F).

```
!  NOTE  !

      THR
  Move to idle
   ⊤I▲      F
 throttle release
     REV/CLR
```
Indicator for the throttle and throttle limiter controls

This warning appears on-screen if:
- Throttle-Check (Check Thr.) is set to ON (➔ 10.4.) **and**
- the collective pitch stick is **not** at the Idle position (collective pitch minimum) **and**
- the Throttle CUT switch is **not** active.

As long as the note is visible on the screen, …
- the servo assigned to throttle (or the speed controller) remains in the Idle position (or motor OFF) **and**
- all other control functions can still be operated normally.

The throttle lock is terminated when …
- the collective pitch stick is moved to the Collective Pitch Minimum position (**provided that:** point P1 on the throttle curve is lower than or equal to the set value for Throttle Minimum Min.) **or**
- EMERGENCY throttle OFF is operated (default: button H) **or**

- the throttle limiter is moved to the Minimum position **or**
- you press the **REV/CLR** button.

> ☻ **Caution! The motor might start to run!**
> **If you override the throttle lock using the REV/CLR button or Throttle CUT, the throttle will jump to the value defined by the assigned throttle control.**

10.5. Switching on to change the transmitter frequency, or to use the Scanner

Two buttons have special functions which only apply when you switch the transmitter on:

a. Button 🔧
(Setup)
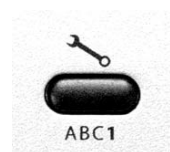
If you hold this button pressed in when you switch the transmitter on, the menu for selecting the transmission channel (transmitter frequency) appears as soon as you release the button:

```
CHANNEL: 073◆

Frequence  35.130MHz

Start with RF Off:
🔧 ⊥ Σ ⊟ ⌚ ⊟ ENTER
```

You can now select the channel on which you wish to operate using the 3-D digi-adjuster or the ▲ ▼ buttons.

> ☻ For safety reasons the **channel selection** option only appears if the transmitter is first switched **OFF, and then switched ON again**.

b. Button ⟨⊙⟩
(allocate 3-D digi-adjuster / scan)

If you hold this button pressed in when you switch the transmitter on, the "Scan" menu (or a message informing you that no scanner is present in the transmitter) appears on the screen when you release the button:

```
Scan: K 079 35.190MHz
ENTERMenu        ▲▼ MOVE
            ↓   >

  ▐  ▐▌  ▐
071  075  079  283  287
```
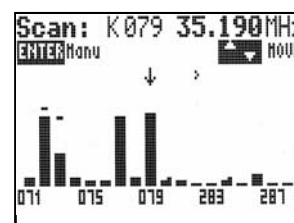
For information on the function and operation of the scanner please refer to the separate scanner instructions and Chapter (➔ 20.6.2.).

10.6. The Status displays

"Status display" is the term we use for the four different screen displays which appear as options when the transmitter is "started" (with or without RF transmission).

You can switch between the individual Status displays using the "▲" or "▼" buttons.

10.6.1. Status display **1** (standard)
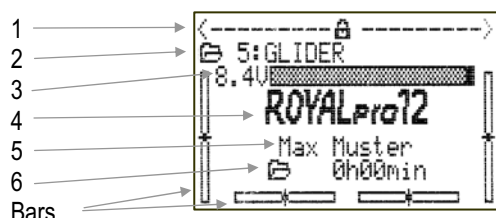
Line 1	Status of the 3-D digi-adjusters. Numerous set-up parameters can be allocated to the 3-D digi-adjusters, which can then be adjusted while the model is flying (➔ 20.1.)
Line 2	Current model memory with memory number and model name: 5:GLIDER
Line 3	Actual operating voltage of the transmitter battery in numeric form and as a graphic bar display
Line 4	Transmitter type: *ROYALpro* 7, 9 or 12
Line 5	Owner's name (➔ 14.5.3.)
Line 6	Operating time for the currently active model memory (➔ 18.2.)
Bars	The four bars at the sides and bottom indicate the current trim positions for the four primary control functions / sticks

10.6.2. Status display **2** (flight phases)
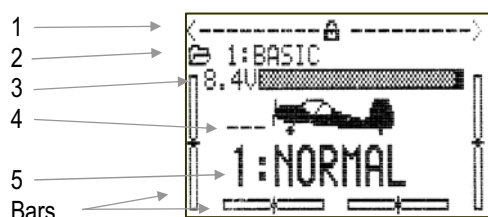
Line 1	Status of the 3-D digi-adjusters (➔ Status display 1)
Line 2	Current model memory (➔ Status display 1)
Line 3	Actual battery voltage (➔ Status display 1)
Line 4	Switch used to select the current flight phase (➔ 19.4.)
Line 5	Current flight phase with number and name: 1:NORMAL
Bars	Current trim positions (➔ Status display 1)

10.6.3. Status display **3** (timers)

The screen only displays those timers to which a switch has been assigned. After the timer the screen shows the associated switch (in this example: the Slot timer is controlled using switch "P"):
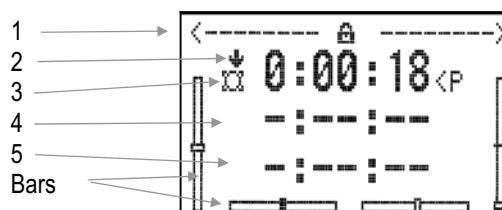
Line 1	Status of the 3-D digi-adjusters (➔ Status display 1)
Line 2	Direction of operation of each timer (here: counting down)
Line 3	Slot timer (➔ 18.3.)
Line 4	Sum timer (➔ 18.4.)
Line 5	Interval timer (➔ 18.5.)
Bars	Current trim positions (➔ Status display 1)

10.6.4. Status display **4** (system information)
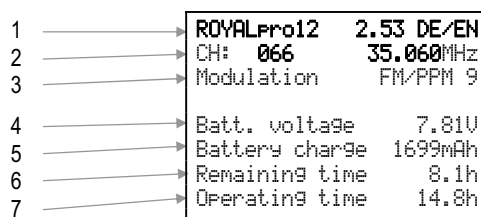
Line 1	Transmitter type: *ROYALpro* 7, 9 or 12 Software version: e.g. 2.53, Loaded language set: e.g. DE/EN (German / English)
Line 2	Channel number and frequency, or "No RF" if no RF module is installed
Line 3	Modulation: FM/PPM 6 to 12 or FM/M-PCM
Line 4	Actual battery voltage
Line 5	Available battery charge quantity
Line 6	Calculated remaining transmitter operating time based on the available battery charge quantity and the actual current drain. Only displayed if an RF signal is being transmitted. The red LED must flash!
Line 7	Transmitter operating time, up to 1000.0 hours, then restarts at 0.0 h

11.   The "*ROYALpro*" philosophy

11.1.   Operating the *ROYALpro*

11.1.1.   Using the keypad

The *ROYALpro* is programmed using the keypad and the two 3-D digi-adjusters. There are eleven buttons in all.

a. Six buttons for direct access to main menus

⚲	**Setup** (Configuration)
⊥	**Control**
Σ	**Mixer**
⎙	**Servo**
00:00	**Timer**
🗁	**Memory**

b. Special function buttons

⟨⊛⟩	Allocate 3-D digi-adjuster for: altering values in flight ➜ 20.1. calibrating servos ➜ 17.1.2. Activate scanner when switching on
REV/CLR	Reverse (**REV**erse) Erase (**CL**ea**R**). Many set-up values (% values) can be restored to the default setting using this button
ENTER	Menu / Open / Close parameter
▲	Cursor up / Increase values
▼	Cursor down / Reduce values

c. Text input buttons

The ten buttons with inscribed letters are used for entering text (name of transmitter owner, model, free mixers, assignment lists):

Text is entered in the manner familiar from mobile telephones. The two 3-D digi-adjusters can be used to select individual characters in the input field.

The characters which can be called up by rapidly and repeatedly pressing one button are printed in small script below the direct menu access buttons (row 1) and above the working buttons (row 2).

When you enter a letter at the start of a text input, or after a space, this is automatically displayed as a capital letter, with the following letters automatically set in lower case. If you wish to enter a series of capital letters, simply 'leaf past' the lower-case letters, and the capitals will follow. When you select a letter, the cursor automatically moves on to the next position. The cursor can also be moved forward or back manually to any position using either of the two 3-D digi-adjusters.

Text input is concluded by pressing the **ENTER** button. The screen now displays a request to input text:

```
Clear rest
  of line?
Yes -> REV/CLR
No -> ENTER
```

- Pressing the **REV/CLR** button erases all inputs after the last position of the cursor.
- Pressing **ENTER** leaves the text unchanged.

Entering special characters:
Certain buttons can also be used to enter characters in addition to the printed ones, such as accented letters and other special characters:

Button	Character
ABC**1**	A B C ä 1 a b c ä
DEF**2**	D E F 2 d e f
GHI**3**	G H I 3 g h i
JKL**4**	J K L 4 j k l
MNO**5**	M N O ö 5 m n o ö
PQR**6**	P Q R 6 p q r
STU**7**	S T U ü 7 s t u ü
VWX**8**	V W X 8 v w x
YZ_**9**	Y Z 9 ␣ y z _ ( ) ( )
/-#**0**	0 / ? ! – + % ÷ & < > *

Space character

11.1.2.   Using buttons when operating a model
The **REV/CLR button** resets all timers to the set alarm times.

The **3-D digi-adjusters** can be allocated to any parameter which is marked in the menus with a hyphen "–" (➜ 20.1.).

Button ⟨⊛⟩ is used to **unlock / lock** the values allocated for adjustment:

Fig. 11.1.2.1.: Aileron Expo allocated to the right-hand 3-D digi-adjuster

a. Value locked   b. Value unlocked

11.2.   The *ROYALpro* menu structure

You will find a diagram of the *ROYALpro* menu structure in the coloured A3 supplement to the manual. Please refer to the supplement when reading this section.

The *ROYALpro* has four menu levels:

- Status displays (not shown in the Overview)
- Main menu
- Menu
- Sub-menu

The **Status display** supplies information about the transmitter and the current model, and is divided up over four screens. You can switch between the displays using the ▲ and ▼ buttons. The Status display appears when you switch the transmitter on, or when you leave the main menus. The four Status displays are not shown in the Overview. Please see Chapter (➔ 10.6.) for details regarding the Status display.

The **six main menus** are called up using the six direct menu access buttons. Within the main menus all you will find is branches leading into the menus themselves. Each branch is always indicated by a series of four full stops.

The **menus** can contain both branches into **sub-menus**, as well as **parameters**.

The **sub-menus** only contain **parameters**.

Parameters are variable values which appear in menus and sub-menus. Some only provide information, but others are in a form which can be altered. Invariable parameters are skipped when you leaf through the menus.
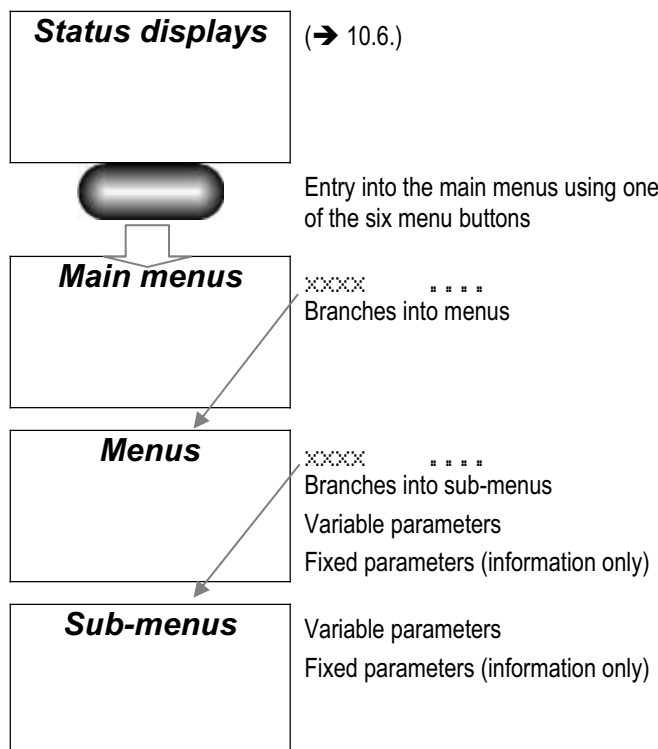
Fig. 11.2.1.: Menu structure in principle

Setup 🔧

Main menu: Setup
with branches into the menus

Menu: Assignment
with parameters
(Mode, Assignment, Name)
and branches
into sub-menus
(TX Controls, Switches)

Sub-menu: Assign Controls
with parameters

TX control
Operating element
Idle position and status
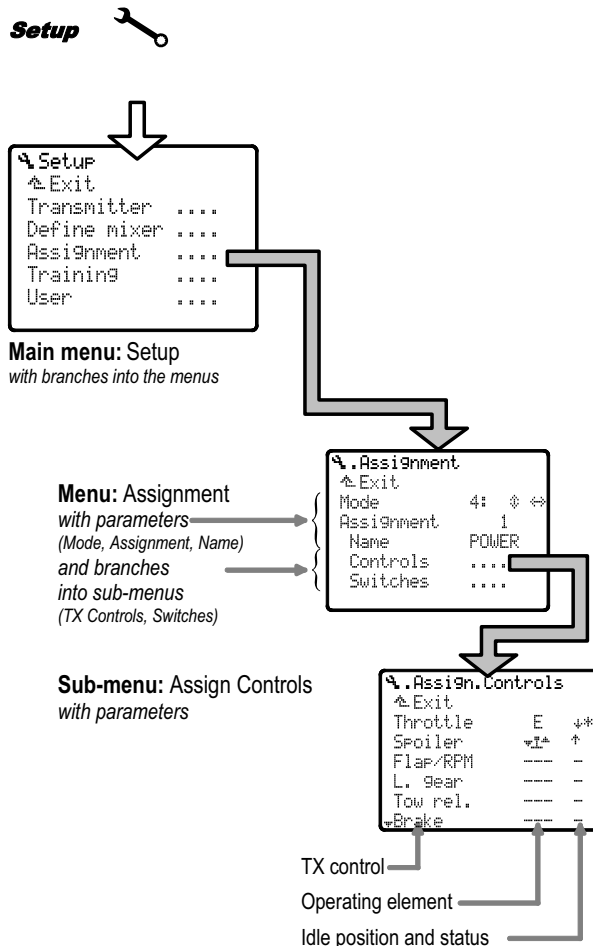
Fig. 11.2.2.: Typical menu structure

11.3.   What do the sticks, sliders and switches do?
Or: Global assignments (lists)

11.3.1.   What does "Assignment" mean?

The assignment defines which transmitter control is used to operate a function in the transmitter or the model. This information is stored in the assignment lists.

The software differentiates between
Controls (➔ 11.3.2.) and **Switches** (➔ 11.3.3.).

The assignment lists **do not include** the basic functions (aileron / elevator / rudder for fixed-wing models, roll / pitch / yaw / collective pitch for helicopters). These functions are covered by the stick mode (Modes 1 to 4).

11.3.2.   What are transmitter controls?

Controls are all those elements on the transmitter which operate functions in the model (servos, speed controllers, gyros, …). The following controls are available:

a. **Sticks**
   (e.g. for throttle, spoilers, ...).
b. **Sliders E and F**
   (e.g. for flaps, mixture, gyro, ...).
c. **Switches and buttons, including those on the sticks**
   (e.g. for retracts, aero-tow release, ...).

The menu ⚒Setup, Assignment, Controls contains a list of all the transmitter controls which are managed by the software:

```
⚒Assign.Controls
 ⚑Exit
 Throttle      ⊤I⊥   ↓⋇
 Spoiler        E    ↑
 Flap/RPM       F    ↓
 L. gear       ---   -
 Tow rel.      ---   -
 ⊤Brake        ---   -
```

In this menu you can change the assignment of the controls in any way you wish, i.e. you can change the arrangement to suit your personal preferences.

11.3.3. What are switches?

Switches are all those elements which control transmitter functions such as Dual-Rate, Combi-Switch, Timer, Flight phases, …

The menu ⚒Setup, Assignment, Switches contains a list of all the switches which are managed by the software.

Transmitter controls can also be used to switch certain functions. **Example:** the motor run time can be recorded using the timer Σᴛ (sum timer), if you use the throttle control as the switch to control this timer. It makes no difference whether the throttle control is a stick, a slider or a switch:

```
⚒Assign.Switches
 ⚑Exit
 DR-ai       <L    ↓⋇
 DR-el       <L    ↓⋇
 DR-ru       <L    ↓⋇
 CS/DTC      <N    ↓
 Throttle-cut H>   ⊓
 ⊤⊠Slot      ---   -
```

In this menu you can change the switch assignment exactly as you wish, i.e. to suit your personal preferences and requirements.

11.3.4. Why "global" assignments?

Every model pilot has his own ideas about the ideal layout of the transmitter controls.

Examples: when flying power models a pilot may always control throttle with the stick, but use switch G for his electric gliders. The glider aero-tow release might always be switch I. When flying model helicopters he may always control idle-up with slider F.

To ensure that our pilot is not obliged to enter this information for each new model, he uses "global" assignment lists for each model category (maximum five lists). Once he has defined the control assignment at this point, it can be used for as many models of the same category as he likes.

The fact that these lists can be altered at any time is one factor in the **flexibility** of the *ROYAL**pro***. However, a high level of **standardisation** is important in order to avoid confusion, and that is why we limit the number of assignment lists to five. This level of standardisation also helps to avoid operating the wrong controls in flight.

If you subsequently wish to change an assignment, perhaps to take into account new methods of control or habits, all you have to do is enter the change in the appropriate assignment list, i.e. you do not need to do this separately for each individual model.

The menu ⚒Assignment contains all the information concerning the current assignment for your model.

Example:

```
⚒Assignment                    1.
 ⚑Exit                         2.
 Mode       1: ◊ ⟷             3.
 Assignment    1               4.
  Name      BASIC              5.
  Controls  ....
  Switches  ....
```

The function of the individual menu lines is as follows:

Line	Menu point		Meaning
1.	Mode	1: ◊ ⟷	For Mode 1 this means: Elevator and rudder on the left stick; can also be changed in this menu point
2.	Assign-ment	1	Selected list is No. 1; can also be changed in this menu point
3.	Name	BASIC	Name of the list; can also be changed in this menu point
4.	Controls	....	On to control assignment list
5.	Switches	....	On to switch assignment list

11.3.5. Which assignment lists are available?

The *ROYAL**pro*** provides five assignment lists: three are pre-defined, and bear the names POWER, GLIDER, HELI. Lists 4 and 5 are empty; by default they are named "4......." and "5.......". All five lists and their names can be changed in any way you wish.
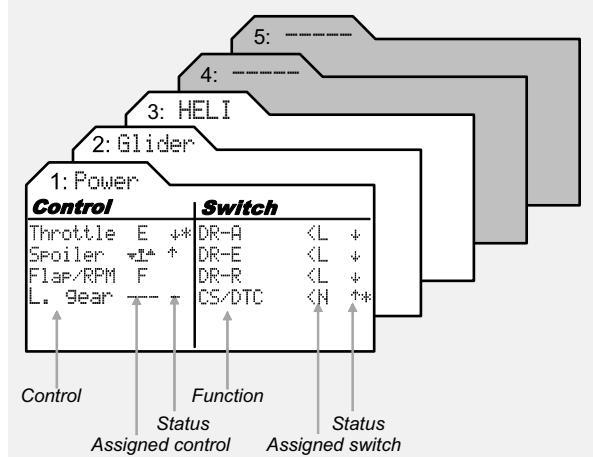
Fig. 11.3.5.1.: Global assignment lists

Please refer to (➔ 22.1.) for information on the default assignments.

11.3.6. How are the assignment lists arranged?

The assignment lists contain all the transmitter controls and switches which can be used when programming.

The second column indicates the control element to which the transmitter control or switch is linked. The arrows adjacent to the switch code letters indicate whether the switch is positioned on the left (⟨N) or right (G⟩) side of the transmitter.

The third column (Status) includes an up-arrow or a down-arrow; these have the following meaning for transmitter controls and switches:

a. In the `Controls` assignment list
The arrow shows the location of the "Idle" position of the transmitter control.
⇡ = forward, ⇣ = back
The asterisk "✳" following the arrow appears when the control is actually in the Idle position.

Example:

Spoiler on the stick, Idle forward, active

Flap on slider F, Idle back, not active
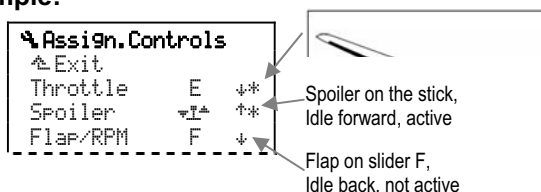
For fixed-wing models: Idle for throttle, spoiler / landing gear retracted.
For helicopters: coll. pitch min., motor OFF position for throttle limiter.

For the other transmitter controls the Idle position only has a subordinate significance.

b. In the assignment list `Switches`
The arrow indicates the direction in which the function is switched on.
`DR-ai` (Dual-Rate aileron), `CS/DTC` (Combi-Switch / Direct Throttle), `Throttle-cut`, Timers etc.
The asterisk "✳" following the arrow appears when the switch is currently at the ON position (function active).

Example:

Dual-Rate on switch L (ON position back)

Combi-Switch on switch N (ON position forward)

Throttle-cut on button H (active when button is pressed)

Slot timer (no switch assigned)
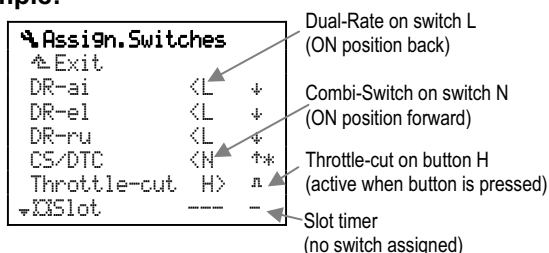
11.3.7. How are the assignment lists used?

When you set up a new model in a memory (➔ 12.2.6. and 13.2.6.), you can select one of the five lists.

The name of the list is intended to describe the **model category** for which the list was created, rather than a specific model (i.e. "E-glider", rather than "Cularis").

Suggested names: E-heli, E-glider if, for example, you wish to use different assignments for your electric models to their equivalents with I.C. motors.

⎍ **Tip:** we recommend that you set up the list to cover the most complex model which you own in that particular category. For example, it presents no problem if the Glider list includes, say, assigned transmitter controls for flaps and retractable wheel, even if your current model is just a simple rudder / elevator glider.

11.3.8. Summary: "Global assignments"
- Five global assignment lists are available.
- Three assignment lists are pre-defined.
- All list names and assignments can be changed.

11.4. Global mixer definitions

11.4.1. Why "global" mixer definitions?
As in the case of assignments, there are particular mixer configurations which modellers use again and again. For this reason we have separated the mixer **definitions** from the process of **setting up** the individual mixer input values for a particular model.

The **definition** is entered "globally" in menu ⌁ (Setup), `Mixer def.` (see illustration below). Once defined, a mixer can be used as often as you like for any number of models.

When a mixer is defined, the following points are determined:
1. A name for the mixer.
2. A maximum of five mixer inputs.
3. A switch for the mixer inputs.
4. The method of working of the mixer inputs.
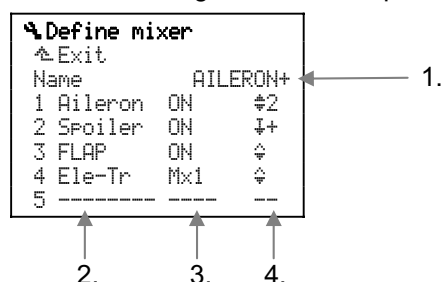
The **magnitude of the mixer inputs** is set individually for each model in the menu ∑ `Mixer`.

Example:
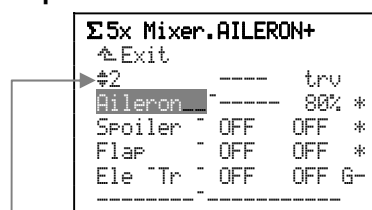
In the line above the mixer inputs, the screen shows the method of working of the selected mixer input and the meaning of the variable values.

11.4.2. Which global mixers are available?

The *ROYALpro* includes fourteen free mixers. Five of them are pre-defined, and can be used immediately. All the mixers - including the pre-defined ones - can be changed exactly as you wish.

Please refer to the overview (➜ 22.2.) "Pre-defined mixers" for information on the default mixer definitions.

☝ **Tip:** the mixer definition should cover the most complex application for which you are likely to want to use the mixer. If the model is a glider whose ailerons you "only" wish to raise for landing, you can use the `AILERON+` mixer. The inputs `Flap` and `Ele -tr` can simply be left at "`OFF`" when you are setting up the mixer inputs in the menu `ΣMixer`. However, those inputs remain available in the definition even though they have no effect on the present model, assuming that they are not set up and activated for that model.

11.4.3. Mixer names with a "+" suffix

You will see a "+" suffix attached to the names of the pre-defined mixers. This indicates that, for example, the `AILERON+` mixer includes other inputs in addition to the basic `Aileron` function. These mixer names are also displayed in capital letters (`ELEVATR+`, `AILERON+`, `FLAP+`, …), to differentiate them more clearly from the basic inputs (`Elevator`, `Aileron`, `Flap`).

11.4.4. How are the free mixers used in fixed-wing model aircraft?

You might care to think of the free mixer definitions as a collection of building blocks, from which you select the most suitable for any particular model. The "selecting" is carried out when you assign the servos in the model. Only if a mixer is assigned to at least one servo (menu `⊟Servo, Assignment`) does the mixer appear in menu Σ (Mixer); you can then set the values for the individual mixer inputs.

The illustration below shows the building block collection and the fourteen mixer building blocks:
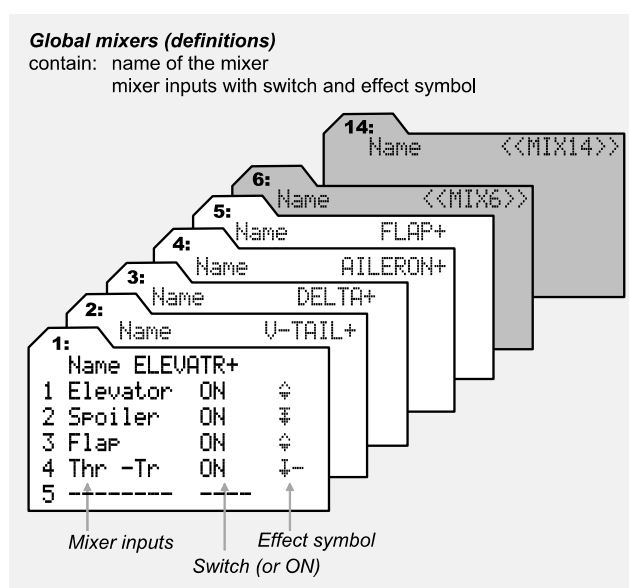
Fig. 11.4.4.1.: The free mixers

🚫 **Important:** a maximum of five free mixers can be used simultaneously in any one model memory.

11.4.5. How are mixers used in helicopters?

For model helicopters the mixers required to control the various rotor head types and the tail rotor are pre-programmed as standard. As a result, the free mixers (1 to 14) cannot be used when assigning the servos for model helicopters.

However, there are three free transmitter control mixers, and they can be used to mix the signals from the controls ROLL, PITCH and YAW into the transmitter controls ROLL, PITCH, YAW, THROTTLE or COLLECTIVE PITCH.

The most important application for these facilities is the various compensation mixers, in which all the control functions are mixed into THROTTLE. For example, these mixers make it possible to compensate for the increased power requirement when the pilot makes deliberate control commands.

The settings in these mixers might look as follows:

```
ΣComp.Mix.CRUISE
↟Aileron ⇕ -> Throttle
  Travel    ⫯  10%
 Elevator⇕ -> Throttle
  Travel    ⫯  10%
 Rudder   ⇕ -> Throttle
  Travel+   ⫯  -5%
  Travel-   ⫯  17%
```

`Roll` and `Pitch` (-axis) are mixed into `Throttle` symmetrically. Separate values for "left" and "right" can be entered for `Yaw`.

11.4.6. Summary of the "free mixers"

- Fourteen free mixers are available.
- Mixer names (max. eight characters), mixer inputs, switches and method of working can be changed in all mixer definitions.
- Up to five free mixers can be used simultaneously for a particular model.
- Every mixer you use can be assigned to as many servo channels as you wish.
- The menu `ΣMixer` only displays those mixers to which at least one servo has been assigned.
- Only Control mixers are available for helicopters.

11.5. Model templates

11.5.1. Why are model templates needed?

The model templates make it much easier and quicker to set up new models, as a large part of the routine work is accomplished just by selecting the appropriate template. Use a template, and you can immediately start entering the settings for the model.

The model templates themselves cannot be changed. However, when you set up a new model and load a copy of the template into the model memory, you can then access it and make changes as needed.

Advantage: since the template itself cannot be altered (even accidentally), it is always available in the exact form described in the Manual.

11.5.2. What do the model templates contain?

a. Basic mixer settings
   The main input is set to full servo travel; all other inputs to OFF.

b. Basic transmitter control settings
   Travel and Dual-Rate to 100%
   Expo to 0%
   Trim increment to 1.5%.

c. Basic servo settings
   Servo travels 100%
   Centre to 0%.

d. Basic flight phase settings
   All four possible flight phases are assigned names. However, only the following are unlocked by default:
   - for fixed-wing models: NORMAL
   - for helicopters: HOVER and AUTOROT (Autorotation).

11.5.3. Which model templates are available?

✈	🛫
1. BASIC	7. HELImech
2. ACRO	8. HELIccpm
3. HOTLINER	
4. DELTA	
5. GLIDER	
6. 4 FLAPS	

Amongst these eight model templates you are bound to find one which is so close to your model that only minor corrections are necessary to produce a perfect match.

For a **detailed description of the model templates** please refer to section (➔ 21.1.) "Fixed-wing models" and (➔ 21.2.) "Helicopters".

11.6. Servo configuration

The term servo configuration refers to the order in which the servos are connected to the receiver output sockets. There are four possible choices:

a. M-PCM
   for use with the new sequence optimised for the new M-PCM transmission mode

b. MPX-UNI
   the standard sequence used for many years by MULTIPLEX and many other makes of transmitter

c. FUTABA

d. JR.

If you have already flown the model with a FUTABA or JR transmitter, we recommend that you select the corresponding configuration.

Note: the receiver output assignment for the four possible configurations can be found in the Overview (➔ 21.3.) "Servo configuration".

11.7. Servo calibration

The advantage of our idea of "global mixers" (➔ 11.4.) is that any change which affects multiple servos sharing the same function only has to be changed as a single numerical value if you wish to alter a control surface travel.

To ensure that this procedure works properly, the control surface travels for servos with the same function must be set to the same values. Any mechanical discrepancies are corrected in this way.

Example: when a 100% aileron signal is present, the left aileron deflects by 13.5 mm, the right only 12 mm. The manufacturer of the model recommends a travel of 11 mm. You can now calculate the required servo travel as a percentage value, and set up the model in the menu ⊟Servo.Calibrate.

Typical calculation, for left aileron:
Nominal deflection: 11.0 mm
Actual deflection: 13.5 mm
Formula: (Nom. / Act.) * 100% = (11 / 13.5) * 100%
                                          = 81.48%
You should therefore set: **81%**

For the right aileron the setting is as follows:
(11 / 12) * 100% = 91.67% = **92%**

Advantage: when the calibration process is complete, a value of 100% relating to transmitter controls and mixers means that both ailerons deflect by 11 mm. The following is also true: 1 mm travel equals a value of 9%. If, for example, you now wish to raise the ailerons by 2 mm for a particular task, then a mixer input (Flap control) of 18% is necessary.

11.7.1. What can be calibrated?

Two, three or five points on the servo curve can be accessed for the calibration process. The number of points is determined when a new model is set up, but for each servo this can also be changed subsequently to any other value in the menu ⊟Servo.Assign.

a. 2P **(2-point curve)**
   Only the servo end-points (Points P1 and P5) are changed. Between these two points the servo travel is linear.
   Application: retracts, tow release, throttle, ...

b. 3P **(3-point curve)**
   In this case the servo centre (Point P3) can be adjusted in addition to the two end-points. If you offset the centre, the two travels between centre and end-point remain linear, i.e. the servo curve is now "bent".
   Application: this equates to the standard form of servo travel adjustment.

c. 5P **(5-point curve)**
   Adding the two intermediate curve points (Points P2 and P4) produces a deliberately "distorted" servo curve.
   Application: this option can be used to generate non-linear servo travel even for control functions for which Expo or a curve are not available.

11.7.2.   How is the calibration carried out?

There is a separate servo calibration menu which is accessed as follows:

Main menu (button): ▣
Menu: Calibrate ....
Sub-menu: 1 AILERON+ ....

Now select the point which you wish to adjust, and press the 3-D digi-adjuster.

```
▣Calibr.AILERON+
 ⬆Exit
REV/TRM     0    SERVO:1
P1        -100%
P2        ----
P3          0%
P4        ----
P5        100%  1  2  3  4  5
```
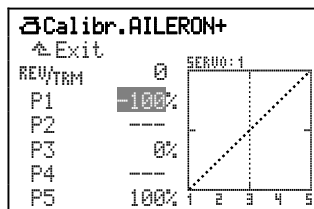
Fig. 11.7.2.1.: Servo calibration with opened % value

The value (e.g. -100%) is now open, and can be altered using the 3-D digi-adjuster.

To alter the travel of one control surface you would now have to keep the corresponding stick at one end-point, hold a ruler against the control surface, and operate the 3-D digi-adjuster with your "third hand".

To simplify this procedure there is the allocation process, which is described in the next section.

11.7.3.   Allocation - what's that?

> **🛈 Caution**
> Don't press the allocation button ⊛ until you have set the servos to the correct direction of rotation.

When a % value is open in the sub-menu ▣Servo.Calibrate, press the ⊛ (allocate) button.

This action sends a control signal to the servo corresponding to the stick position for the point on the servo curve which you wish to calibrate. The vertical line in the graph jumps to the opened point, and the corresponding servo can now be adjusted.

Example:
Servo 1 operates the left aileron. Point P1 defines the down-travel. Rotating the 3-D digi-adjuster moves the servo, and the end-point can be adjusted.

Important!
Pressing the Allocate button sends the control information to all the servos which share the same function. This makes it easy and convenient to set up control surface travels to match each other accurately.

Examples for fixed-wing model aircraft:
Multi-flap wing
    Matching left and right control surfaces to each other (e.g. with AILERON+ at servos 1 and 5).

Separate elevators with two servos
    Matching the travels.

Example for model helicopters:
Electronically mixed swashplate
    Setting the swashplate exactly horizontal at the end-points; if non-linear effects are apparent, the process can be repeated at the intermediate positions (P2 and P4).

12. Setting up a fixed-wing model

We recommend that you first read Chapter 11, which describes the operating philosophy of the *ROYALpro*, before you set up a new model in a memory. This should ensure that you have at least a basic understanding of the system, and will be able to carry out the following steps more easily.

12.1. The method in principle

In this example we will set up a model memory for a glider with a four-flap wing.

The following steps have to be carried out to ensure that the model's basic functions work as expected:

a. Set up new model memory   12.2.
b. Prepare transmitter controls and switches 12.3.
c. Prepare servos   12.4.
d. Activate and check mixed functions   12.5.
   Example: ailerons raised as landing aid.

After these four steps you will be able to control the model's basic functions, i.e. aileron, elevator, rudder and throttle. Butterfly (Crow) is activated as landing aid.

At this point you can expand and refine the set-up:

e. Activate Combi-Switch   12.11.2.
f. Set up aileron differential   12.6.
g. Elevator trim mixers   12.7.
   spoiler / throttle to elevator mixers
h. Activate the inboard wing flaps   12.8.
i. V-tail model   12.9.
j. Working with flight phases   12.10.
   Assign switch
   Unlock / lock / name phases
   Set transition times
   Adjust values
k. Further options that can be added   12.11.
   Dual-Rate (D/R), Expo,
   Combi-Switch, Motor run timer.

12.2. Setting up the new model in the transmitter

12.2.1. Menu ⌸, call up New model

a. Open the main menu Memory:
   Press button ⌸.

b. Open the menu New model:
   Turn the 3-D digi-adjuster to the right as far as New model, and open the menu
   (press 3-D digi-adjuster):

```
⌸New model
  ⬆Exit
  Memory nr.      3      ⇨ 12.2.2.
  Template    4 FLAPS    ⇨ 12.2.3.
  Servo conf. MPX-UNI    ⇨ 12.2.4.
  Mode        4:  ⬍ ⬌    ⇨ 12.2.5.
  Assignment  GLIDER     ⇨ 12.2.6.
        OK              ⇨ 12.2.7.
```

Note:
The new model is not stored in the memory until you confirm the selected settings with OK (➔ 12.2.7.).

12.2.2. Which model memory will be used?

New models are automatically stored in the first vacant memory; the memory number appears in the menu. Since you have no influence over the memory number, this line in the menu is skipped.

If all model memories are in use, the screen displays:

```
Memory nr.      -1
```

If you nevertheless attempt to set up the new model, the following on-screen warning appears:

```
   No memory free
   Press ENTER
```

12.2.3. Selecting the Template

Note:
The templates (➔ 11.5.) make it much quicker and easier to create new models, as they already contain the essential assignments and settings. You can check which template was used to create a particular model by accessing the menu ⊟Memory, Properties.

Turn the 3-D digi-adjuster to the right until the select bar stands in the Template line, then press the 3-D digi-adjuster.

Now you can select the template 4 FLAPS from the eight available templates, using the 3-D digi-adjuster:

```
⊟New model
  ⬆Exit
  Memory nr.      3
  Template    ▓4 FLAPS▓
  Servo conf. MPX-UNI
  Mode        4:  ⬍ ⬌
  Assignment  GLIDER
        OK
```

Press the 3-D adjuster once more to confirm your choice.

12.2.4. Selecting the servo configuration (servo conf.)

Note:
The servo configuration (➔ 11.6.) defines the order in which the servos have to be connected to the receiver in the model. The selected configuration is only a suggestion, and can be changed subsequently in any way you wish if the servos are connected to different receiver outputs (➔ Menu: ⊟, Assignment).

Rotate the 3-D digi-adjuster to the right until the select bar is at the Servo conf. line, then press the 3-D digi-adjuster.

Now use the 3-D digi-adjuster to select, for example, the MPX-UNI configuration from those available:

```
⊟New model
⤴Exit
Memory nr.        3
Template      4 FLAPS
Servo conf.   MPX-UNI
Mode          4:  ⊕ ⇔
Assignment    GLIDER
      OK
```
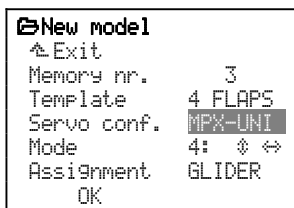
Press the 3-D adjuster again to confirm your choice.

By selecting the 4 FLAPS template and the servo configuration MPX-UNI you automatically set the following receiver output sequence:

MPX-UNI	
1	AILERON+
2	ELEVATR+
3	Rudder
4	Throttle
5	AILERON+
6	FLAP+
7	FLAP+
8	Spoiler
9	Spoiler

See also the illustration in (➜ 12.2.7.).

12.2.5. Selecting the stick mode
The stick mode defines the association between the stick axis and the controlled function. However, the mode affects **only** the functions **aileron, elevator** and **rudder.** The way in which **throttle, spoiler and flap** are controlled is defined when you assign the transmitter controls (➜ Menu: ⤦, Assignment, Controls).

First consider the functions you wish to control using the **left stick**, then look up the appropriate mode in the table below.

Mode table for the left stick:

Stick movements, left stick		Required
forward/back	left/right	mode
Elevator	Rudder	1: ⊕ ⇔
	Aileron	3: ⊕ ⇔
Throttle (or Spoiler)	Rudder	2: ⇔ ⊕
	Aileron	4: ⊕ ⇔

The double arrows following the mode code numbers indicate where elevator (⊕) and rudder (⇔) are located.

The stick functions for the right stick are assigned automatically.

Example: we will assume that you want elevator and aileron on the **left stick**; in which case you would select Mode 3. Rudder is now automatically on the right stick.

Turn the 3-D digi-adjuster to the right until the select bar is over the Mode line, then press the 3-D digi-adjuster:

```
⊟New model
⤴Exit
Memory nr.        3
Template      4 FLAPS
Servo conf.   MPX-UNI
Mode          4:  ⊕ ⇔
Assignment    GLIDER
      OK
```
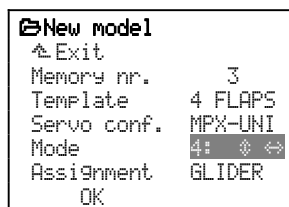
You can now use the 3-D digi-adjuster to select the stick mode you have just decided to use.

Press the 3-D digi-adjuster to confirm your choice.

12.2.6. Selecting the Assignment
At this point you can select the assignment list, which defines which transmitter controls and switches are used to operate the various functions.

For a glider you would of course use the assignment list bearing the name GLIDER (No. 2).

Turn the 3-D digi-adjuster to the right until the select bar is over the Assignment line, then press the 3-D digi-adjuster:

```
⊟New model
⤴Exit
Memory nr.        3
Template      4 FLAPS
Servo conf.   MPX-UNI
Mode          4:  ⊕ ⇔
Assignment    GLIDER
      OK
```
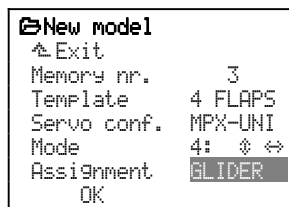
Select GLIDER from the five available assignments using the 3-D digi-adjuster.

Press the 3-D digi-adjuster to confirm your selection.

> **Note:**
> You can also change the selected assignment in any way at any time (Menu: ⤦ Setup, Assignment).

12.2.7. Confirming with OK
Rotate the 3-D digi-adjuster to the right until the select bar is at the OK line, then press the 3-D digi-adjuster.

Congratulations!
You have successfully stored a new model in the transmitter's memory.

If you have kept to our suggestions in the steps completed thus far, the following data is now stored in the new model memory:

a. Receiver output sequence
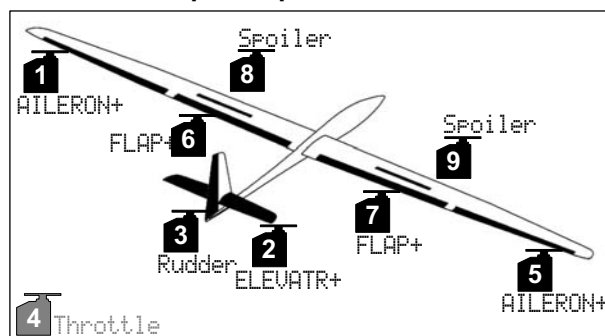
Fig. 12.2.7.1.: Servo assignment with MPX-UNI configuration

- Servos 1 to 9 are pre-defined
  (**ROYALpro 7**: only servos 1 to 7 are possible).
- All servo assignments can be changed at any time in any way (Menu: 🖳 Servo, Assignment).

For example, servo 4 (Throttle) could be changed to tow-release (Tow rel.) if your model features that function.

b. Transmitter control assignment

Aileron, elevator and rudder are defined by the stick mode which you have selected in Step (➔ 12.2.5.).

In the menu ⦥, Assignment, Controls you will find:

- Throttle at slider E, Idle position "back":

```
Throttle     E   ↓*
```
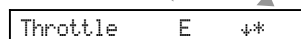
The asterisk "" appears after the arrow when the slider is in the Idle position. Try moving slider E to confirm this.*

- Spoiler on the stick, idle position "forward":

```
Spoiler      ↓I↑   ↑*
```
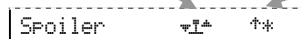
The asterisk "" appears when the stick is in the Idle position (forward). Try moving the stick to confirm this.*

c. Switch assignment

In the menu ⦥, Assignment, Switches you will see:

Function	Switch		
DR-ai	‹L	↓	Dual-Rate
DR-el	‹L	↓	Aileron, elevator and rudder are
DR-ru	‹L	↓	switched simultaneously by L
CS/DTC	‹N	↓	Combi-Switch (and DTC for helicopters) assigned to N
Throttle-cut	H›	⊓	With momentary function assigned to H
Σ›Sum	E	↑	Aggregate timer controlled by control E (throttle) for motor run time
Mix-1	G›	↓	Mixer input switch assigned to G
Phases 1-3	‹O	↑	Flight phase switch assigned to O

Switches not in use are marked as " --- - ", and are not listed here.

🔌 **Tip:** you can now carry out an initial check of the working systems using the servo monitor; you don't need the model for this. Move to the monitor as follows:

Menu 🖳 Servo, Monitor:
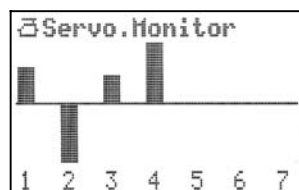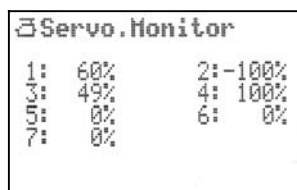
Bar graph

Percentage values

Move the sticks, sliders and switches and watch the effects on-screen.

When you access the Monitor menu you will see the bar graph display. Rotate the 3-D digi-adjuster to toggle between the two types of display. Press the 3-D digi-adjuster to leave the servo monitor.

12.2.8. Entering the model name

The model you have just stored initially bears the name of the template you are using. In our example this would be 4 FLAPS. To help you keep track of your models, you should change this default name to the actual model name.

This is the procedure:

a. Open the main menu 🖃 Memory
   (press button 🗀).

b. Select the Properties menu and open it:

```
🖃Memory
 ⌐Exit
  Select model ....
  Copy        ....
  Erase       ....
  Flight phase ....
  Properties  ....
 ↓New model   ....
```

(Select using the 3-D digi-adjuster, then press).

c. Use the 3-D digi-adjuster again to select the Name line, then press **ENTER** (or the 3-D digi-adjuster):
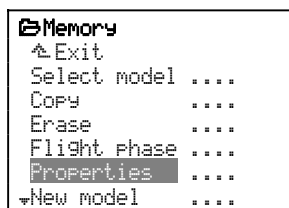
```
🖃Properties
 ⌐Exit
  Template  4 FLAPS
  Mode      4:  ◊ ⇔
  Assignment GLIDER
  Name      ▮asyGlid
            er
```
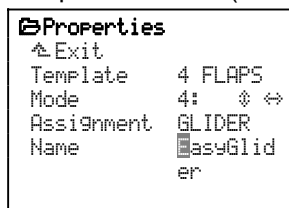
At this point you can enter a model name with a maximum of sixteen characters; it should clearly identify the model. This name will also appear in the Status display.

Text input using the keypad (➔ 11.1.1.).

12.3. Preparing the controls / switches

In the 4 FLAPS template the following transmitter controls are already prepared in addition to the basic functions of aileron, elevator and rudder:

a. Spoiler
controlled by stick, idle position (i.e. spoilers retracted) forward.

b. Flap
controlled by slider F.

c. Throttle
controlled by slider E, Idle position back.

12.3.1. Selecting / changing the idle position for spoiler / throttle

If you wish to change the Idle position, you must carry out this procedure:

a. Open main menu ⦥ Setup (press button ⦥).

b. Select (3-D digi-adjuster) and open (press 3-D digi-adjuster) menu Assignment.

c. Select (3-D digi-adjuster) and open (press 3-D digi-adjuster) sub-menu Controls.

d. Select (3-D digi-adjuster) and open (press 3-D digi-adjuster) Spoiler control.

e. Press **ENTER** to confirm the warning message: Standard list!
The warning has to be confirmed because any change affects all models which are set up using the same assignment list (GLIDER).
The line in the menu must look like this:

> | Spoiler   ▾I▴ ↑ |

f. Now move the transmitter control to the desired idle position; the arrow will change its direction when you do this (↑ , ↓). The asterisk (✳) is always displayed.

g. Press the 3-D digi-adjuster or **ENTER** to confirm:

> | Spoiler▬▬▬▬ ▾I▴ ↓✳ |

In our example the idle position for Spoiler is "stick back".

The idle position for Throttle can be changed in the same manner.

For Flap (camber-changing flaps) there is no need to change the idle position, as the deflection takes place on both sides of centre.

12.3.2.　Changing the switch ON position
The position of the "ON" state can be changed for all switches which are used in an assignment list.

Example Combi-Switch (CS/DTC):
In the pre-defined assignment list GLIDER the Combi-Switch is active when the switch N is in the "back" position. If you want the ON state to be "forward", please use this procedure:

a. Open the main menu ⤢ Setup (press button ⤢).

b. Select (3-D digi-adjuster) and open (press the 3-D digi-adjuster) the Assignment menu.

c. Select (3-D digi-adjuster) the sub-menu Switches and open the setting (press the 3-D digi-adjuster).

d. Select (3-D digi-adjuster) and open (press 3-D digi-adjuster) the switch CS/DTC.

e. Confirm the warning message: Standard list! by pressing **ENTER**.
The warning has to be confirmed because any change affects all models which are set up using the same assignment list (GLIDER).
When switch N is forward, the line in the menu must look like this:

> | CS/DTC   ◁N   ↑✳ |

f. Now move the switch to your preferred position for Combi-Switch "ON". The arrow changes its direction (↑ , ↓). The asterisk (✳) is always displayed.

g. Press the 3-D digi-adjuster or **ENTER** to confirm:

> | CS/DTC▬▬▬▬▬▬ ◁N ↑✳ |

12.4.　Preparing servos
In this section the settings for the outboard wing flaps are entered. The inner wing flaps are added in section (➔ 12.8.).

12.4.1.　Checking / changing the servo assignment
At the servo assignment stage the following aspects are determined:
- the **receiver outputs** to which the servos have to be connected,
- the **signal format** which the servos require (MPX or UNI), and
- the **number of variable curve points** (2, 3 or 5) required for servo travel and centre calibration.

Note: defaults
In the 4 FLAPS template all the servos are set to the UNI signal format and three (3) curve points by default.

This is the procedure:
a. Open the main menu ⊟Servo (press button ⊟).

b. Select (3-D digi-adjuster) and open (press 3-D digi-adjuster) the menu Assignment.

c. In this menu the assignment for all receiver outputs can be changed in any way you like.

In our example we will change servo 4 from Throttle to Tow release (Tow rel.):

d. Select (3-D digi-adjuster) and open (press 3-D digi-adjuster) Servo 4:

> ```
> ⊟Servo.Assign
> ⬑Exit
> 1 AILERON+   UNI   3P
> 2 ELEVATR+   UNI   3P
> 3 Rudder     UNI   3P
> 4 Throttle   UNI   3P
> 5 AILERON+   UNI   3P
> ▾6 FLAP+     UNI   3P
> ```

e. Select Tow rel. (3-D digi-adjuster) and move on to Signal format (press 3-D digi-adjuster).

f. For example: if you are using a servo with MULTI-PLEX signal format for the tow release, you can switch to MPX (rotate 3-D digi-adjuster) at this point.

> | 4 Tow rel.   UNI   3P |

g. Move to the number of curve points (press the 3-D digi-adjuster again):

> | 4 Tow rel.   UNI   2P |

h. Two points (2P) are sufficient for the tow release, since only the two end-points need to be adjusted. A tow release is normally operated using a two-position switch as transmitter control, since intermediate positions would offer no advantage.

i. Press the 3-D digi-adjuster or **ENTER** to confirm. The number 4 is highlighted, and you can now select a different servo:

> | 4 Tow rel.   UNI   2P |

12.4.2. Checking / changing the direction of servo rotation

It is important to check the direction of rotation of the servos and correct that aspect (if necessary) before making adjustments to the centre position and travels.

Checking:

Move the transmitter controls for the individual control functions in turn (aileron, elevator, rudder), and check whether the control surfaces move in the correct direction.

This is the procedure for altering the direction of rotation:

a. Open the main menu ⊟Servo
   (press button ⊟).

b. Open the Calibration menu (Calibrate) and select a Servo.

c. Select line REV/TRM and open Parameter:

```
⊟Calibr.AILERON+
  ⌃Exit       SERVO:1
REV/TRM    ░░░0 ┌──┬──────┐
              │  │     ╱ │
              └──┴──────┘
```

Now you can reverse the direction of servo rotation using the **REV/CLR** button. The effect is immediately visible in the graph (curve reverses).

⌕ **Tip:**

If you move the associated stick slightly away from the centre position and then press the **REV/CLR** button, the servo will jump to a new position when you reverse it. This is an easy way to check that you have selected the "right" servo.

d. When the direction of rotation is correct, press the 3-D digi-adjuster or the **ENTER** button to confirm your choice, then quit the menu via Exit and select the next servo you wish to adjust.

> 🕃 **Note:**
> Please don't start adjusting servo travels and centre positions until you have corrected the direction of rotation for all the servos. If you subsequently reverse the servo, you will need to carry out the calibration process again.

12.4.3. Calibrating servos = setting the centre and maximum travels

In the menu ⊟Servo.Calibrate (➔ 11.7.) you can adjust the travels (P1 and P5), the centre positions (P3) and the intermediate points (P2 and P4) for all servos in such a way that the servos take up the correct idle position, move evenly across their range of travel, and reach the appropriate end-points.

> 🕃 If you wish your models to fly accurately, precise servo calibration is a fundamental requirement!
>
> 🕃 The travel you set at this point cannot be exceeded (travel limit).
>
> 🕃 Always set the largest travel which the servo will be required to carry out.
> **Example:** when the ailerons are raised for glide path control, the ailerons deflect up by 20 mm, but only 12 mm deflection is required for AILERON control. If the ailerons are used as camber-changing flaps, the required travel is just 3 mm. At the calibration stage point P1 (and P5) must be adjusted so that the aileron travel is 20 mm.

This is the procedure for adjusting servo centre:

a. Open the main menu ⊟Servo
   (press button ⊟).

b. Open the Calibration menu (Calibrate) and select the servo.

c. Select line P3 and open Parameter:
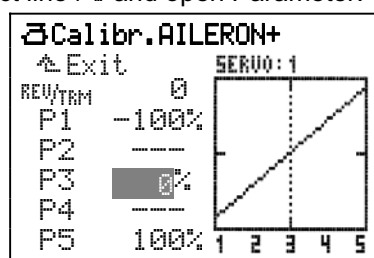
```
⊟Calibr.AILERON+
  ⌃Exit        SERVO:1
REV/TRM    0
 P1   -100%
 P2   ─────
 P3   ░░0%
 P4   ─────
 P5    100%  1 2 3 4 5
```

> 🕃 **Note: first carry out a hardware "calibration"!**
> Now press button ⊙. This generates the "true" centre, without the influence of the trim or mixer inputs on the servo.
>
> If the servo is not in the desired centre position at this stage, it is essential to correct the control surface position mechanically (by re-positioning the output arm on the servo, or otherwise adjusting the linkage).
>
> Wherever possible, the fine-tuning for Point P3 of servo calibration should not exceed ±15%.

d. Now use one of the two 3-D digi-adjusters to set the control surface to the desired centre position. Any adjustments you make are immediately visible on the model itself.

e. When the centre point is correct, press the 3-D digi-adjuster or the **ENTER** button to confirm, quit the menu via Exit, and select the next servo you wish to adjust.

This is the procedure for setting maximum servo travel (control surface deflection):

🝂 **Tip: first adjust the mechanical linkage**

Always adjust the mechanical linkages on the model as accurately as you can before you carry out any (electronic) adjustments at the transmitter:

- Fit the output arm on the servo output shaft at right-angles to the line of the pushrod. This eliminates any mechanical differential.

- At the servo:
  Connect the pushrod as close to the centre as possible, and set maximum servo travel. This reduces the effect of play in the gearbox, and exploits the servo's torque to the full.

- At the control surface:
  Connect the pushrod as far out as possible on the horn. This reduces the effect of play in the linkage, and transmits the servo's power to the control surface in the most efficient way possible.

---

a. Open the main menu 🎛Servo
   (press button 🎛).

b. Open the menu Calibrate and select the servo.

c. Select line P1 and open Parameter:

```
🎛Calibr.AILERON+
 🝂Exit          SERVO: 1
REV/TRM      0
 P1     -100%
 P2     -----
 P3       0%
 P4     -----
 P5      100%   1  2  3  4  5
```
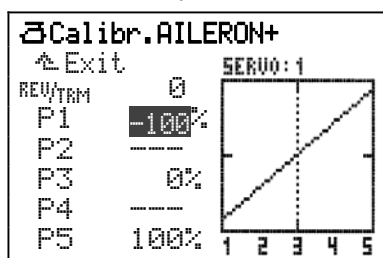
d. Allocating "maximum" using button 🎛
   Now press button 🎛. This generates the largest possible value - the maximum - for all servos which share the same basic function (or mixed function), enabling you to set the maximum servo travel (control surface deflection) regardless of the position of the transmitter control, trims and any transmitter control and mixer settings.
   Note: moving the stick or pressing button 🎛 again cancels this allocation!
   Now test the function by operating the servo using the associated stick. To re-allocate simply press button 🎛 again.

e. Conclude the calibration process for P1
   (press the 3-D digi-adjuster or the **ENTER** button).

🔵 **Note regarding "allocation"**

Allocating the maximum in this way saves you the bother of holding the stick at one end-point, and enables you to use both hands in order to measure the control surface deflection on the model. If necessary you can make corrections using the 3-D digi-adjuster.

Calibrating multiple servos with the same function
Example: setting up the left and right ailerons
Servos 1 and 5 are assigned as AILERON+ (mixed function). In the Calibration menu (Calibrate) you open point P1 for servo 1. If you now press button 🎛 to allocate maximum, **both ailerons** will immediately take up the same end-point (e.g. up-travel). At this point you can conveniently measure the control surface deflection for servo 1 and adjust it using the 3-D digi-adjuster, or alter it to match the travel of the aileron on the other wing.

🔵 **Note: maximum servo travel = ±110%**
If necessary you can increase servo travel on both sides up to the maximum of 110%.

---

f. Repeat the procedure for point P5 starting at step c. (if you have selected a five-point curve for the servo concerned, you can also adjust P2 and P4 using the same method).

g. Quit the menu via 🝂Exit, and adjust the remaining servos in the same manner.

12.5. Adjusting ailerons, and activating landing aid (Mixer AILERON+)

This is the procedure for defining the mixer AILERON+:
If you have not yet changed anything in the mixer definition, the AILERON+ mixer is defined as follows:
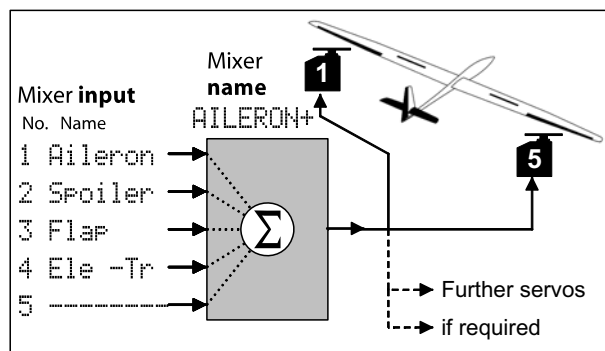
Fig. 12.5.1.: The AILERON+ mixer in principle

The two aileron servos are controlled by the transmitter controls Aileron, Spoiler, Flap and Elevator without trim.

The mixer input Ele -Tr (Elevator without trim) is only required for the "SnapFlap" function (elevator to aileron mixer), and is selected using switch "G". The "-" following the G means that the switch is in the OFF position.

In the menu `⬉Setup,Mixer def.,4 AILERON+` you will find the following definition:

```
⬉Define mixer
  ⬆Exit
   Name       AILERON+
 1 Aileron    ON    ⇕2
 2 Spoiler    ON    ⇕+
 3 Flap       ON    ⇕
 4 Ele -Tr    Mx1   ⇕
 5 --------   ----  ---
```

The mixer input 1 `Aileron` works as follows:

1 Aileron
   `ON`   always active
   `⇕`   symmetrical
   `2`   alternating direction

The control surface travel generated by the aileron stick is set in the menu `Σ Mixer, AILERON+`. The default settings are as follows:

```
Σ5x Mixer.AILERON+
  ⬆Exit

 Aileron ⊙------ 100% *
 Spoiler ˉ OFF  OFF  *
 Flap    ˉ OFF  OFF  *
 Ele -Tr ˉ OFF  OFF  G-
 -------ˉ------ ------
```

Values marked in this way can be allocated to the 3-D digi-adjuster, and varied in flight.

The inputs `Aileron`, `Spoiler` and `Flap` are always active (*). A value for travel is only set for `Aileron` (`100%`). Since the method of working of the mixer input is set to "symmetrical", the aileron travel is the same up and down (Differential (➜ 12.6.)).

The `Spoiler` and `Flap` controls have no effect on the `AILERON+` servos (all inputs are `OFF`).

> If the model has no airbrakes, the ailerons can be set to deflect up as a landing aid (glide path control). In the template `4 FLAPS`, which we have used for the new model, the mixer `AILERON+` is assigned to the aileron servos. This function is controlled by the transmitter control `Spoiler`.
>
> We use the term "spoiler" for the transmitter controls and mixer inputs which are used as glide path control or for "braking" the model (airbrakes, ailerons up, butterfly (crow)).
>
> The landing aid (both ailerons up) is activated by setting a value for the `Spoiler` input.

12.6. Differential aileron travel

Aileron differential means: the travel of the down-going aileron is smaller than that of the up-going one.

Differential is necessary because the down-going aileron generates greater drag than the up-going aileron, and this tends to counteract the desired direction of the turn. The model yaws (swings around its vertical axis).

The Differential setting defines the percentage by which the down-going aileron travel is reduced relative to that of the up-going aileron. At `50%` differential the down-deflection is half as great as the up-deflection. The higher the percentage value, the smaller the travel of the down-going aileron.

If you set `100%` differential, the ailerons only deflect up; there is no down-travel at all. This special setting is sometimes termed Split mode.

Aileron differential can be set to a different value for each flight phase separately.

12.6.1. Activating differential
Aileron differential is located in the Mixer menu.

a. Open the main menu `Σ Mixer` (press button Σ).

b. Select and open the `Ail.Diff.` menu, select and open the `Mode` menu point:

```
ΣAil.Diff..NORMAL
  ⬆Exit

 Mode       OFF
 Diff.   ⌐  50%
```

There are three different modes for Differential:

`OFF`
No differential.

`ON`
Differential always effective with the value which is set at `Diff.` (flight phase specific).

`+SPOILER`
When spoilers (or Butterfly) are extended, aileron differential is suppressed in order to maintain adequate aileron response on the landing approach.

c. Press **ENTER** (or press the 3-D digi-adjuster) to close this menu point.

12.6.2. Setting the differential value
a. Open the main menu `Σ Mixer` (press button Σ).

b. Select and open the `Ail.Diff.` menu, then select and open the menu point `Diff.`:

```
ΣAil.-Diff..NORMAL
  ⬆Exit

 Mode       +SPOILER
 Differ. ⌐  50%
```

This value applies for Flight Phase `2`, `NORMAL`.

`50%` is a useful starting point for carrying out experiments with aileron differential.

🔞 If you allocate aileron differential to one of the two 3-D digi-adjusters (`⌐`), you can adjust the value while the model is in the air (➜ 20.1.).

12.7. Adjusting elevator, activating elevator mixers (Mixer ELEVATR+)

In the template 4 FLAPS the elevator servo is already assigned to the mixer ELEVATR+. Various mixers are added to the signal in order to compensate for unwanted trim changes (e.g. from Spoiler or Throttle).

This is how the mixer is defined:

```
⤵Define mixer
  ⬆Exit
  Name          ELEVATR+    How the inputs work:
1 Elevator  ON     ⇕        ← asymmetrical
2 Spoiler   ON     ⥮        ← single-sided, two curve points
3 Flap      ON     ⇕        ← asymmetrical
4 Thr -Tr   ON     ⥮-       ← single-sided, with deadband
5 ---------  ----   ----
```

12.7.1. Spoiler to elevator = Spoiler compensation (Spoiler input to ELEVATR+ mixer)

When the spoilers are extended (or when Butterfly is activated), many models require elevator trim correction.

The default method of working of the Spoiler input in the elevator mixer is single-sided with two curve points (⥮). Point 2 (pt2) defines the elevator deflection at full extension of Spoiler / Butterfly (57%). Point 1 (pt1) is generally set to half of Point 2 (pt1 = 28%) to ensure that response to the control is linear.

If the effect of the spoilers themselves is non-linear, then non-linear travel can be set to compensate for this. For instance, Point 1 (pt1) could be set to ⅓ or ¼ of Point 2 (pt2) to obtain this effect:

```
Σ5x Mixer.ELEVATR+
  ⬆Exit
  ⥮          pt1   pt2
Elevator¯  100%  100%  *
Spoiler¯    28%   57%  *
Flap   ¯   OFF   OFF   *
Thr -Tr¯   OFF   OFF   *
--------¯--------------
```

12.7.2. Throttle to elevator = Throttle compensation (Thr -Tr input to ELEVATR+ mixer)

Many models tend to "balloon up" when the throttle is opened (incorrect downthrust setting); this can be corrected using down-elevator (stick forward).

The default method of working of the Throttle input in the elevator mixer is single-sided with deadband (⥮-).

If down-elevator correction is only required after, say, about the 1/3 throttle point, set 33% as deadband:

```
Σ5x Mixer.ELEVATR+
  ⬆Exit
  ⥮-          dead  trv
Elevator¯  100%  100%  *
Spoiler ¯   20%   57%  *
Flap    ¯  OFF   OFF   *
Thr -Tr ¯   33%  OFF   *
--------¯---- ---- ----
```

12.8. Activating inboard flaps (camber-changing flaps) (Mixer FLAP+)

In the template 4 FLAPS servos 6 and 7 are assigned to the FLAP+ mixer (camber-changing flap):
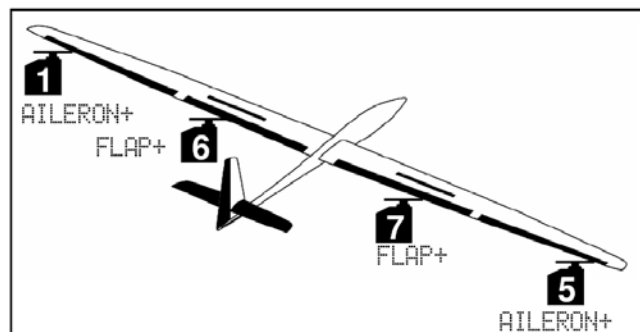
Fig. 12.8.1.: Four-flap wing

This mixer can be used to implement the following functions:

- **Butterfly (Crow)**
  as glide path control or landing aid
- **Camber-changing flaps**
  for modifying the wing airfoil (thermal, speed)
- **Aileron support for better manoeuvrability**
- **Snap-Flap** (elevator to flap)
  e.g. for aerobatics.

The structure of the FLAP+ mixer:
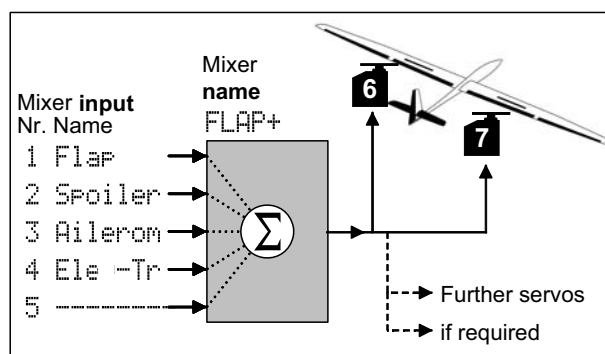
Fig. 12.8.2.: The FLAP+ mixer in principle

These are the default settings for the FLAP+ mixer:

```
Σ5x Mixer.FLAP+
  ⬆Exit
  ⇕          trv↑  trv↓
Flap   ¯   OFF   OFF   *
Spoiler¯   OFF  100%   *
Aileron¯   OFF   OFF   *
Ele -Tr¯   OFF   OFF   --
--------¯  ---------
```

In this mixer the Spoiler input is assigned a default value of 100% travel (for Butterfly). All the other inputs are OFF.

12.8.1. Activating the `Spoiler` input in the mixer `FLAP+` (Butterfly)

For Butterfly (Crow) both ailerons are raised, and the two inboard flaps are lowered.

We have already prepared the up-deflection of the ailerons in Section (➔ 12.5.).

At this point the travel of the two inboard flaps (servos 6 **and** 7) can be set:

- Open the menu `ΣMixer`
- Select and open `FLAP+`
- Select the `Spoiler` line
- Press **ENTER** twice to open the Travel parameter (`trv`)
- Move the Spoiler stick to the "extended" position
- Set the travel using the 3-D digi-adjuster
- Conclude with **ENTER**.

```
Σ5x Mixer.FLAP+
 ⏏Exit
↕+      offs trv
Flap    ⁻ OFF  100% *
Spoiler ⁻ OFF  -80% *
Aileron ⁻ OFF  OFF  *
Ele ⁻Tr ⁻ OFF  OFF  --
--------⁻ ----------
```

12.8.2. Activating the `Flap` input in the mixer `FLAP+` (camber-changing flaps)

Setting up the four wing control surfaces to act as camber-changing flaps allows you to optimise the model's aerodynamic characteristics for different flight situations.

The camber-changing flap function is controlled using the Flap transmitter control. The default setting for this is the right-hand slider (F) (➔ 12.3.).

For **speed flying** all the wing flaps are raised slightly; for **thermal flying** they are all drooped slightly.

For the slider to have any effect you must first "turn up" (assign a value to) the Flap inputs in the two mixers `AILERON+` and `FLAP+`.

To test the system you could initially set both sides of the `Flap` input to `20%` in the `FLAP+` mixer:

```
ΣMixer.FLAP+
 ⏏Exit
↕       trv↑ trv↓
Flap    ⁻ 20%  20% *
Spoiler ⁻ OFF  -80% *
Aileron ⁻ OFF  OFF *
Ele ⁻Tr ⁻ OFF  OFF --
--------⁻ ----------
```

If you now move slider F, the inboard flaps should respond. If the direction of flap deflection to slider movement does not meet your requirements, you must change the prefix of **both** travel inputs:

```
↕       trv↑ trv↓
Flap    ⁻ -20% -20% *
```

Note: the effect of setting different prefixes for the two travels would be that the flaps always deflect in the same direction from centre, i.e. whether the slider is moved forward or back.

These settings have to be repeated for the `Flap` input in the `AILERON+` mixer:

```
Σ5x Mixer.AILERON+
 ⏏Exit
↕       trv↑ trv↓
Aileron ⁻----- 100% *
Spoiler ⁻OFF   -65% *
Flap    ⁻ 18%   18% *
```

The values must be set in such a way that the travels for the outboard flaps (ailerons) and the inboard flaps (flaps) are the same.

12.8.3. Activating the `Aileron` input in the `FLAP+` mixer (aileron support by the inboard (camber-changing) flaps)

If your model requires it, you can set up the inboard wing flaps to act as superimposed ailerons to support the primary ailerons. In this case the Split arrangement is generally used. This means: the inboard flap on the wing panel whose aileron moves **up** should also be set to deflect up.

This is the procedure for setting the aileron travel of the two inboard wing flaps (servos 6 **and** 7):

- Open the menu `ΣMixer`
- Select and open `FLAP+`
- Select the `Aileron` line
- Press **ENTER** to open the Travel↑ parameter (`trv↑`)
- Move the aileron stick to one end-point
- Use the 3-D digi-adjuster to set the required travel
- Conclude the procedure with **ENTER**.

If you hold the stick to the right, only the flap in the right wing changes its position.

```
Σ5x Mixer.FLAP+
 ⏏Exit
↕2      trv↑ trv↓
Flap    ⁻ -20%  -20% *
Spoiler ⁻ OFF   -80% *
Aileron ⁻ 50%   OFF  *
```

Looking at the model from the nose, this function now produces the following travels for a right-hand turn:
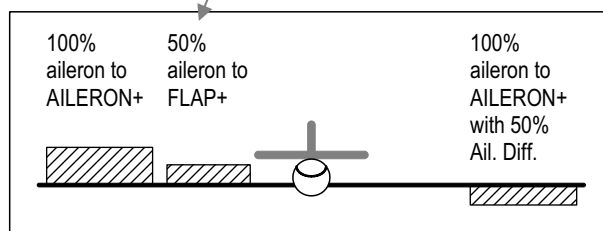
Fig. 12.8.3.1.: Ailerons supported by inboard flaps

The extent to which the left aileron (as seen from the tail) deflects is determined by the value you have set for differential.

12.8.4. Activating the Elevator-Tr (Ele -Tr) input in the FLAP+ mixer (snap-flap)

The term Snap-Flap is used when elevator is mixed into the camber-changing flaps or ailerons. This function is prepared in the mixer AILERON+ and FLAP+. Input 4 for both mixers is Ele -Tr.

The suffix "-Tr" means "without trim". If you adjust the elevator trim at the transmitter, the aileron and flap settings are unaffected by the change.

---

❽ Note: Snap-Flap and switches

If Snap-Flap is switched on at excessive airspeeds, very high aerodynamic forces can occur which may damage or even wreck the model. **Please: take care when using this function!**

The procedure for setting up Snap-Flap:
a. Checking / changing the switch

The Ele -Tr input is switched using the mixer switch Mix-1 (logical switch). Switch G with the ON position "back" (G↓) can be prepared as the physical switch in assignment list 2 GLIDER.

- Main menu: �’Setup
- Menu: Assignment, Switches

```
Mix-1          G>    ↓*
```

In this menu you can also change the switch or the switch position for Snap-Flap "ON":

- Open the menu point with **ENTER**
- Confirm the warning message with **ENTER**
- Operate the desired switch repeatedly
- Move the switch to the position for ON
- Close the menu point again with **ENTER**.

---

❽ If you are using a three-position switch, only the two end-points can be set as the ON position.

---

b. Setting the control surface travels
- Main menu: Σ Mixer
- Menu: AILERON+
- Menu point: Ele -Tr
- Open the menu point with **ENTER**
- Move switch G to the ON position
  (✳ must be displayed)

```
ΣMixer.AILERON+
 ⚘Exit
 ⇕        trv↑  trv↓
 Aileron ----- 100% *
 Spoiler  OFF  -65% *
 Flap     18%   18% *
 Ele -Tr  15%  OFF G*
```

Set a test value of 15% control surface travel, then check with the elevator stick (back-stick) that the ailerons move down.
If so: hold the elevator stick in that position, and set the desired travel.
If not: press the **REV/CLR** button to change the value to -15%. Now hold the stick in position and set the desired travel.

Press **ENTER** to switch to the second parameter, and repeat the procedure with "down-elevator", and the up-travel of the ailerons.

Note: The prefixes for the first and second parameters must be the same!

```
Ele -Tr   15%  18%G*
```

12.9. V-tail models

12.9.1. Assigning V-tail servos
In the Servo Assignment menu you must change the tail servos ELEVATR+ and Rudder to V-TAIL+:

```
⊟Servo.Assign
 ⚘Exit
 1 AILERON+  UNI   3P
 2 V-TAIL+   UNI   3P
 3 V-TAIL+   UNI   3P
 4 Throttle  UNI   3P
 5 AILERON+  UNI   3P
▾6 FLAP+     UNI   3P
```

The compensating inputs for Spoiler, Flap and Throttle can also be mixed into the V-TAIL+ mixer.

12.9.2. Activating the mixer V-TAIL+

❽ When you assign the V-tail servos, you will find that the V-tail still does **not** respond to any control commands, as the default value for all the mixer inputs is OFF.

For this reason you should first set both travel inputs for Elevator to, say, 60% in the V-TAIL+ mixer:

```
Σ5x Mixer.V-TAIL+
 ⚘Exit
 ⇕        trv↑  trv↓
 Elevator  60%   60% *
 Rudder    OFF   OFF *
 Spoiler   OFF   OFF *
 Flap      OFF   OFF *
 Thr -Tr   OFF   OFF *
```

12.9.3. Checking / changing the direction of servo rotation
With the travel settings you have just entered, the V-tail servos will now respond to the elevator stick.

Apply up-elevator (back-stick) and watch the V-tail. If either or both servos rotate in the wrong direction, reverse them at this point.

- Main menu: Open ⊟Servo
- Menu: Select and open Calibrate
- Line: Select REV/TRM
- Press **ENTER** to select Parameter
- Press **REV/CLR** to reverse the servo direction
- Move the elevator stick to check the direction of rotation
- If all is well, press **ENTER** to end the procedure.

If necessary, you can now reverse the second servo or adjust the other inputs.

12.9.4. Adjusting the remaining inputs
Start with Rudder:
In V-TAIL+ set **both** travel inputs for rudder to 60%.

Now check that the control surfaces move in the correct direction corresponding to Rudder commands.

If the direction of movement for right / left is incorrect, you must reverse the prefix for **both** mixer inputs for Rudder.

This is accomplished by selecting the inputs in turn, and pressing the **REV/CLR** button:

```
Σ5x Mixer.V-TAIL+
 ⌂Exit
 ⇕2        trv↑ trv↓
 Elevator¯  60%  60% *
 Rudder  ¯  60%  60% *
 Spoiler ¯  OFF  OFF  *
 Flap    ¯  OFF  OFF  *
 Thr -Tr ¯  OFF  OFF  *
```

12.10. Working with flight phases

12.10.1. What is the purpose of switching between different flight phases?
Using flight phases you can adjust the characteristics of the transmitter controls to suit the requirements of the model for each phase of a flight (e.g. reduced travels for SPEED tasks, extended flaps for LANDING). All settings which can be varied separately for the flight phases are marked in the transmitter control menus with the code number of the flight phase.

Example Flap control:

```
 Ⅰ Flap.NORMAL
 ⌂Exit

 Time         ¯ 0.0s          Same for all flight phases
 Fixed value 2 ◄ OFF          For flight phase 2 = OFF
```

Pre-condition: if you wish to work with flight phases, you must assign at least one switch (for the Main phase, or Phases 1-3) in the menu ⌐, ASSIGNMENT, SWITCHES. If this is not the case, the transmitter always remains in Phase 1.

Note: only transmitter control settings can be altered
Settings which are flight phase specific can only be entered in relation to the transmitter controls. The servo settings remain the same for all flight phases.

12.10.2. Default settings in the menu Flight phase
Press button ⌐: this opens the main menu Memory. Now use the 3-D digi-adjuster to select the Flight phase menu, and open it by pressing the 3-D digi-adjuster.

A typical Flight phase menu looks like this:

```
 ⌐Flight phase
 ⌂Exit
 1 SPEED1    X ---
 2 NORMAL      ---
 3 THERMAL1    ---
 4 Start1      ---

   Time        OFF
```

Names have already been assigned to all four possible flight phases, although they can be altered.

The three hyphens "---" following the flight phases indicate that physical switches have not yet been assigned to operate as flight phase switches. As a result SPEED1 has automatically been selected as Flight Phase 1, and marked as the active phase (X).

12.10.3. Assigning flight phase switches
You cannot use different transmitter control settings in the various flight phases until you have assigned at least one of the two switches:

- Main menu: Setup
- Menu: Assignment
- Menu point: Switches
- Press **ENTER** to open the menu point.

If you wish to use all four flight phases, you will need to assign two switches:

a. Switch: Main phase
(assign two-position switch)
Moving this switch to the ON position (marked with ✱ when assigned) activates flight phase 4. The position of the second switch then has no effect.
If **no switch is assigned** for Phases 1-3, the Main phase switch can only be used to select Phases 1 and 4.

b. Switch: Phases 1-3
(assign three-position switch)
This switch can be used to activate phases 1, 2 or 3, provided that the Main phase switch is at the OFF position.

```
 Main phase    I〉  ↓
 Phases 1-3    ---  -
```

12.10.4. Locking / unlocking flight phases
It is possible to lock any flight phases which you have not yet set up. Locked phases cannot be activated even if a switch is assigned to them. If nevertheless you move the switch to the position corresponding to a locked flight phase, an audible warning sounds (beep every 0.5 seconds) for as long as the switch is in the "wrong" position.

This is the procedure for locking / unlocking flight phases:
- Open the main menu Memory (button ⌐)
- Select the menu Flight phase
- Press **ENTER** to open the menu
  (or press the 3-D digi-adjuster):

```
 ⌐Flight phase
 ⌂Exit
 1 SPEED1    X ---
 2 NORMAL      ---
 3 THERMAL1    ---
 4 START1      ---

   Time        OFF
```

- Select the flight phase with the 3-D digi-adjuster, and press **ENTER** to open it
  (or press the 3-D digi-adjuster):

```
 3 THERMAL1     ---
```

- Every time you press the **REV/CLR** button you switch the flight phase between:

     THERMIK1 locked, and

     THERMAL1 unlocked.

- Once you have set the desired state, press **ENTER** to conclude the procedure (or press the 3-D digi-adjuster).

🔧 The current flight phase, which is marked with an X, cannot be locked:

     | 1 SPEED1   X --- |

12.10.5. Copying flight phases
Once you have established the correct settings in one flight phase, you can copy the values into another flight phase and then modify them. This avoids the need to re-enter all the settings from the start.

🔧 Only the current flight phase can be copied. The destination (target) flight phase for the copy process must be an unlocked flight phase.

This is the procedure for copying the current flight phase:
- Open the main menu Memory (button 🗁)
- Select the menu Flight phase
- Press **ENTER** twice to select the X (or press the 3-D digi-adjuster twice):

```
⊟Flight Phase
   ⌂Exit
1 SPEED1     X  I>
```

- Now select the destination (unlocked flight phase) using the 3-D digi-adjuster:

```
⊟Flight Phases
   ⌂Exit
1 SPEED1     X  I>
2 NORMAL        ---
3 THERMAL1   c  ---
4 START1        ---

     Time        OFF
```

- Confirm with **ENTER** (or press the 3-D digi-adjuster).

The marker jumps back to the code number for the current flight phase. Only the name for the "Target" phase is retained. All flight phase specific transmitter control settings are now the same as in the current flight phases.

12.10.6. Changing flight phase names
You can select any of the thirteen pre-set names for the flight phases:

1	NORMAL	6	SPEED1	11	HOVER
2	START1	7	SPEED2	12	3D
3	START2	8	CRUISE	13	ACRO
4	THERMAL1	9	LANDING		
5	THERMAL2	10	AUTOROT		

The only purpose of the name is to provide additional information; it has no influence on the characteristics of the corresponding flight phase. The crucial aspect for the properties is always the flight phase number.

Once you have activated an input field for the name, you can select a suitable name from those on offer:

```
⊟Flight Phase
   ⌂Exit
1 SPEED1     X  ---
2 NORMAL        ---
3 THERMAL1      ---
4 START1        ---

     Time        OFF
```

12.10.7. Setting a transition time
The switch from one flight phase to another can occur immediately, or alternatively you can set a transition period of 1, 2 or 4 seconds (smooth transition). The latter reduces the loads on the model and the power system.

This is the procedure for setting a transition Time between flight phases:
- Open the main menu Memory (button 🗁)
- Select the menu Flight phase
- Press **ENTER** (or press the 3-D digi-adjuster) to open the menu
- Select the Time line (see fig. 12.10.7.1.)
- Press **ENTER** (or press the 3-D digi-adjuster) to open the set-up window
- Use the 3-D digi-adjuster to set a transition period (see fig. 12.10.7.2.): 1sec, 2sec, 4sec or OFF
- Press **ENTER** (or press the 3-D digi-adjuster) to confirm the selected setting.

```
⊟Flight Phase
   ⌂Exit
1 NORMAL     X  ---
2 ACRO          ---
3 START1        ---
4 LANDING       ---

■   Time        OFF
```
Fig. 12.10.7.1.: Time line selected

```
⊟Flight Phase
   ⌂Exit
1 NORMAL     X  ---
2 ACRO          ---
3 START1        ---
4 LANDING       ---

     Time        2sec
```
Fig. 12.10.7.2.: Time set to 2 sec

12.11. Supplementary functions

12.11.1. D/R and Expo

D/R (Dual-Rate) is available for the transmitter controls Aileron, Elevator and Rudder. The function is used to reduce the control surface travels when necessary to suit the flight situation (e.g. for speed tasks).

The Travel parameter (Trvl) in the Transmitter control menu defines the maximum travel. If D/R is switched on, the travel is reduced by the factor entered at this point.

Example:
80% trvl and 60% D/R result in 48% control surface travel (60% of 80%).

Expo is available for the transmitter controls Aileron, Elevator, Rudder **and** Throttle. Negative Expo values produce finer control around the centre position of the stick ("softer" control of the model). Setting positive Expo values produces "sharper" control around the stick centre. In either case the end-travels are not affected in any way.

The effect of Negative Expo applied to Throttle is a smoother increase in speed at the Idle end of travel.

12.11.2. Activating Combi-Switch

"Smooth" turns can only be flown if aileron and rudder commands are applied simultaneously; this applies to models just as it does to full-size aeroplanes. Synchronised control is not particularly easy to achieve, especially for relative beginners. The Combi-Switch "combi"-nes (couples) aileron and rudder, and thereby makes it easier to fly accurate turns.

a. Open the main menu Mixer (press the Σ button).

b. Select and open the menu Combi-Sw:

Assigned switch (➔ 14.3.2.)

Switch direction and status
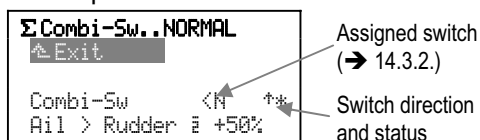
The Combi-Sw line shows which switch is assigned to the function (N), where the ON position is located (⇑ = forward) and whether the function is switched on or not (∗ = ON). Nothing can be changed in this line.

c. Open the menu point Ail > Rudder (following):

Following direction
Aileron = Master
Rudder = Slave
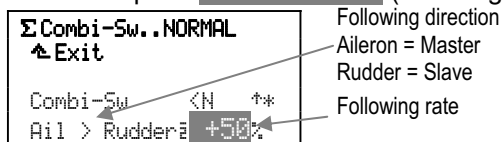
Following rate

The rate of following can be adjusted in 2% increments up to a maximum of 200%.

Values from +2% to +200% cause the rudder to follow the movement of the aileron stick. If you set a negative following rate (−2% to −200%), the rudder stick causes the ailerons to follow its movements. The display changes to Ail < Rudder (< or >).

The direction of following can be altered by pressing the **REV/CLR** button. It changes automatically if

you alter the value beyond OFF and in the opposite direction (opposite prefix).

Checking / changing the switch position for Combi-Switch ON:

a. Checking the assignment
Menu: open the menu Setup, Assignment, Switches and select the line CS/DTC:
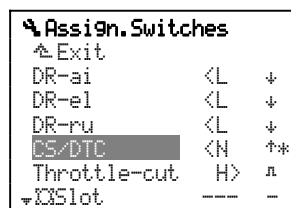
DTC means Direct Throttle Control and is needed for helicopters.

Switch N is assigned to Combi-Switch, and is switched on (∗). The switch position for ON is forward (⇑).

b. Changing the switch position for ON
Move the switch to the new, desired position for ON. Use the 3-D digi-adjuster to select the line CS/DTC, and open the parameter with the **ENTER** button (or press the 3-D digi-adjuster). Confirm the warning message with **ENTER**. The arrow now points in the new position for the switch corresponding to ON (⇓), and you will see an asterisk after it. Press **ENTER** to close the field.

12.11.3. Motor run timer

You can record the motor run time if you assign the switch for this timer to Throttle. You can set the switching threshold for activating the timer (➔ 15.3.) in the Transmitter control menu under TriggerPoint.

13. Setting up a model helicopter

13.1. The method in principle

In our example we will set up a model memory for a helicopter with 120° CCPM rotor head and electric power system.

The following steps are necessary to ensure that the model's working systems operate correctly:

a. Set up a new model in the transmitter   13.2.
b. Prepare the transmitter controls / switches   13.3.
c. Check / change the servo assignment   13.4.
d. Check and adjust the main rotor   13.5.
e. Check and adjust the tail rotor   13.6.

Once you have completed these five steps, you will be able to control the model's basic functions - roll, pitch, yaw and throttle / collective pitch.

At this point we can expand and refine the set-up:

f. Working with flight phases   13.10.
    Assign switches
    Unlock / lock / name flight phases
    Set up transition times
    Set the correct values.

13.2. Setting up a New model in the transmitter

13.2.1. Menu 🗁, call up New model

a. Open the main menu Memory:
Press button 🗁.

b. Open the menu New model:
Turn the 3-D digi-adjuster to the right as far as New model, and open the menu
(press the 3-D digi-adjuster):

```
🗁New model
 ⚐ Exit
 Memory nr.      3        ⇨ 13.2.2..
 Template     HELIccpm    ⇨ 13.2.3.
 Servo conf.  MPX-UNI     ⇨ 13.2.4.
 Mode          2:  ⬦ ⇔   ⇨ 13.2.5.
 Assignment    HELI       ⇨ 13.2.6
       OK                 ⇨ 13.2.7
```

Note:
The definition of the model is not complete until you confirm your selected settings with OK (➜ 13.2.7.).

13.2.2. Which model memory will be used?
New models are automatically stored in the transmitter's first vacant model memory: the memory number appears in the menu. Since you have no influence over the memory number, this line in the menu is skipped.

If all the memories are occupied, the screen displays:

```
┌─────────────────────┐
│ Memory nr.    -1     │
└─────────────────────┘
```

If you nevertheless attempt to set up the new model, the following on-screen warning appears:

```
┌─────────────────────┐
│   No memory free    │
│   Press ENTER       │
└─────────────────────┘
```

13.2.3. Selecting the template

Note:
The model templates (➜ 11.5.) make it much easier and quicker to set up new models, as they already contain the essential assignments and adjustments. You can check which template was used to create a particular model by accessing the menu 🗁Memory, Properties.

Turn the 3-D digi-adjuster to the right until the select bar stands in the Template line, then press the 3-D digi-adjuster.

Now you can select the template HELIccpm from the eight available templates, using the 3-D digi-adjuster:

```
🗁New model
 ⚐ Exit
 Memory nr.      3
 Template     HELIccpm
 Servo conf.  MPX-UNI
 Mode          4:  ⬦ ⇔
 Assignment    HELI
       OK
```

Press the 3-D adjuster once more to confirm your choice.

13.2.4. Selecting the servo config(uration)

Note:
The servo configuration (➜ 11.6.) defines the order in which the servos in the model have to be connected to the receiver. The selected configuration is only a suggestion, and can be changed subsequently in any way you wish if the servos are connected to different receiver outputs (➜ Menu: 🗂, Assignment).

Rotate the 3-D digi-adjuster to the right until the select bar is at the Servo conf. line, then press the 3-D digi-adjuster.

Now use the 3-D digi-adjuster to select the MPX-UNI configuration from those available:

```
🗁New model
 ⚐ Exit
 Memory nr.      3
 Template     HELIccpm
 Servo conf.  MPX-UNI
 Mode          4:  ⬦ ⇔
 Assignment    HELI
       OK
```

Press the 3-D adjuster again to confirm your choice.

By selecting the HELIccpm template and the servo configuration MPX-UNI you automatically set the following receiver output sequence:

	MPX-UNI
1	HEAD f/b
2	HEAD le
3	TAIL
4	HEAD ri
5	Throttle
6	Gyro

See also the illustration in 13.2.7. and Section 21.2.2.

The servo assignment can be changed in any way you wish, should this prove necessary (➔ 13.4.).

13.2.5. Selecting the stick Mode

The stick mode defines the association between the stick axis and the controlled function. However, the mode affects **only** the functions **Roll, Pitch, Yaw** and **Collective pitch. Throttle** is controlled automatically by the collective pitch stick (➔ 13.8.).

First consider the functions you wish to control using the **left stick**, then look up the appropriate mode in the table below.

Mode table for the left stick:

Stick movements, left stick		Required mode
forward/back	left/right	
Pitch (elevator)	Yaw (rudder)	1: ⇕ ⇔
	Roll (aileron)	3: ⇕ ⇔
Collect. pitch (and throttle)	Yaw (rudder)	2: ⇔ ⇕
	Roll (aileron)	4: ⇕ ⇔

The double arrows following the mode code numbers indicate where pitch (elevator) (⇕) and yaw (rudder) (⇔) are located.

The stick functions for the right stick are assigned automatically.

Example: we will assume that you want pitch (elevator) and roll (aileron) on the **left stick**; in which case you would select Mode 3. Yaw (rudder) and collective pitch (and throttle) are now automatically on the right stick.

Turn the 3-D digi-adjuster to the right until the select bar is over the Mode line, then press the 3-D digi-adjuster:

```
🖻New model
 ᐱ Exit
 Memory nr.       3
 Template     HELIccpm
 Servo conf.  MPX-UNI
 Mode         3:⇕    ⇔
 Assignment   HELI
      OK
```

You can now use the 3-D digi-adjuster to select the stick Mode you have just decided to use.

Press the 3-D digi-adjuster to confirm your selection.

13.2.6. Selecting the Assignment

For a helicopter you would, of course, use the assignment list bearing the name HELI (No. 3).

Turn the 3-D digi-adjuster to the right until the select bar is over the Assignment line, then press the 3-D digi-adjuster:

```
🖻New model
 ᐱ Exit
 Memory nr.       3
 Template     HELIccpm
 Servo conf.  MPX-UNI
 Mode         3:⇕    ⇔
 Assignment   HELI
      OK
```

Select HELI from the five available assignments using the 3-D digi-adjuster.

Press the 3-D digi-adjuster to confirm your selection.

> **Note:**
> You can also change the selected assignment in any way at any time (Menu: ⚙ Setup, Assignment).

13.2.7. Confirming with OK

Rotate the 3-D digi-adjuster to the right until the select bar is at the OK line, then press the 3-D digi-adjuster.

Congratulations!
You have successfully stored a new model in the transmitter's memory.

If you have kept to our suggestions in the steps completed thus far, the following data is now stored in the new model memory:

a. Receiver output sequence
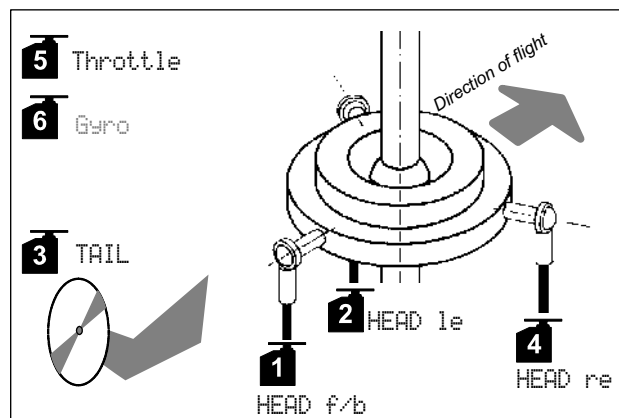
Fig. 13.2.7.1.: Servo assignment with MPX-UNI configuration

- Servos 1 to 6 are pre-defined
  All servo assignments can be changed at any time in any way (Menu: 🖮, Assignment).

b. Transmitter control assignment

Roll, pitch, yaw (aileron, elevator, rudder) and collective pitch are defined by the stick mode which you selected in step (➜ 13.2.5.).

✆ Important: do not assign a throttle control!
The model helicopter's throttle is always controlled by the collective pitch stick, so you must not enter **anything** under `Throttle` in the menu `Setup`, `Assignment`, `Controls`.

> | Throttle   --- - |

The throttle settings are entered under Throttle in the Transmitter control menu.

In the menu `⤹ Assignment`, `Controls` you will find:

Function	Control		
Throttle	----	-	***Assign nothing!***
Gyro	E	↓✳	Left slider for gyro gain
Collect.	▾I▴	↓	
Thr.limit	F	↓✳	

Transmitter controls not in use are marked in the assignment list with " --- - ", and are not listed here.

c. Switch assignment

In the menu `⤹ Assignment`, `Switches` you will see:

Function	Switch		
DR-ai	‹L	↓	Dual-Rate
DR-el	‹L	↓	Aileron, elevator and rudder are
DR-ru	‹L	↓	switched simultaneously
CS/DTC	‹N	↓	DTC = **D**irect Throttle **C**ontrol (and CS = Combi-Switch for fixed-wing models)
Throttle-cut	H›	┎	With momentary function
Σ Sum	F	↑	Aggregate timer, motor run controlled by Control F (throttle limiter)
Main phase	I›	↓	Switch for main flight phase
Phases 1-3	‹O	↑✳	Flight phase switch

Switches not in use are marked in the assignment list with " --- - ", and are not listed here

⚒ Tip: you can now carry out an initial check of the working systems using the servo monitor; you don't need the model for this. Move to the monitor as follows:

Menu ☐Servo, Monitor:
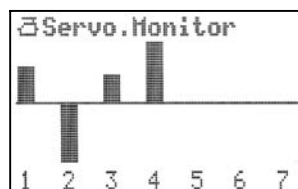
Bar graph   *Percentage values*

Move the sticks, sliders and switches and watch the effects on-screen.

When you access the `Monitor` menu you will see the bar graph display. Rotate the 3-D digi-adjuster to toggle between the two types of display. Press the 3-D digi-adjuster to leave the servo monitor.

13.2.8. Entering the model name

The model you have just stored initially bears the name of the template you are using. In our example this would be `HELIccpm`. To help you keep track of your models, you should change this default name to the actual model name.

This is the procedure:
a. Open the main menu `☐Memory` (press button 🗁).
b. Select the `Properties` menu and open it:

> ```
> ☐Memory
> ⤒Exit
> Select model ....
> Copy         ....
> Erase        ....
> Flight phase ....
> Properties   ....
> ▾New model   ....
> ```

(Select using the 3-D digi-adjuster, then press).

c. Use the 3-D digi-adjuster again to select the `Name` line, then press **ENTER** (or the 3-D digi-adjuster):

> ```
> ☐Properties
> ⤒Exit
> Template   HELIccpm
> Mode       3: ◊ ⇔
> Assignment HELI
> Name       ▮eli 600
> ```
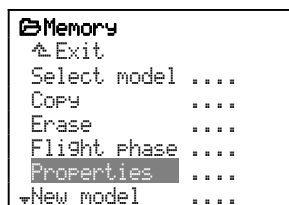
At this point you can enter a model name with a maximum of sixteen characters; it should clearly identify the model. This name will also appear in the Status display.

Text input using the keypad (➜ 11.1.1.).

13.3. Preparing the controls / switches

13.3.1. Checking / changing control settings for idle / collective pitch min. and throttle limiter min.

a. Idle / Collective pitch min.
In the Helicopter templates Idle / collective pitch min. is set to "back" (↓ arrow following the code letter).

b. Throttle limiter
By default the minimum position for the throttle limiter is also set to "back".

This is the procedure for changing it to "forward":
Move to the menu `⤹ Setup`, `Assignment` (e.g. Coll. Pitch (`Collect.`)), and search for the transmitter control to be changed:

> | Collect.   ▾I▴ ↓✳ |

Press **ENTER** to open the menu point.
This change is **"global"** in effect, i.e. it affects all models which are set up to use the `HELI` assignment list. For this reason you must confirm the warning message by pressing **ENTER**.

> | Collect.   ▾I▴ ↓ |

Move the stick to the desired position for Idle / Collective pitch min.:

> | Collect.   ▾I▴ ↑✳ |

The direction arrow indicates the current stick position. You must press **ENTER** to confirm the change:

```
Collect.        ↓↧  ↑✳
```

Idle / Coll. pitch min. is now "forward".

The Minimum position for Throttle limit (Thr.lim.) can be changed using the same procedure.

13.3.2. Changing the switch ON positions and / or the switch assignment

The position for the "ON" state can be changed for all switches which are used in an assignment list.

Example Direct Throttle (CS/DTC):
DTC stands for **D**irect **T**hrottle **C**ontrol. Combi-Switch is not used for model helicopters, so the same switch can be used for the Direct Throttle function.

In the pre-defined HELI assignment list Direct Throttle is active by default when switch N is at the "back" position. If you wish the ON state to be "forward", use this procedure:

a. Open the main menu ⚒ Setup (press button ⚒).

b. Select (3-D digi-adjuster) and open (press the 3-D digi-adjuster) the Assignment menu.

c. Select the sub-menu Switches (3-D digi-adjuster) and open the setting (press the 3-D digi-adjuster).

d. Select (3-D digi-adjuster) and open (press the 3-D digi-adjuster) the switch CS/DTC.

e. Confirm the warning message Standard list! by pressing **ENTER**.
You must confirm the warning message because any change you make at this point affects all models which are set up to use the same assignment list (HELI).
If switch N is forward, the line in the menu must look like this:

```
CS/DTC          <N  ↑✳
```

f. Now move the switch to the desired position for Direct Throttle ON. The arrow changes its direction (↑ , ↓). The asterisk (✳) is always displayed.

g. Press the 3-D digi-adjuster or **ENTER** to confirm:

```
CS/DTC          <N  ↑✳
```

13.4. Checking / changing the servo Assignment

Servo assignment determines the following:
- the **receiver outputs** to which the servos have to be connected,
- the **signal format** (MPX or UNI) which the servos require,
- the number of **curve points** (2, 3 or 5) required for adjusting servo travel.

Note: defaults
In the HELIccpm template all the servos are set to the UNI signal format by default. The rotor head servos and the gyro "servo" have three curve points (i.e. the centre point can also be adjusted), whereas throttle and tail have two curve points (only the end-points have to be adjusted).

This is the procedure:

a. Open the main menu ☐ Servo (press button ☐).

b. Select (3-D digi-adjuster) and open (press the 3-D digi-adjuster) the menu Assignment.

c. In this menu the assignment for all receiver outputs can be changed in any way you like.

In our example we will swap over servos 3 and 4, so that all the rotor head servos are in sequence:

d. Select (3-D digi-adjuster) and open (press the 3-D digi-adjuster) Servo 4:

```
☐Servo.Assign
  ↰Exit
1 HEAD f/b  UNI  3P
2 HEAD le   UNI  3P
3 TAIL      UNI  3P
4 HEAD ri   UNI  3P
5 Throttle  UNI  3P
↓6 Gyro     UNI  3P
```

e. Select (3-D digi-adjuster) the TAIL function, and move on to the signal format (press the 3-D digi-adjuster):

```
4 TAIL      UNI   3P
```

f. If the tail rotor is controlled via a gyro, you should leave the format at UNI.

g. Switch to the number of curve points (press the 3-D digi-adjuster again):

```
4 TAIL      UNI   2P
```

Set 2P: this ensures that the Centre point for the TAIL control signal is only influenced by the settings in the TAIL mixer and the yaw (rudder) trim.

h. Press the 3-D digi-adjuster or the **ENTER** button to confirm. The number 4 is highlighted, and you can now select a different servo:

```
4 TAIL      UNI   2P
```

i. Select (3-D digi-adjuster) and open (press the 3-D digi-adjuster) Servo 3.

```
3 TAIL      UNI   3P
```

j. Select the HEAD ri function (3-D digi-adjuster) and switch to Signal format (press the 3-D digi-adjuster):

```
3 HEAD ri   UNI   3P
```

k. Since all three rotor head servos are always of the same type, the signal formats must be set to the same value.

l. Move on to the number of curve points (press the 3-D digi-adjuster again):

```
3 HEAD ri   UNI   3P
```

Set 3P at this point.

Note: you can set the swashplate exactly horizontal in the centre (point P3) and both end-points (points P1 and P5) by altering the three points in the menu Servo, Calibrate. This compensates for any mechanical discrepancies in the swashplate linkages.

m. Press the 3-D digi-adjuster or **ENTER** to confirm your choice. The number 3 is highlighted, and you can select a different servo:

```
3 HEAD ri   UNI   2P
```

13.5. Checking / adjusting the main rotor

❽ Always secure the model before you adjust servo direction, centre and travels, to avoid any danger or damage if the model responds unexpectedly.

13.5.1. Checking / changing the direction of rotation of the rotor head servos

It is important to check the direction of rotation of the servos (and reverse them if necessary) before making adjustments to the centre position and travel.

> ❽ **Electric helicopters: disconnect the motor!**
> **Set the coll. pitch stick approximately to centre.**
> **Then switch the receiving system ON.**

❽ **Start with the collective pitch function!**
If the swashplate responds correctly when you move the collective pitch stick, **and** the rotor head servos are connected correctly (HEAD f/b, ri, le), the directions of travel for roll and pitch **must** also be correct.

Checking:
Move the collective pitch stick in the direction of maximum pitch (climb): the swashplate should now move up the rotor mast, but remain exactly horizontal.

This is the procedure for altering the direction of rotation:
a. Open the main menu ☐Servo
   (press button ☐).
b. Open the Calibration menu (Calibrate) and select Servo.
c. Select line REV/TRM and open Parameter:

```
☐Calibr.HEAD f/b
↰Exit          SERVO:1
REV/TRM    ▨ 0    ┆          ╱
```

Now you can reverse the direction of servo rotation using the **REV/CLR** button. The effect of the change is immediately visible in the graph (the curve reverses), and can also be observed on the model.

⌂ **Tip:**
If you move the collective pitch stick slightly from the neutral position before pressing the **REV/CLR** button, the servo will jump to the new position when you reverse it. This is an easy way to check that you have selected the "right" servo.

d. When the direction of rotation is correct, press the 3-D digi-adjuster or the **ENTER** button to confirm your choice, then quit the menu via Exit, and select the next servo you wish to adjust.

> ❽ **Note: please don't start adjusting servo travels until the directions of rotation are correct!**
> Please don't start adjusting servo travels and centre positions until you have corrected the direction of rotation for all the servos. If you subsequently reverse the servo, you will need to carry out the calibration process all over again.

13.5.2. Calibrating servos = setting the centre and maximum travels

In the menu ☐Servo.Calibrate (➜ 11.7.) you can adjust the travels (P1 and P5), the centre positions (P3) and the intermediate points (P2 and P4) for all servos in such a way that the servos take up the correct idle position, move evenly across their range of travel, and reach the appropriate end-points.

> ❽ If you wish your models to fly accurately, precise servo calibration is a fundamental requirement!
>
> ❽ The travel you set at this point cannot be exceeded (travel limit).
>
> ❽ Always set the largest travel which the servo will be required to carry out.
> **Example:** when the ailerons are raised for glide path control, the ailerons deflect up by 20 mm. For AILERON control only 12 mm deflection is required. If the ailerons are used as camber-changing flaps, the required travel is just 3 mm. At the calibration stage point P1 (and P5) must be adjusted so that the aileron travel is 20 mm.

This is the procedure for adjusting servo centre:
a. Open the main menu ☐Servo
   (press button ☐).
b. Open the Calibration menu (Calibrate), and select the servo.
c. Select the line P3 and open Parameter:
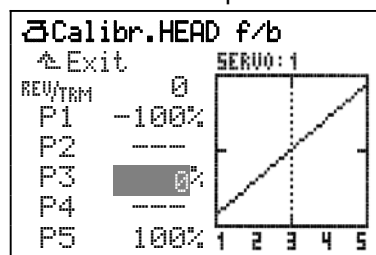
```
☐Calibr.HEAD f/b
↰Exit          SERVO:1
REV/TRM     0
P1       -100%
P2        ----
P3        ▨ 0%
P4        ----
P5        100%   1 2 3 4 5
```

> ❽ **Note: first carry out a hardware "calibration"!**
> Now press button ⊕. This generates the "true" centre, without the influence of the trim or mixer inputs on the servo.
>
> If the servo is not in the desired centre position at this stage, it is essential to correct the control surface position mechanically (by re-positioning the output arm on the servo, or otherwise adjusting the linkage).
>
> Wherever possible, the fine-tuning for Point 3 of servo calibration should not exceed ±15%.

d. "Allocating" Centre using button ⊕:
Now press button ⊕. This passes the Centre value, 0%, to all servos with the same basic function (or mixed function).
This enables you to set the centre for the current servo regardless of the stick position.
Important: moving the stick, or pressing button ⊕ again, erases the allocation!

Note regarding "allocation"

Allocating in this way saves you the bother of holding the stick at one end-point, and enables you to use both hands in order to measure the control surface deflection on the model. If necessary you can make corrections using the 3-D digi-adjuster.

Calibrating multiple servos with the same function Example:

Servos 1, 2 and 4 are assigned as HEAD xxx (mixed function). In the Calibration menu for servo 1, point P3 is opened. If you now press button ⟨☺⟩ to allocate Centre, **all the swashplate servos** will immediately move to centre. At this point you can use the 3-D digi-adjuster to adjust the current servo to match the other two.

e. Now use one of the two 3-D digi-adjusters to set the servo to the desired centre. Any changes you make are immediately visible on the model itself.

f. When the centre is correct, press the 3-D digi-adjuster or the **ENTER** button to confirm the setting, quit the menu via Exit, and select the next servo you wish to adjust.

This is the procedure for setting maximum servo travel (control surface deflection):

At this point set the maximum required value for blade deflection; this is generally the auto-rotation value. The smaller values needed for normal flying can be set for the individual flight phases in the menu ⫶ Control under Collect..

a. Open the main menu ⊟Servo
(press button 🗂).

b. Open the menu Calibration (Calibrate), and select the servo.

c. Select line P1 and open Parameter:

```
⊟Calibr.HEAD f/b
⇧ Exit           SERVO:1
REV/TRM      0
  P1     -100%
  P2     ----
  P3       0%
  P4     ----
  P5     100%      1 2 3 4 5
```
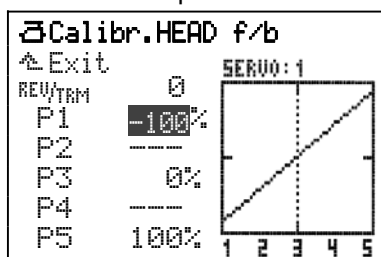
d. Allocating "maximum" using the ⟨☺⟩ button:
This passes the maximum signal to all the swash-plate servos so you can set the maximum servo travel for the selected servo regardless of the position of the transmitter control or trim.
Important: moving the stick, or pressing button ⟨☺⟩ again, erases the allocation!

Note: maximum servo travel = ±110%

If necessary, servo travel can be increased to 110% on both sides of centre.

e. Conclude the calibration for P1
(press the 3-D digi-adjuster or the **ENTER** button).

f. Repeat the procedure for point P5, starting with Step c.

g. Quit the menu via ⇧ Exit and set up the other servos accordingly.

13.6. Checking / adjusting the tail rotor

13.6.1. Checking / changing the direction of rotation of the tail rotor servo

Before you adjust Centre and Travel it is important to check the direction of rotation of the servo, and reverse it if necessary.

TIP: when entering the basic settings connect the tail rotor servo directly to the receiver output socket for TAIL (servo 3, if you have not changed the default assignment). This ensures that the gyro has no effect on your settings.

Checking:
Set the tail rotor blades vertical relative to the tail rotor. Move the yaw stick to the left, and observe the response of the tail rotor.
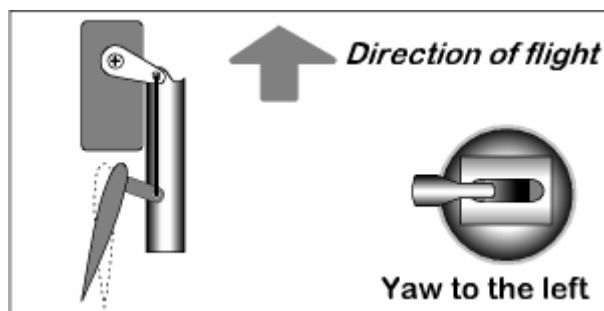
13.6.1.1.: Direction of movement of the tail rotor blades when a "left yaw" command is given

Watch the tail rotor blade whose rounded side is facing forward: the trailing edge of this rotor blade must move left when you apply a "left yaw" command. This would push the tail to the right, causing the helicopter's nose to turn to the left.

13.6.2. The TAIL mixer

The *ROYALpro*'s TAIL mixer conceals the function "static tail rotor compensation", which is also sometimes known as REVO-MIX (revolution mixer). The TAIL mixer always appears automatically in the main menu Mixer when you set up a model based on the model templates HELImech or HELIccpm.

When a helicopter makes the transition from the hover into a climb or descent, the torque which the tail rotor has to compensate becomes larger or smaller, with the result that the helicopter yaws in one direction. Once set up correctly, the TAIL mixer compensates for these torque fluctuations, and prevents the model yawing. It also eases the task of the gyro system, so that you can set higher gyro gain and thereby obtain very good tail rotor stabilisation. Four parameters are required for this:

Coll.(pitch)+, Coll.(pitch)-, Offset, Zero point

```
ΣTAIL.HOVER
⌂Exit
Coll.+        ⦙ OFF
Coll.-        ⦙ OFF
Rudd.Diff.    ⦙ OFF
Offset        ⦙ OFF
Zero point      0%
  Collect.      0%
```

13.6.3. Basic Offset value
To compensate for the torque at 0° collective pitch (main rotor), a small tail rotor pitch angle (= Offset) is required; the value can be set separately in each flight phase. This will be necessary if you set different system rotational speeds in the various flight phases.

In the flight phase AUTOROT (Auto-rotation) the Offset can be changed so that no tail rotor pitch is present at all. This is particularly important if your model helicopter features a driven tail rotor.

13.6.4. Collective pitch to tail (Revo-Mix)
The Collective pitch → tail rotor mixers are set using the parameters Coll.+ / Coll.-, separately for climb and descent, and for each flight phase:

Coll.+   → correction for climb
Coll.-   → correction for descent

The exact values can only be established through a programme of flight testing, as they vary according to many parameters.

13.6.5. Mixer Zero point
The Zero point is where you set the starting point for the static tail rotor compensation mixer. The collective pitch → tail rotor mixer takes effect from this collective pitch angle in the direction of "climb", using the value set under Coll.+. In the other direction (descent) the value set under Coll.- takes effect.

Procedure:
a. Move the collective pitch stick to the position equating to 0° collective (use a rotor blade gauge if available). Note: you should first set up the collective pitch curve completely.
b. The Collective pitch value (Collect. / last line) cannot be changed, as it simply shows the current position of the collective pitch stick, and serves as an aid when setting-up. This value is set in the Zero point parameter.

13.6.6. Differential yaw (rudder) travel
The purpose of the Yaw (rudder) differential parameter (Rudd.Diff.) is to reduce the tail rotor travel in one direction. This is necessary if the model behaves differently when yawing (yaw commands) to left and right (angular velocity). Since the tail rotor has to counteract the torque generated by the main rotor, "Yaw" is usually weaker when the model is required to turn against the direction of the main rotor.

A separate value can be set for each flight phase.

13.7.   Gyro
In the Gyro mixer the optimum gain (sensitivity) can be set separately for each flight phase.

The Gyro menu is a dynamic menu: if the current model does not feature a servo which is assigned to Gyro, this function is not offered in the menu ΣMixer.
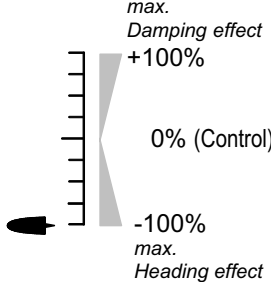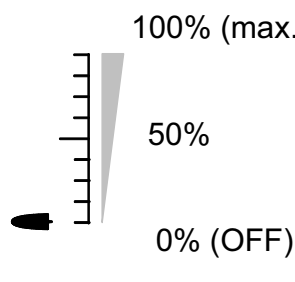
The default setting for gyro type in the model templates HELImech and HELIccpm is Heading. Gyro gain is controlled using Slider E, and gyro suppression is OFF (no reduction in gyro effect when yaw commands are given). Servo 6 is assigned to Gyro.

Press button Σ to open the main menu ΣMixer, then select and open the Gyro menu:

```
ΣGyro.HOVER
⌂Exit
Type of Gyro Heading
Control       ⦙ E
Suppression     OFF
```
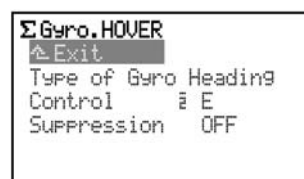
This means that everything is already prepared for use of a gyro in Heading mode, with gyro gain variable via slider E.

The following table shows the basic types and characteristics of commonly used gyro systems.

Heading gyro (heading-lock gyro)	**Damping gyro** (normal gyro)
The gyro brakes the rotational movement of the model around the axis to be stabilised, and also returns the model to its original position. Heading or Damping can be selected as operating modes via the gyro gain adjustment system.	The gyro brakes the rotational movement of the model around the axis to be stabilised.
Gain adjustment is variable within the range -100% ... +100%: *max. Damping effect* +100% 0% (Control) -100% *max. Heading effect*	Gain adjustment is variable within the range +0% ... +100% 100% (max. 50% 0% (OFF)

🛈 If you set a value of 0° in line 2 of the menu, the screen displays "Control", and you can then vary the gain using the transmitter control which is assigned to the gyro (default setting: Slider E).

13.7.1. Parameter Type of Gyro

The *ROYALpro* caters for two types of gyro, and you can select either of them.

a. Gyro type: Damping
Application:
In the case of damping (normal) gyros the gyro gain is varied via a separate control channel.

Gyro gain is adjusted via the parameter Damping. For each flight phase a separate % value can be set for gyro gain. In this way the gyro can be set up very accurately to match any flight task / flight phase.

b. Gyro type: Heading
Application:
In the case of Heading gyros the gain **and** the behaviour (damping / heading) are influenced by a separate control channel.

For each flight phase it is possible to adjust gyro gain and the mode of operation separately, enabling you to set up the gyro to match each flight phase accurately.

The gyro works in **Heading mode** if you set gyro gain to a value in the range −1% to −100%:
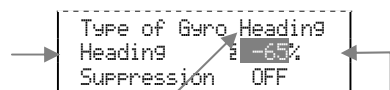
```
Type of Gyro Heading
Heading      ≜ -65%
Suppression  OFF
```
Fig. 13.7.1.1. Heading gyro in Heading mode

If you set gyro gain to a value within the range −1% ... −100% (Heading mode active), the yaw trim is automatically switched off. Trim changes affect a separate heading / yaw trim memory. This trim value is used in every flight phase which works in Heading mode, in order to allow the pilot to carry out minor corrections (temperature drift). The display of this trim can be found in Status displays 1 to 3 for the Yaw stick.

❽ The Parameter Trim in the menu for the transmitter control Yaw continues to display only the trim, according to the flight phase in the operational mode Damping.

At the same time the static tail rotor compensation mixer for the tail rotor is automatically switched off.

The gyro works in **Damping mode** if you set a value for gyro gain in the range +1% and +100%:
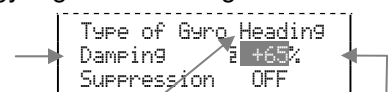
```
Type of Gyro Heading
Damping      ≜ +65%
Suppression  OFF
```
Fig. 13.7.1.2. Heading gyro in Damping mode

In **Control mode** gyro gain can only be varied manually using the "Gyro" transmitter control (default setting: Slider E). In this case the gain must be set to 0%. However, the screen shows the code letter of the gyro control instead of OFF or 0%:
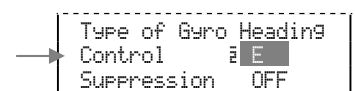
```
Type of Gyro Heading
Control      ≜ E
Suppression  OFF
```
Fig. 13.7.1.3. Heading gyro in Control mode

❽ **Note: checking Heading / Damping mode**
When operating a Heading gyro system in Heading mode, you must check - before you fly the model - that the gyro is working in the appropriate mode with the gain value you have set:

a. Activate a flight phase in which the gain is set within the range −1% ... −100% (Heading).

b. Move the yaw / tail rotor stick to either end-point, then return it to the neutral (centre) position:

   If the yaw / tail rotor servo immediately returns to its starting point, the gyro is operating in Damping mode:

   ⇒ You need to reverse the direction of rotation of the Gyro channel!

13.7.2. Adjusting gyro suppression

Many gyros reduce their effect (gain) when the pilot gives a deliberate yaw command. Without this suppression the gyro would also damp out intentional yaw movements. If you are using a gyro without its own integral automatic suppression (read the appropriate notes in the gyro system operating instructions!), then you should activate this function.

The gyro effect is suppressed in proportion to the deflection of the "Yaw" stick.
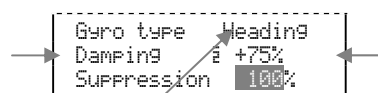
```
Gyro type    Heading
Damping      ≜ +75%
Suppression  100%
```
Fig. 13.7.2.1. Heading gyro in Damping mode

If you set Suppression to 100%, then gyro gain (sensitivity) is reduced to zero (= gyro OFF) at full travel of the "Yaw" control.

If you set Suppression to 200%, gyro gain is reduced to zero (= gyro OFF) when the yaw stick is moved to half its full travel.

If you set Suppression to 50%, gyro gain remains at 50% of the set value at full travel of the yaw stick.

In all flight phases, gyro suppression acts with the same value in all gyro modes: Control, Damping, Heading.

❽**Exception:**
If you set gyro gain to a value within the range −1% ... −100% (= Heading), gyro gain is **not** suppressed (reduced).

❽**Caution!**
Before flying a model it is vital to check that the gyro is working properly, i.e. that it is set up to counteract any rotational movement. If set incorrectly, the gyro will amplify any unwanted yawing motion of the helicopter, rendering it uncontrollable. Please read the operating instructions supplied with the gyro system!

13.8.   Throttle, and associated functions

The illustration below shows how throttle limiter, throttle curve and the collective pitch stick affect the throttle function. The individual terms are explained in Section (➔ 13.8.1.).

Since there are certain differences between electric and I.C. (internal combustion) helicopters in this respect, the instructions describe the settings for these two power system types separately:

➔ 13.8.2. Throttle for electric helicopters

➔ 13.8.3. Throttle for I.C. helicopters

The illustration printed below shows the association between all the settings and transmitter controls which have a role to play in controlling the power system.

- **Points P1 to P5**
  define the shape of the throttle curve
- **Collective pitch stick** controls throttle
- **Throttle limiter** limits throttle upwards
- **Throttle min.** limits throttle downwards.
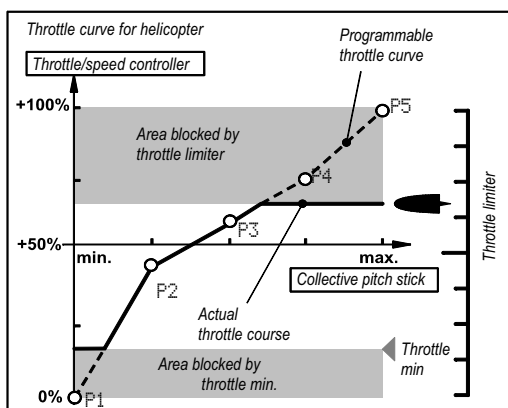
Fig. 13.8.1.: General overview "Throttle for helicopters"

This graph contains the essential information for I.C. powered model helicopters:
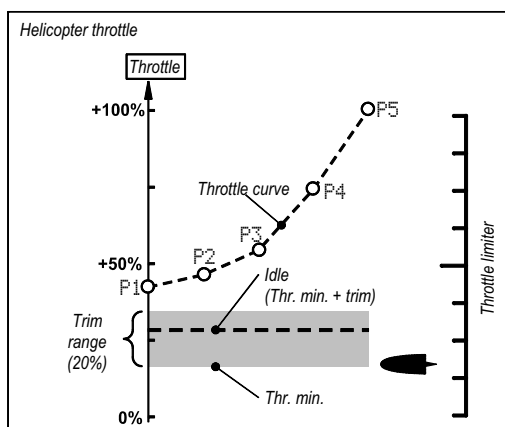
Fig. 13.8.2.: Overview for I.C. helicopters

Point P1 on the throttle curve is located at around 45%. From that point the throttle can be "pulled down" to the value for Throttle Min. using the Limiter. However, the actual idle throttle setting is defined by the sum of Throttle Min. and the set trim value. Starting from Throttle Min., idle can be increased by up to 20%. This makes it possible to adjust the idle to suit the current operating conditions.

13.8.1.   What is the meaning of the terms Limiter, Curve, Throttle Min., Trim, DTC and Throttle cut?

Throttle limiter:
The throttle limiter restricts the maximum possible throttle value. For normal flying the limiter should be left at Maximum. All throttle values which are dictated by the collective pitch stick in accordance with the set throttle curve are also present at the Throttle channel.

Once the engine has been started, the throttle limiter can be used slowly to raise the speed of the main rotor "by hand".

Throttle curve:
The throttle curve of the **ROYALpro** has five points, and determines how much throttle is assigned to the various individual positions of the collective pitch stick. The aim is a constant rotational speed, i.e. the higher the collective pitch, the more the throttle is advanced.

Throttle Minimum and Throttle Trim (Idle):
Throttle Min. (minimum throttle) is used to set the engine's idle speed.

If you set the throttle limiter to minimum, the idle characteristics of an I.C. engine can be fine-tuned using the trim in order to suit the operating conditions (temperature, humidity). Trimming is carried out by the trim button adjacent to the stick which you have selected (via stick Mode) to control Collective Pitch.

DTC:
DTC stands for **D**irect Throttle **C**ontrol. If DTC is switched on (CS/DTC switch in the ON position), the throttle channel - regardless of whether it acts upon a carburettor or a speed controller - is controlled directly by the transmitter control assigned to Limiter (default control is Slider F), and is independent of the position of the collective pitch stick.

DTC is useful when you wish to start an I.C. engine, or adjust the carburettor settings.

Throttle-cut:
If you hold this button pressed in, the throttle channel is maintained in the position which you earlier selected as Point P1 for the throttle servo under Servo travel adjustment. This enables you to "switch off" an I.C. engine, assuming that the carburettor barrel is fully closed at this position (➔ Fig.13.8.2.).

The default choice for Throttle-cut is button H on the right-hand side of the transmitter.

🛇 **Caution: in the case of electric helicopters** you must remember that the throttle channel jumps back to the last used throttle value when you release the Throttle-cut button. This could cause the main rotor to start spinning again.

13.8.2. Throttle for electric helicopters

🚫 You **must not** assign `Throttle` in the menu `⤡Setup, Assignment, Controls`!

```
⤡Assign.Controls
⤒Exit
Throttle      ---  -
```

Throttle is controlled automatically by the collective pitch control via the throttle curve.

If the throttle curve is to work properly, you must ensure that the following pre-conditions are fulfilled:

a. CS/DTC switch at OFF position
You will find the switch at `CS/DTC` in the menu `Setup, Assignment, Switches`. The asterisk must not appear after the direction arrow:

```
CS/DTC        I>   ↓
```

b. Throttle limiter at Max. position
In the menu `Setup, Assignment, Controls` you will find the transmitter control which is used to control Throttle Limit (`Thr.lim.`). The default is the right-hand slider (F).
The arrow following the F points in the direction of the Minimum position (in our example "back"):

```
Thr. limit    F    ↓
```

c. Throttle trim "fully back"
If the Idle setting for Throttle is "back", then the trim (trim buttons adjacent to the collective pitch stick) must also be set fully back. Otherwise, in the worst case - with the collective pitch stick in the Minimum position - 20% throttle could still be generated by the associated receiver output. That could prevent the initialisation of an electronic speed controller, or allow the power system to continue spinning even when collective pitch minimum is selected.

d. Throttle Minimum at 0%

🚫 **For electric helicopters the rule is as follows:**
The motor of an electric helicopter can only be switched off completely using the Limiter or the collective pitch stick if Throttle `Min.` is set to `0%`.

For I.C. engines the rule is this:
At Throttle `Min.` = `0%` the carburettor barrel is completely closed, and the engine stops. For this reason a value for Throttle `Min.` must be set at which the engine continues to run reliably (default setting is `20%`).

The value for Throttle `Min.` can be found in the main menu `⟂ Control` under `Throttle`:

```
⟂Throttle.HOVER
⤒Exit
Min.       0%
P1    |    0%
P2    |   25%
P3    |   50%
P4    |   75%
▼P5   |  100%      1 2 3 4 5
Curve ON
Limit  0.0s        1 2 3 4 5
```
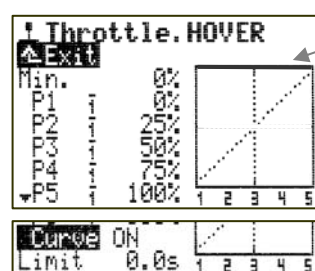
Throttle limiter slider F at maximum

Default settings from the templates for HELIccpm or HELImech

Area only visible after scrolling

The full range of the throttle curve can now be exploited.
For initial experiments you can safely use the default values from the model template (see illustration).

13.8.3. Throttle for I.C. powered helicopters

🚫 You **must not** assign anything for throttle in the menu `⤡Setup, Assignment, Controls`!

```
⤡Assign.Controls
⤒Exit
Throttle      ---  -
```

Throttle is automatically controlled by the collective pitch control via the throttle curve.

If the throttle curve is to work properly, you must ensure that the following pre-conditions are fulfilled:

a. Switch CS/DTC at OFF setting
You will find the switch at CS/DTC in the menu `Setup, Assignment, Switches`. The asterisk after the direction arrow must not appear:
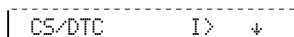
```
CS/DTC        I>   ↓
```

b. Throttle limiter at Max. position
In the menu `Setup, Assignment, Controls` you will find the transmitter control which is used to control Throttle limit (`Thr.lim.`). By default this is the right slider (F).
The arrow after F points in the direction of the Minimum position ("back" in our example):

```
Thr.lim.      F    ↓
```

c. Throttle trim "to centre"

d. Throttle minimum to 20% (default setting)
This setting ensures that the motor continues to run at idle when the throttle limiter is set to minimum. You can find this value in the menu `⟂ Control` under `Throttle`.

```
⟂Throttle.HOVER
⤒Exit
Min.      20%
P1    |    0%
P2    |   25%
P3    |   50%
P4    |   75%
▼P5   |  100%      1 2 3 4 5
Curve ON
Limit  0.0s        1 2 3 4 5
```
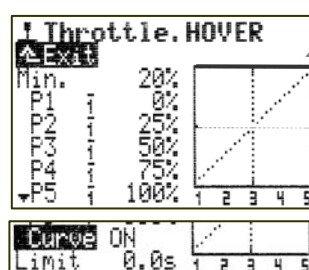
Throttle limiter slider F at maximum

Default settings from the model template for HELIccpm or HELImech

Area only visible after scrolling

The full range of the throttle curve can now be exploited.
For initial experiments you can safely use the default values from the model template (see illustration).

🖐 **Tip: speed governor (regulator)**
Glow-powered model helicopters can be fitted with a supplementary speed governor which automatically and very accurately maintains a constant system rotational speed. If you wish to fly such a model, the *ROYAL*pro* offers the following special function:

Assign the function `RPM` to a vacant servo output (➔ menu `Servo, Assignment`), and connect the governor to this receiver output. The menu `Control` now includes an item designated `RPM`. At this point you can set a fixed value for the nominal rotational speed, and set a different value for each flight phase. The speed governor, i.e. the fixed value for the governor, can be switched off at any time using a physical switch. If you do this, the throttle servo is controlled via the throttle curve in the usual way.

Before using the system please read the appropriate notes in the operating instructions supplied with the speed governor.

13.9. Setting the collective pitch curve

⌷: takes effect in the active model memory.

Range: +/-100%.

One collective pitch curve for each flight phase.

◉ Any of the curve points can be allocated to a 3-D digi-adjuster for in-flight adjustments (➔20.1.).

The collective pitch curve for model helicopters is set up in the menu ⊥ Control under Collec.. A separate collective pitch curve can be set up for each flight phase, in order to obtain the most suitable form of collective pitch control for each phase of flight:
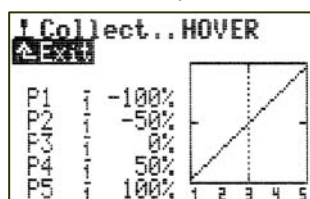
Example 1: Collective pitch curve for the flight phase HOVER

A "shallower" collective pitch curve from the hover setting (stick centre) to the minimum setting (descent) helps to provide fine control at the hover and promote accurate landings.

In the "climb" area (stick centre to maximum) only 70% of possible collective pitch travel is exploited. This also contributes to fine control at the hover:
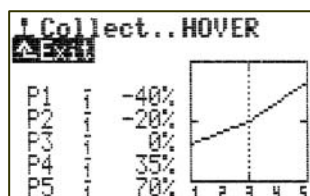
Example 2: Collective pitch curve for the flight phase CRUISE

Linear, symmetrical collective pitch curve for the same collective pitch control when climbing and descending:
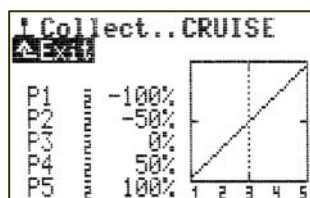
13.10. Working with Flight phases

13.10.1. What is the purpose of switching between different flight phases?

Using flight phases you can adjust the characteristics of the transmitter controls to suit the requirements of the model for each phase of flight (e.g. reduced travels for HOVER, maximum control travels for collective pitch at AUTOROTATION, V-shaped throttle curve for 3-D flying, ...).

All settings which can be varied separately for the flight phases are marked in the transmitter control menus with the code number of the flight phase.

Example Roll control:
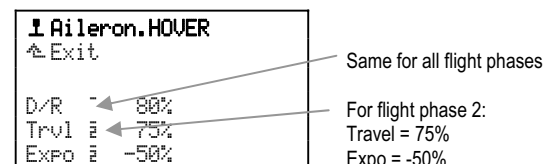
Pre-condition: if you wish to work with flight phases, you must assign at least one switch (for the main phase, or phases 1-3) in the menu ⚲, Assignment, Switches. If this is not the case, the transmitter always remains in Phase 1.

> ⊘ **Note: only transmitter control settings can be altered**
> Settings which are flight phase specific can only be entered in relation to the transmitter controls. The servo settings remain the same for all flight phases.

13.10.2. Default settings in the menu Flight phase

Press button ⌷: this opens the main menu Memory. Now use the 3-D digi-adjuster to select the Flight phase menu, and open it by pressing the 3-D digi-adjuster.

A typical Flight Phase menu looks like this:

This provides us with the following information:
Flight phases 2, 3 and 4 are blocked (names crossed though).

Names have already been assigned to all four possible flight phases, although they can be altered.

The three hyphens "---" following the flight phases indicate that physical switches have not yet been assigned to operate as flight phase switches.

As a result Flight Phase 1 HOVER has automatically been selected and marked as the active phase (X).

13.10.3. Assigning flight phase switches

You cannot use different transmitter control settings in the various flight phases until you have assigned at least one of the two switches:

- Main menu: Setup
- Menu: Assignment
- Menu point: Switches
- Parameter: Main Phase
- Press **ENTER** to open the menu point
- Move switch I to the ON position
  (✳ must appear on the screen).

If you wish to use all four flight phases, you will need to assign two switches:

a. Switch: Main Phase
(assign two-position switch)
Moving this switch to the ON position (marked with * when assigned) activates flight phase 4.
The position of the second switch then has no effect.
If **no switch is assigned** for Phases 1-3, you can only use the Main Phase switch to select Phases 1 and 4.

b. Switch: Phases 1-3
(assign three-position switch)
This switch can be used to activate phases 1, 2 or 3, provided that the Main Phase switch is at the OFF position.

```
Main Phase      I>  ↓
Phases 1-3      G>  ↓
```

13.10.4. Locking / unlocking flight phases

It is possible to lock any flight phases which you have not yet set up. Locked phases cannot be activated even if a switch is assigned to them. If you neverthe-less move the switch to the position corresponding to a locked flight phase, an audible warning sounds (beep every 0.5 seconds) for as long as the switch is in the "wrong" position.

This is the procedure for locking / unlocking flight phases:

- Open the main menu Memory (button 🖿)
- Select the menu Flight Phase
- Press **ENTER** to open the menu
  (or press the 3-D digi-adjuster)

```
🖿Flight Phase
   ↰Exit
 1 HOVER    X ---
 2 CRUISE     ---
 3 ACRO       ---
 4 AUTOROT    ---

   Time      OFF
```

- Select the flight phase with the 3-D digi-adjuster
- Press **ENTER** to open it
  (or press the 3-D digi-adjuster):

```
 3 ACRO           ---
```

- Every time you press the **REV/CLR** button you switch the flight phase between

  ACRO--- locked, and

  ACRO unlocked.

- Once you have set the desired state, press **ENTER** to conclude the procedure
  (or press the 3-D digi-adjuster).

❽ The current flight phase, which is marked with an X, cannot be locked:

```
 1 HOVER  X ---
```

13.10.5. Copying flight phases

Once you have established the correct settings in one flight phase, you can copy the values into another flight phase and then modify them. This avoids the need to re-enter all the settings from the start.

❽ Only the current flight phase can be copied.
The destination (target) flight phase for the copy process must be an unlocked flight phase.

This is the procedure for copying the current flight phase:

- Open the main menu Memory (button 🖿)
- Select the menu Flight Phase
- Press **ENTER** twice to select the X
  (or press the 3-D digi-adjuster twice):

```
🖿Flight Phase
   ↰Exit
 1 HOVER     X  I>
```

- Now select the destination (unlocked flight phase) using the 3-D digi-adjuster:

```
🖿Flight Phases
   ↰Exit
 1 HOVER      X  I>
 2 CRUISE       ---
 3 ACRO      c  ---
 4 AUTOROT      ---

   Time         OFF
```

- Confirm with **ENTER**
  (or press the 3-D digi-adjuster).

The marker jumps back to the code number for the current flight phase. Only the name for the "Target" phase is retained. All flight phase specific transmitter control settings are now the same as in the current flight phases.

13.10.6. Changing flight phase names

You can select any of the thirteen pre-set names for the flight phases:

1	NORMAL	6	SPEED1	11	HOVER
2	START1	7	SPEED2	12	3D
3	START2	8	CRUISE	13	ACRO
4	THERMAL1	9	LANDING		
5	THERMAL2	10	AUTOROT		

The only purpose of the name is to provide additional information; it has no influence on the characteristics of the corresponding flight phase. The crucial aspect for the properties is always the flight phase number.

Once you have activated an input field for the name, you can select a suitable name from those on offer.

```
┌─Flight phase
   ⏎Exit
 1 HOVER     X ───
 2 CRUISE      ───
 3 ACRO        ───
 4 AUTOROT     ───

   Time         OFF
```

13.10.7. Setting a transition time
The switch from one flight phase to another can occur immediately, or alternatively you can set a transition period of 1, 2 or 4 seconds (smooth transition). The latter reduces the loads on the model and the power system.

❽ Exception: flight phase AUTOROT
Applies to helicopters only!!

The transition always occurs **immediately** when you switch to the AUTOROT flight phase.

If you switch to any other flight phase (i.e. flight phase other than AUTOROT), then the transition occurs with the set delay or immediately, according to your setting.

This is the procedure for setting a transition time between the flight phases:
- Open the main menu Memory (button 🗁)
- Select the menu Flight phase
- Press **ENTER** (or press the 3-D digi-adjuster) to open the menu
- Select the Time line (see Fig. 13.10.7.1.)
- Press **ENTER** (or press the 3-D digi-adjuster) to open the set-up window
- Use the 3-D digi-adjuster to set a transition period (see Fig. 13.10.7.2.):
  1sec, 2sec, 4sec or OFF
- Press **ENTER** (or press the 3-D digi-adjuster) to confirm the selected setting.

```
┌─Flight phase              ┌─Flight phase
   ⏎Exit                       ⏎Exit
 1 HOVER     × G>            1 HOVER     × G>
 2 CRUISE      G>            2 CRUISE      G>
 3 ACRO        G>            3 ACRO        G>
 4 AUTOROT   ───            4 AUTOROT   ───

 ■ Time         OFF            Time        2sec
```

Fig. 13.10.7.1.:   *Fig. 13.10.7.2.:*
Time line selected   *Time set to 2 sec*

REFERENCE Section

The REFERENCE SECTION is the part of the manual where you can look up terms and find out detailed information about individual menus or parameters.

This section of the manual describes all the menus of the *ROYALpro*. The sequence is the same as that of the main menus when you access them directly using the six dedicated buttons (Chapters 14. to 19.). The description of the menus is also arranged in the order in which they occur when you leaf through using the 3-D digi-adjusters.

All the menus are summarised in a clear manner on the separate overview sheet supplied in the set, so that you can quickly find functions which you do not need to use regularly.

14.   Main menu � Setup

The main menu `Setup` is opened by pressing this button:

```
⚓Setup
 ⬆Exit
 Transmitter  ....   ➜14.1.
 Mixer def.   ....   ➜14.2.
 Assignment   ....   ➜14.3.
 Training     ....   ➜14.4.
 User         ....   ➜14.5.
```

The settings in these menus are "global", i.e. they extend beyond individual model memories, or apply to the transmitter as a whole.

14.1.   Menu Transmitter

```
⚓Transmitter
 ⬆Exit
 Sound          All
 Safety
  Check thr.    ON
  Check RF      ON
 Battery
 ▾ Alarm        7.10V
 ┄┄┄┄┄┄┄┄┄┄┄┄┄┄┄┄
  Capacity      2100mAh
  Charge        275mAh
  SlfDsCharge   low
 Display
  Contrast      0
  Trim graph    0
```

Note:
If the screen area is not sufficient to display all the sub-menus, this is indicated by means of arrows (▲ or ▾) at the left-hand edge of the screen. In this case you can access the start or end of the list by scrolling up or down using the UP / DOWN buttons (▲ / ▾) or one of the two 3-D digi-adjusters.

14.1.1.   Parameter Sound
The software allows you to select which events are to be accompanied by an audible beep:

Values	Meaning
Battery	Battery alarm only
Bat+Trim	Battery alarm and trim increments
B+Tr+Tim	Battery alarm, trim increments and timers
Init off	All off, except power-on melody
All	All audible signals

14.1.2.   Parameter group Safety
Parameter: Check thr.

Function	Warning if throttle is not at a safe setting (Idle or (electric) motor OFF) when you switch the transmitter on or change model memories
Values	ON OFF
Default	ON
Effect	Affects current model only

Parameter: Check RF

Function	RF channel is displayed at power-on, and must be confirmed before an RF signal is transmitted.
Values	ON OFF
Default	ON
Effect	Affects current model only

```
⚓Transmitter
 ⬆Exit
 Sound          Init off
 Safety
  Check thr.    ON
  Check RF      ON
 Battery
 ▾ Alarm        7.10V
```

14.1.3.   Parameter group Battery
Parameter: Alarm

Function	Battery alarm threshold
Values	6.70V to 7.50V (increment 0.01V)
Default	7.0V

The threshold for the battery alarm can be adjusted to suit your own preferences and the condition of the transmitter battery.

🔔 **Tip:** this setting affects the residual time, i.e. the time between the alarm sounding and the transmitter shutting down.

Switch the transmitter on with the aerial extended and the RF module active (RF status LED must be flashing). You do not need to operate the transmitter sticks.

Parameter: Capacity

Function	Capacity of the rechargeable transmitter battery for the purposes of battery management
Values	0mAh to 4000mAh (increment 50mAh)
Default	2100mAh

Parameter:	Charge

Function	Displays the current state of charge of the battery in mAh; can be varied
Values	0mAh max. = set battery capacity
Default	According to state of charge of battery

Parameter:	SlfDsCharge (self-discharge)

Function	Adjusts the battery management system to the self-discharge rate of the rechargeable transmitter battery in use
Values	norm. low
Default	low (for PERMABATT+ battery type)

14.1.4. Parameter group Display

Parameter:	Contrast

Function	Optimises screen contrast to suit the operating conditions
Values	-8 to +8
Default	0

Parameter:	Trim graph

Function	Selects different methods of representing the trim positions on screen
Values	0 to 5
Default	0

14.2. Menu Mixer def.

This menu lists all fourteen available free mixers:

```
↘Define mixer
  ⬆Exit
 1 ELEVATR+    ....
 2 V-TAIL+     ....
 3 DELTA+      ....
 4 AILERON+    ....
 5 FLAP+       ....
▼6 <<MIX6>>    ....
```

```
13 <<MIX13>>   ....
14 <<MIX14>>   ....
```

Mixer names consisting of up to eight characters can be entered when the mixer is set up.

Mixers 1 to 5 are pre-defined, but can be modified in any way you like.

Our standard for mixer names:
Capital letters with "+" suffix indicate that additional inputs can be mixed into a basic function (e.g. Elevator).

Notes:
- The mixer definitions are **"global"**: changes to the mixer definition affect all models which make use of that mixer.
- **Up to five** free mixers can be used for each model (memory).
- The free mixers are only available **for fixed-wing model aircraft**.

14.2.1. Defining a free mixer
Each mixer can contain up to five inputs (transmitter controls).

The servo travel is the sum of all mixer inputs. For this reason we use the mathematical symbol for "sum" Σ as the symbol for the mixers:

```
↘Define mixer
  ⬆Exit
  Name        ELEVATR+
1 Elevator ON    ↕
2 Spoiler  ON    ↨
3 Flap     ON    ↕
4 Thr -Tr  ON    ↧-
5 --------- --- --
```

Mixer name for servo assignment

The servo is controlled by these inputs

Mixer input Switch Effect
(Mixer option ➔ 14.2.2.)
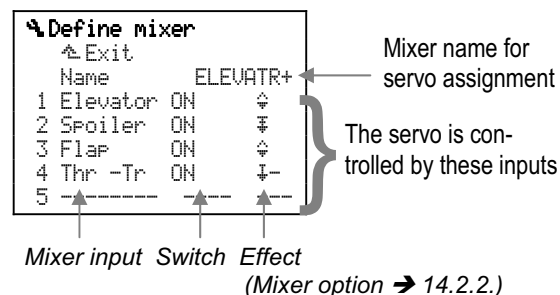
14.2.2. Method of working and options for the mixer inputs

These methods of working apply to all mixer inputs:

Symbol	Effect	Parameter in Mixer menu
↕	symmetrical	-------- trv
↕	asymmetrical	trv↑ trv↓
↧	single-sided	-------- trv
↨	single-sided with centre	pt1 pt2

Possible supplementary options are:

Symbol	Effect	Meaning
2	2 directions	Automatic change of input direction from servo to servo
+	with Offset	Shifts the centre point of the input
-	with deadband	Input only works when the transmitter control has passed the deadband

Not all combinations of effect and supplementary option make sense in practice. The available combinations are listed in the table below.

When you leaf through the methods of working during the mixer definition procedure you will find the symbols in the following order:

Symbol	Effect	Meaning	Fig.
↕2	symmetrical, 2 directions		①
↕2+	symmetrical, 2 directions, with Offset	Shifts the centre of the servo / servos by the Offset offs	②
↕+	symmetrical, with Offset		
↕2-	symmetrical, 2 directions, with deadband	The input only takes effect when the transmitter control has passed the deadband dead	③
↕-	symmetrical, with deadband		
↕	symmetrical		①
↕	asymmetrical		④
↕2	asymmetrical, 2 directions		④

⌇	single-sided	Idle position of the transmitter control at one end-point	⑤
⌇+	single-sided, with Offset	Shifts the end-point of the servo / servos by the Offset `offs`	⑥
⌇–	single-sided, with deadband	The input only takes effect when the transmitter control as passed the deadband `dead`	⑦
‡	Single-sided, with Centre	Point1 (`Pt1`) is the magnitude of the input at the transmitter control's centre point	⑧

The parameter `trv` defines the travels for both directions of servo rotation, starting from the transmitter control centre.

The input alters the direction of rotation from servo to servo
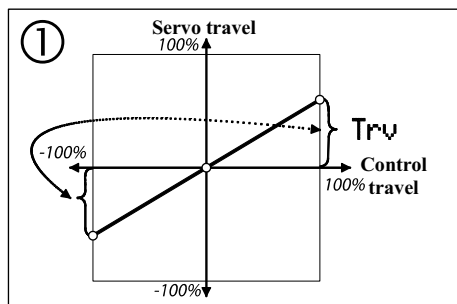
The control surface travel is symmetrical, i.e. the same on both sides.

Example: ailerons
Different values for up-travel and down-travel can be set using the Differential function.
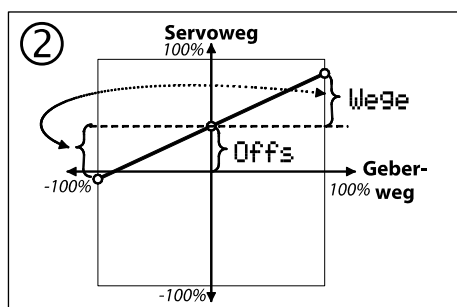
The `offs` shifts the centre of the servo(s). The travels for both directions of rotation are the same (as in ①)
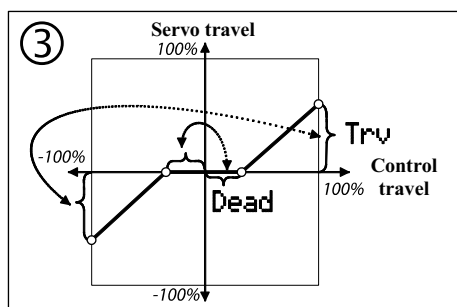
`dead.` (deadband) defines how far the control must be moved before the effect takes force. **Servo travels** for both directions are **the same**.

Example: six-flap wing
Small commands move the tip ailerons only. The main ailerons only follow when the dead-band is passed.
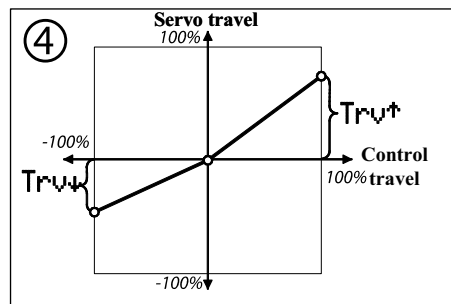
The travel (`trv`) can be set to different values for each direction of rotation of the servo(s).

Example: elevator compensation for camber-changing flaps
Different values can be set for positive and negative camber settings.
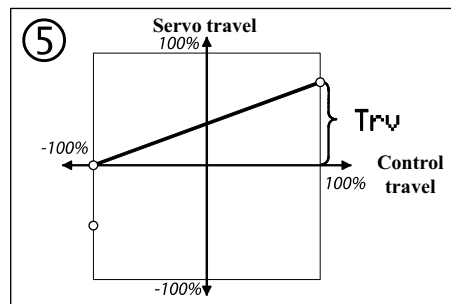
Starting from the idle position of the transmitter control, the servo moves only in one direction.

Example: elevator compensation for spoilers
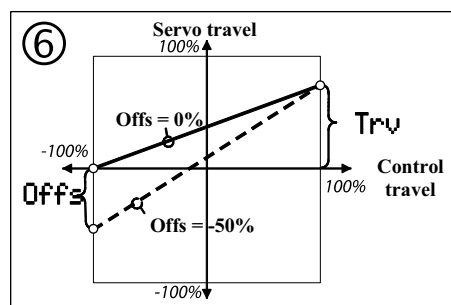
`offs` defines the starting point (= idle position of the servo), `trv` defines servo target point for the control end-point.

❷ The **total servo travel** is the **sum** of `trv` and `offs`.

Example: ailerons as landing aid
If ailerons are to be raised for landing, in most cases as much up-deflection as possible is desirable. The down-travel is small, so the working range of the servo around the neutral position of the ailerons is different. An Offset is used to avoid the necessity for travel reductions.
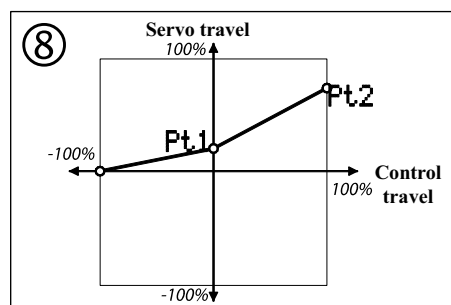
`Pt1` and `Pt2` determine the servo positions for the centre and end-points of the transmitter control.

Example:
Non-linear throttle compensation for elevator
Less compensation (down-elevator) is required from idle to half-throttle (`Pt1`) than for the range from half-throttle to full-throttle (`Pt2`).

14.2.3. Making mixer inputs switchable

Mixer switches are used when you need to be able to activate and turn off mixer inputs using a switch. With clever combinations of switches for the flight phases, it is possible to switch mixer inputs off and on in individual flight phases.

Two steps are necessary in order to use a mixer switch:

- Assign a control element
  (Menu: Setup, Assignment, Switches
  Mix-1, Mix-2 or Mix-3).
- "Attach" the mixer input to a switch
  (Menu: Setup, Mixer def., desired mixer, desired input).

Assigning a control element for the mixer switch:
The control element for the three mixer switches can be any of the mechanical switches G to P, the control switches on the throttle / spoiler / collective pitch stick, or slider E or F.

"Attaching" a mixer input to a mixer switch:
When defining mixers in the menu Setup, Mixer def. you can select the switches directly or reversed (inverted).

The following possibilities can be selected in the "Switches" column:

Assigned function	The mixer input is ...
ON	... always switched on
Mx1	... only switched on, if the switch is at its ON position (in the case of three-stage switches OFF / OFF / ON)
Mx2	
Mx3	
OFF	... always switched off
Mx1N	... only switched on, if the switch is in its OFF position (in the case of three-stage switches ON / ON / OFF)
Mx2N	
Mx3N	

Special case: three-position switches:
In the menu Setup, Assignment, Switches you can also assign three-position switches for Mix-1, -2 or -3. In the centre position of the switch the following switched functions are then available:

Mx1/2/3   Centre position equates to OFF
           (effect ON / OFF / OFF).

Mx1/2/3N   Centre position equates to ON
           (effect OFF / ON / ON).

14.3. Menu: Assignment

If you press button ↘ to open the main menu ⬊Setup, then select and activate Assignment, the following menu appears (the content of the lines Mode, Assignment and Name may be different).

Example:
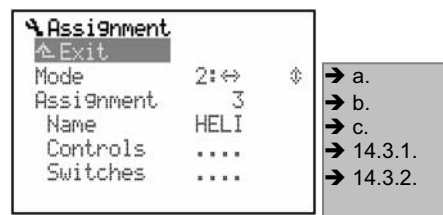
a. **Select Mode**
   Stick modes (Mode) 1 to 4 are possible.
   The double arrows stand for ⇔ Rudder, ⬍ Elevator, and indicate which stick is used to control those functions:

Mode	Effect
1: ⬍ ⇔	Elevator and rudder on left stick or pitch and yaw on left stick
2: ⇔ ⬍	Rudder left, elevator right, or yaw left, pitch right
3: ⬍ ⇔	Elevator left, rudder right, or pitch left, yaw right
4: ⬍ ⇔	Elevator and rudder on right stick, or pitch and yaw on right stick

🛫 Aileron is assigned automatically. The unused stick axis is generally used for throttle or spoilers (➔ 14.3.1.).

🚁 Roll is assigned automatically. The unused stick is always assigned to collective pitch, and simultaneously controls the throttle via the throttle curve.

b. **Assignment**
   Assignments 1 to 5 are possible.
   At this point you select which of the five assignments for transmitter controls and switches is to be used to control the model. Three pre-defined lists for POWER, GLIDER and HELI are provided.
   Note: the assignment lists are "global", i.e. any changes you make affect all models which are set up using the corresponding list.

c. **Name of the assignment**
At this point a "descriptive" name can be entered for the lists; it may be up to eight characters long.

14.3.1. Sub-menu Assign.Controls
When you select and open this sub-menu, all the available transmitter control functions are displayed on-screen, and you can determine which control elements are to be used to operate them.

List with all available transmitter controls and default assignments for the lists (➔ 22.1.).

Two- / three-position switches or push-button as transmitter controls:

All the switches of the *ROYAL**pro*** can also be assigned as transmitter controls. The control then only provides two or three positions, i.e. proportional control is not possible.

Examples:

Two-position switches:
 Retracts, aero-tow release.

Three-position switches:
 Electric motor OFF – half-throttle – full-throttle,
 Flaps to neutral, launch or landing position.

If the function which you are operating with a switch has no set-up options (e.g. Mixture control), adjustments can be carried out in the menu Servo, Calibrate (end-points and centre, or intermediate points).

✪ Check the idle position!
In the case of transmitter controls which only work in one direction from the idle position (throttle, spoilers, retracts), the idle position must also be set correctly at the assigning stage. This is important for mixers, as "nothing" is mixed in at the idle position. At the working position (full-throttle, spoilers / landing gear extended) the set travel input is to be mixed in.

This is the method of changing the idle position:
a. Select the desired transmitter control:
 | Spoiler ▼I▲ ↓* |
b. Press **ENTER** to open.
 Press **ENTER** to confirm the warning message:
 | Spoiler ▼I▲ ↓* |
c. Move the control element to the desired idle position: the arrow must point in the direction of the desired idle position:
 | Spoiler ▼I▲ (↑*) |
d. Confirm with **ENTER**:
 | Spoiler ▼I▲ ↑* |
e. Check:
 The asterisk indicates that the control element is located at the previously defined idle position.
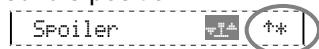
14.3.2. Sub-menu Assign.Switches
When you select and open the sub-menu, you will find all available switch functions, and can determine which control elements are to be used to operate them.

List showing all available switches and default assignments for the lists (➔ 22.1.).

Last menu point in the list is Extra-Switch (➔ 14.3.3.).

(Proportional) transmitter controls as switches:
The proportional controls of the *ROYAL**pro***:
 ▼I▲ Sticks (throttle, spoiler, collective pitch)
 E Left-hand slider
 F Right-hand slider

can all be used as two-position switches.

Examples:
 Sum timer Σ⊤ for motor run time:
 Switch on with throttle
  (e.g. after ¼ -throttle).
 Switch glowplug on at Idle
  (e.g. under 15% throttle).
 Change flight phase when spoilers are extended
  (landing).

The trigger point is set under TriggerPoint in the menu I Control.

✪ Check the ON position!
In the case of switches the ON position can be determined in this menu. This is useful for adjusting the switch positions to your personal preferences.

This is the method for changing the ON position:
a. Select the desired switch:
 | CS/DTC <N ↓* |
 Example: Combi-Switch is ON when switch N is back (towards keypad). The arrow "<" indicates that switch N can be found on the left-hand side of the transmitter.
b. Open with **ENTER**.
 Press **ENTER** to confirm the warning message:
 | CS/DTC <N ↓* |
c. Move the switch to the desired ON position. The arrow must point in the direction of the ON position:
 | CS/DTC ▼I▲ (↑*) |
d. Confirm with **ENTER**:
 | CS/DTC ▼I▲ ↑* |
e. Check:
 The asterisk indicates that the switch is in the ON position.
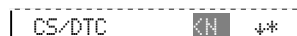
14.3.3. Special case Extra Sw.
The switch which is connected to the terminal clamp (terminals ABC) on the main circuit board is termed the Extra-Switch (supplementary switch). This will usually be a two-position or three-position stick switch. The method of installing and using these switches is described in Section (➔ 20.6.5.).

If the Extra Sw. is to be used, it must be assigned a "logical" function in addition to the "physical" input on the main circuit board.

> **✪ The** Extra Sw. **assignment** always **applies!**
> The same assignment always appears at the same point in the five assignment lists. However, the selected "logical" assignment can be used for different transmitter control or switch functions.

 | Extra Sw. -> Ksw |

✪ Important: the assignment must **be selected using the 3-D digi-adjuster!**
Quick-Select (selecting by operating) is not possible in this menu point.

There are four possibilities for assignment:

- ▬▬ the socket ABC is not used
- K◇ or ◇P

  enter as K or P at the assignment stage
- Ksw enter as Ksw at the assignment stage
  (our recommendation)

If you decide on Ksw, it will immediately be clear from the assignment lists that this means the stick switch.

14.4. Menu Training

The arrangement known as Trainer (Teacher / Pupil) mode is the safest method for beginners to get started in model sport. Two transmitters are inter-connected using a special lead. An experienced modeller has control over the model, and is able to transfer control functions to the pupil by operating the Trainer button ("TEACHER" button). Initially these will be individual control functions, and later all the main control functions when the "Pupil" has gained sufficient skill. If individual control functions are transferred, the Teacher retains control over the remaining control functions. If he releases the TEACHER button, the tutor resumes full control of the model - typically if a dangerous situation develops. The Teacher transmitter alone transmits an RF signal, powers the Pupil transmitter and carries out all the data processing. This means that the Pupil transmitter simply needs to be switched to Pupil mode, although this does vary according to transmitter type. No further adjustments or programming work are required. All the Teacher transmitter needs from the Pupil transmitter are the pure stick signals.

The *ROYALpro* can be used both as Teacher transmitter and Pupil transmitter.

As **Teacher transmitter** the *ROYALpro* can transfer up to five functions to the Pupil.

For fixed-wing model aircraft these are:
Aileron, elevator, rudder, throttle, spoiler.

For model helicopters:
Roll, pitch-axis, yaw, collective pitch.

As **Pupil transmitter** it also generates the functions listed above, which can then be processed by the Teacher transmitter. If the *ROYALpro* is in Pupil mode, the trims, mixers and all transmitter control and servo adjustments are switched off.

14.4.1. The *ROYALpro* as Teacher transmitter

a. The Teacher and Pupil transmitters are interconnected using the Trainer lead # 8 5121 plugged into the multi-function sockets. Connect the lead the right way round: the Pupil end of the cable is marked "Schüler", the Teacher end "Lehrer".

   The following can be used as the Pupil transmitter: *ROYALpro*, ROYALevo7 / 9 / 12, Cockpit MM, Cockpit SX, Commander mc, EUROPA mc, PiCOline, PROFI mc 3010 / 3030 / 4000.

   Many earlier MULTIPLEX transmitters can also be used as Pupil units. If your proposed Pupil transmitter is not listed above, please ask our Customer Service department for advice.

b. Switch the Teacher transmitter (*ROYALpro*) on. The Pupil transmitter is also switched on automatically, as it is powered by the Teacher transmitter.

   Important: the ON / OFF switch on the Pupil transmitter must be left in the OFF position.

c. Move to the sub-menu Setup, Training. Select Mode, and confirm with **ENTER**. Rotate one of the 3-D digi-adjusters until you see the following display:

Menu Setup, Training for fixed-wing models   *Menu Setup, Training for model helicopters*

   The "◇M" indicator means that the button on the left-hand side (◇) of the transmitter is the Trainer switch used to transfer control. If you operate this switch, an asterisk appears, indicating that the Pupil now has control.

d. Select:
   Mode = Teach.M, if the Pupil transmitter generates signals in the MULTIPLEX format (Neutral signal = 1.6 ms):
   e.g. ROYALevo7 / 9 / 12 with "Pupil M", Cockpit MM with servo format set to "M", Cockpit SX with "SCHULM", Commander mc, EUROPA mc, PiCOline, PROFI mc 3010 / 3030 / 4000).

   Mode = Teach.U, if the Pupil transmitter generates signals in the UNIVERSAL format (neutral signal = 1.5 ms):
   e.g. PiCO-line, ROYALevo transmitter with "Pupil U", COCKPIT MM with servo format set to "U" (UNI), Cockpit SX with "SCHULU".

e. Select the function which the Pupil is to control, then press the **ENTER** button or one of the 3-D digi-adjusters.
   ⇒ The cursor now moves to the channel assignment input field.

f. At the Pupil transmitter move the control which is to operate the selected control function (Quick-Select). The corresponding channel number is displayed (e.g. "K1" for aileron). Check that the control

surfaces deflect in the right direction (sense). If not, press the **REV/CLR** button to reverse the function (↓ or ↑).

Note: Quick-Select is only possible if the *ROYALpro* is switched on as Teacher transmitter, with the RF module active.

g. Press the **ENTER** button or one of the 3-D digi-adjusters to complete the assignment process. Ensure that the function works correctly by holding the TEACHER button pressed in. The Pupil should now operate the control function which has just been transferred. Please check that the control surface on the model deflects in the appropriate **direction**!

h. Repeat Steps e. to g. until you have assigned all the control functions which are to be transferred to the Pupil. Now you can return to the Status display, and training operations can commence.

❽ **Caution when assigning the functions** Throttle **or Collective** Pitch, **as the motor could burst into life during the assigning process. Injury hazard!**

Ensure that nobody could be endangered by a motor revving up or an electric motor starting to run, and that the model is not in a position to cause any damage. For safety reasons the assignment pro-cess should be carried out with the engine stopped or the electric motor disconnected. The correct function can also be checked using the Servo Monitor (➔ 17.3.), in which case the model can be left switched off.

If you wish to erase an assignment, select the appropriate control function and select OFF using the (▲ / ▼) buttons or one of the 3-D digi-adjusters.

If the transmitter is switched off in "Teach.U" or "Teach.M" mode, the software automatically moves to the menu Setup, Training when next switched on, reminding you that the transmitter is still set to this mode.

14.4.2. The *ROYALpro* as Pupil transmitter

Important: when the *ROYALpro* is operating as a Pupil transmitter, the trims have no effect (Teacher trims).

The following can be used as the Teacher transmitter:
ROYALpro, ROYAL*evo7 / 9 / 12,* Cockpit SX, Commander mc, PROFI mc 3010 / 3030 / 4000.

Some earlier MULTIPLEX transmitters can also be used as Teacher units. If your proposed Teacher transmitter is not listed above, please ask our Customer Service department for advice.

a. The Teacher and Pupil transmitters are interconnected using the Trainer lead # 8 5121 plugged into the multi-function sockets. Connect the lead the right way round: the Pupil end of the cable is marked "Schüler", the Teacher end "Lehrer".

b. Switch the Teacher transmitter on.
The Pupil transmitter is also switched on automatically, as it is powered by the Teacher transmitter.

c. Move to the sub-menu Training.

d. Select:
Mode = Pupil M, if the Teacher transmitter expects signals in the MULTIPLEX format (neutral signal = 1.6 ms):
e.g. ROYALevo7 / 9 / 12 with "Teach.M", Commander mc, PROFI mc 3010 / 3030 / 4000.

Mode = Pupil U, if the Teacher transmitter expects signals in the UNIVERSAL format (neutral signal = 1.5 ms):
e.g. ROYALevo7 / 9 / 12 with "Teach.U".

The following display now appears:
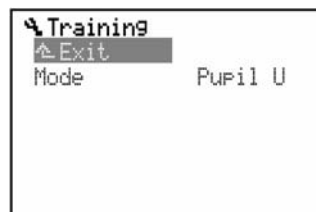
Note:
If you switch your *ROYALpro* off after a period of Trainer mode operations, without setting the parameter Training, Mode to OFF, for safety reasons the transmitter will revert directly to the menu Setup, Training when you next switch the system on.

Before every flight in Trainer mode it is essential to check the following points:
- Are all the control functions which the Pupil is not permitted to control set to OFF?
- Is the control function assignment absolutely clear? Check that none of the Pupil's servo channels is assigned twice!
- Are all the control functions working in the correct direction (sense)? Always check this before launching the model.

Note:
If the Trainer lead is disconnected during a flight, all the control functions will automatically revert to the Teacher transmitter.

14.5. Menu User

```
↘User
 ⏎Exit
PIN          0000
Language     English
Name         N  Schneid
             er
```

14.5.1. Parameter PIN (access code)

The purpose of the PIN (**P**ersonal **I**dentification **N**umber) is to protect the settings and values stored in your transmitter. When the PIN is active, you can view settings and values, but you cannot change them.

> PIN = 0000

The default PIN provides no protection against changes to the settings and values stored in your transmitter.

> PIN = **** (four digits)

The PIN must contain at least one digit which is not "0".

If you enter a PIN, the lock takes effect next time you switch the transmitter on. You can leaf through all the menus, but as soon as you try to change anything you will see this on-screen message:

```
Input Locked
Please enter
correct PIN:
    ▓***
```

Entering the correct PIN unlocks the system; the code lock will be re-activated next time you switch the transmitter on.

❷ If you forget your PIN:

You can reset the PIN to 0000 - and thereby render it ineffective - using the PC program ROYALpro-Data-Manager (free download from the Internet) and the PC Interface lead # 8 5148 (USB) or # 8 5156 (serial).

14.5.2. Parameter Language

The ***ROYALpro*** contains two language sets for the on-screen texts. The default primary language is English, which is selected as the active language.

The default second language is Deutsch (German).

In the menu ↘, User (or Benutzer) you can toggle between these two languages using the Language (or Sprache) parameter.

It is also possible to install other languages in your transmitter using the DataManager program for the ***ROYALpro***. This is available on the Internet from our website http://www.multiplex-rc.de under DOWNLOADS, SOFTWARE.

The following language combinations are available:

Code	Main language	Second language
DE/EN		German
FR/EN	English	French
ES/EN		Spanish
IT/EN		Italian

You can find out which language pair is installed in your transmitter by consulting Status display 4:

```
ROYALpro12  2.53 DE/EN ◄──
 K:  066      35.060MHz
Modulation     FM/PPM 9

Batt. voltage      7.81V
Battery charge  1699mAh
Remaining time     8.1h
Operating time    14.8h
```
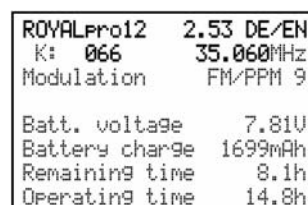
Fig. 14.5.2.1.: Status display 4 showing screen languages

14.5.3. Parameter Name

The default name on your transmitter is MULTIPLEX. At this point you can enter your own name with up to sixteen characters. The name then appears in Status display 1 (Example: Max Muster):

```
<──────── 🔒 ────────>
🗁 5:GLIDER
7.9V▓▓▓▓▓▓▓▓▓▓▓▓▓▓█▓
        ROYALpro12
        Max Muster
      🗁    0h01min
```

Fig. 14.5.3.1.: Status display 1 showing owner's name

15. Main menu ⊥ Control

The main menu Control is opened by pressing this button:

The term transmitter control refers to all those operating elements on the transmitter which are assigned to a control function. These include sticks, sliders and switches.

This menu is **dynamic**, i.e.:

- The menu content differs for fixed-wing model aircraft and helicopters.
- The screen only displays those transmitter controls which are used directly to control servos or mixers.
- Controls which have no variable parameters are not displayed
  (Tow rel., Brake, Mixture, AUX1 and AUX2).

For a simple fixed-wing model aircraft or helicopter the main menu Control may look like this:

Typical fixed-wing model aircraft:

```
⊥ Control
 ⌃ Exit
 Aileron      ....
 Elevator     ....
 Rudder       ....
 Throttle     ....
 Spoiler      ....
 ⌄Flap        ....
 ┄┄┄┄┄┄┄┄┄┄┄┄┄┄┄┄┄┄
  TriggerPoint ....
```
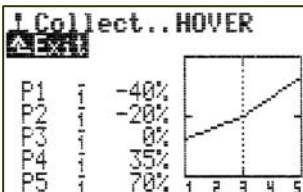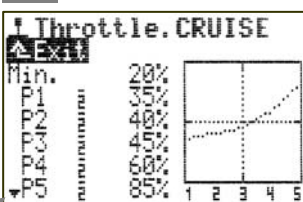
Typical model helicopter:

```
⊥ Control
 ⌃ Exit
 Aileron      ....
 Elevator     ....
 Rudder       ....
 Collect.     ....
 Throttle     ....
 TriggerPoint ....
```

15.1. Menu Control ✈

Control	*Parameter*	Default
Aileron Elevator Rudder	Trim	Current trim (display only)
	Step	Trim increment 0.5% **1.5%** 2.5% 3.5%
	D/R	Dual-Rate 10% to **100%**
	Trvl	Transmitter control travel setting Flight phase specific 0% to **100%**
	Expo	Flight phase specific −100% **0%** 100%
Throttle	TrCut	Motor CUT switch, (display only, with Status ✳ = active)
	Trim	Current trim (display only)
	Step	Trim increment 0.5% **1.5%** 2.5%
	Mode	Effect of throttle trim HALF = from idle to half-throttle FULL = from idle to full-throttle
	Expo	Expo −100% **0%** 100%
	Slow	Delay, only when throttle is opened **0.0s** to 6.0s
Spoiler Flap	Time	Slow function **0.0s** to 6.0s
	Fixed value	Flight phase specific −100% **OFF** 100%
L. gear	Time	Slow function **0.0s** to 6.0s
Tow rel. Brake Gyro Mixture AUX1 AUX2	No adjustment at the transmitter control end! Adjustment is only possible in the menu ⊿Servo, Calibrate	
	Direction of rotation	REV/TRM
	Centre	P3
	End-points	P1, P5
	Curve points	P2, P4
TriggerPoint	(➔ 15.3.)	

15.2. Menu Control 🖳

Control	Parameter	Default
Aileron Elevator Rudder	Trim	Current trim (display only)
	Step	Trim increment 0.5% 1.5% 2.5% 3.5%
	D/R	Dual-Rate 10% to 100%
	Trvl	Transmitter control travel setting Flight phase specific 0% to 100%
	Expo	Flight phase specific -100% 0% 100%
Collect. (Collective Pitch)	P1 to P5	5-point curve, flight phase specific

```
↥Collect..HOVER
▲Exit
P1 ┊  -40%
P2 ┊  -20%
P3 ┊    0%
P4 ┊   35%
P5 ┊   70%    1 2 3 4 5
```

Control	Parameter	Default
Throttle	Min.	Throttle idle (I.C. engine) 0% 20% 100% for electric 0%: recommended
	P1 to P5	5-point curve, flight phase specific
	Curve	Switch throttle curve on / off ON use throttle curve OFF only a fixed value for electric helicopters with regulated rotor speed (Governor mode)
	Limit	Slow function for throttle limiter 0.0s to 6.0s

```
↥Throttle.CRUISE
▲Exit
Min. ┊   20%
P1 ┊     35%
P2 ┊     40%
P3 ┊     45%
P4 ┊     60%
▼P5 ┊    85%    1 2 3 4 5
```

Additional menu points

Control	Parameter	Default
Spoiler Flap	Speed	Slow function 0.0s to 6.0s
	Fixed values	Flight phase specific -100% OFF 100%
L. gear	Time	Slow function 0.0s to 6.0s
Tow rel. Brake Gyro Mixture AUX1 AUX2		No adjustment at the transmitter control end! Adjustment is only possible in the menu 🖳Servo,Calibrate
	Direction of rotation	REV/TRM
	Centre	P3
	End-points	P1, P5
	Curve points	P2, P4
Trigger Point	(➔ 15.3.)	

15.3. Menu ⊥ TriggerPoint 🛩 🖳

In this menu you can set the switching thresholds for:

- the stick
  symbol ⊤⊥⊢,
  (left or right stick, according to mode) and
- the two sliders E and F.

If a switching process is set up to operate with these three transmitter controls, you can define a point which determines when the switching is to take place:

Control	Parameter	Default
⊤⊥⊢ E F	↓ ↑	Idle position of the transmitter control; display only, not defined during the assignment process: ↓ back, ↑ forward
	— ✴	Current switched state: — OFF, ✴ ON
	Step	Trigger point: -100% 0% 100%

Example: switching a Timer at ¼ -throttle
Since the range extends from -100% to 100%, the switching point for ¼ -throttle must be set at -50%.

🖰 Tip: using throttle / spoiler as switch
The sketch below clearly shows the connection between the control position and the switching threshold. For example, if the motor run time is to start at ¼ - throttle, the threshold for the associated transmitter control must be set to -50%.

Control position   Switching point
100% (max.) ———— +100%
(¾)
50% (½) ————   0%
(¼)
0% (OFF) ———— -100%
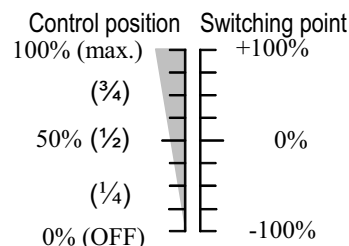
15.4. Control menu screen layout

In our example we show the display for the transmitter control Aileron with all the available set-up parameters. However, the screen may not look exactly like this, depending on the transmitter controls you have assigned, and the parameters associated with them:

```
↥Aileron.NORMAL
▲Exit
Trim ≈  4.5%
Step   1.5%
D/R  -  75%
Trvl ≈  80%
Expo ≈ -60%
```
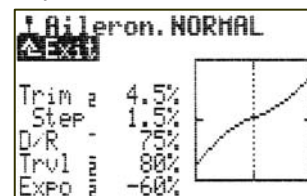
The screen is divided into three areas:

1. **Transmitter control names, active flight phase**
   At the top is the name of the transmitter control (in our example Aileron). Next to this is the name of the active flight phase (in our example the flight phase NORMAL).

2. Parameter list

On the left you will see a clearly arranged list of all the parameters for the selected transmitter control, together with their set values.

3. Graph

The graph on the right of the screen shows in graphic form the effect of all the settings you have selected. The curve immediately reflects any changes you make to the settings, and also clearly shows the behaviour of the transmitter control: the vertical dotted line shows the current position of the control.

In addition to the set-up parameters, the screen also shows two more items of information:

The small, high-set hyphen following the parameter name indicates that this value can be allocated to one of the 3-D digi-adjusters, and can then be adjusted in flight (➔ 20.1.):

```
Expo ⁻ -90%
```

The small number (1 to 4) following the parameter name indicates that this value may vary from flight phase to flight phase (➔ 19.4.):

```
Trim ₂  2.0%
```

Some parameters can be allocated to a 3-D digi-adjuster, and can also be set to different values for each flight phase. In this case both symbols are displayed:

```
Travel  ₂⁻ -90%
```

15.4.1.   Parameter Trim

🎮 for controls:	Aileron, Elevator, Rudder
🚁 for controls:	Roll, Pitch, Yaw
👁	Display only
📑	One trim value for each flight phase

The digital trim position is displayed graphically in bar-form in status displays 1 - 3. The parameter Trim also shows the trim setting of the transmitter control in the appropriate flight phase as a % value.

15.4.2.   Parameter Step (Trim increment)

🎮 for controls:	Aileron, Elevator, Rudder, Throttle
🚁 for controls:	Roll, Pitch, Yaw
Adjustment range:	1.5% (= normal) / 0.5% (= fine) / 2.5% / 3.5%

The range of the digital trims of the *ROYAL**pro*** is ± 20 steps. The parameter Step can be used to define the trim change for each trim increment as a % figure. For example, you could obtain a maximum trim range of ±10% with Step 0.5%, and ±30% with Step 1.5%:
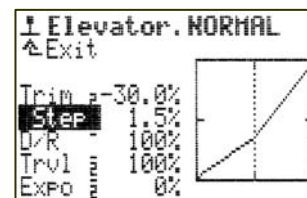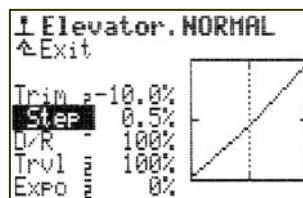
🔔 Note:

If the associated transmitter control is not at centre, then any alteration in the trim increment size automatically affects the trim value (trim setting). In this case you must adjust the trim accordingly.

For general-purpose use an increment size of 1.5% has proved a good compromise. However, for very fast models with accurate control surface linkages, or models with very large control surface travels (e.g. fun-fly types) an increment size of 1.5% may be too large. In this case you should set Step to 0.5%, which will provide very fine trim control.

15.4.3.   Parameter Mode (throttle trim)

The trim of the transmitter control Throttle enables the user to adjust and fine-tune the idle speed in models with internal-combustion engines. The parameter Mode also determines the throttle trim's method of working:

Mode = HALF: the trim of the Throttle control only affects the range from idle to half-throttle.

Mode = FULL: the trim of the Throttle control affects the full range from idle to full-throttle.

15.4.4.   Parameter D/R (Dual-Rate)

🎮 for controls:	Aileron, Elevator, Rudder
🚁 for controls:	Roll, Pitch, Yaw
Adjustment range:	10% to 100% Can be allocated to a 3-D digi-adjuster (➔ 20.1.)

The purpose of Dual Rates is to alter the sensitivity of particular transmitter controls. If the Dual-Rate parameter for one control function (e.g. Elevator) is set to 50%, you can switch to finer control of the model by operating the switch assigned to Dual-Rate, thereby reducing the travel of the model's control surfaces to half. When you operate the switch assigned to Dual-Rate, the transmitter control curve in the graph changes accordingly:
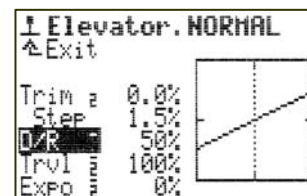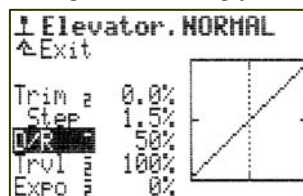
15.4.5.   Parameter Trvl (Travel)

🎮 for controls:	Aileron, Elevator, Rudder
🚁 for controls:	Roll, Pitch, Yaw
Adjustment range:	0% to 100% Can be assigned to a 3-D digi-adjuster (➔ 20.1.)
📑	One value for each flight phase

The parameter `Trvl` works in a similar way to Dual-Rate: it provides a means of influencing (reducing) the sensitivity of a transmitter control. The difference with `Trvl` is that the influence varies from one flight phase to the next, i.e. you can set a separate value in each flight phase. For example, in the flight phase `NORMAL` = 100% for maximum control response, and in the flight phase `SPEED1` = 60% for finer control at high speed:
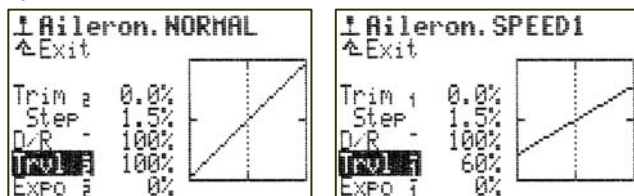
Note:
At any one time the screen can only display the set-up value for the active flight phase. If you wish to change the values for other flight phases, please remember that you must first activate the appropriate flight phase before you actually alter the value.

15.4.6.   Parameter `Expo`

⚁ for controls:	Aileron, Elevator, Rudder
⚃ for controls:	Roll, Pitch, Yaw
Adjustment range:	−100% to +100% Can be allocated to a 3-D digi-adjuster (➜ 20.1.)
▣	One value for each flight phase

`Expo` can be used to assign an exponential characteristic to a transmitter control curve. At `Expo` = 0% the transmitter control works in a linear fashion. The effect of negative Expo values is that the transmitter control generates small control surface travels around the centre position, providing finer control for the pilot. The effect of positive Expo values is that the control surface travels are increased around the centre position. In either case the end-points of the travel are unchanged when `Expo` is used, i.e. full travel is still available when required:
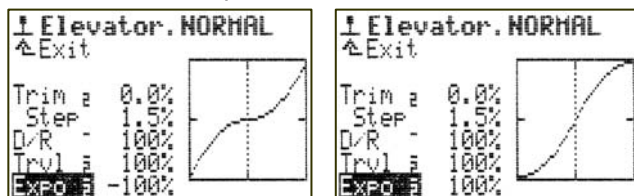
15.4.7.   Parameter `Fixed Value`

⚁ for controls:	Spoiler, Flap
Adjustment range:	−100% ... OFF ...+100%
▣	One value for each flight phase. Can be allocated to a 3-D digi-adjuster (➜ 20.1.)

This parameter can be used to generate fixed (flight phase specific) control surface travels which cannot be changed by the associated transmitter control. If `Fixed value` = OFF, the control surfaces are controlled directly by the relevant transmitter controls.

A typical example of this is thermal and speed settings for a four-flap model glider (e.g. F3B). For example, if you activate the flight phase `THERMAL1`, ailerons and camber-changing flaps (Flaps) move to a different neutral position optimised for thermal flying (e.g. fixed value Flap Thermal = −30%). If you set `Fixed value` = OFF in the flight phase `NORMAL`, and select the flight phase `NORMAL`, the neutral position of the ailerons and camber-changing flaps in our example will be under proportional control using the transmitter control assigned to Flap.
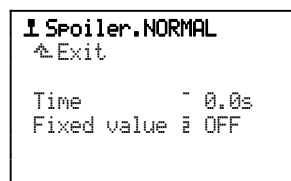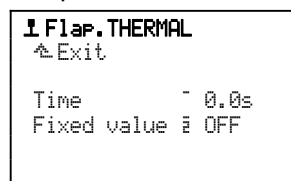
Note:
At any one time the screen can only display the set-up value for the active flight phase. If you wish to change the values for other flight phases, please remember that you must first activate the appropriate flight phase before you actually alter the value.

15.4.8.   Parameter `Time`

⚁ for controls:	Spoiler, Flap, L. gear
⚃ for control:	L. gear
Adjustment range:	0.0s to 6.0s Can be allocated to a 3-D digi-adjuster (➜ 20.1.)

The parameter `Time` is used to determine the period of time over which the transmitter control runs from one end-point to the other. This makes it possible for a process to be carried out slowly, over a specific period, even though it is operated by a switch.

Examples:
Extend Retracts (`L. gear`) slowly, so that the process looks true to scale.

Extend `Spoiler` (airbrakes / landing flaps) slowly, to avoid the model carrying out abrupt movements when the spoilers are deployed.

15.4.9.   Parameter `Limit`

⚁ for control:	Throttle
⚃ for control:	Throttle
Adjustment range:	0.0s to 6.0s Can be allocated to a 3-D digi-adjuster (➜ 20.1.)

Slow function for throttle limiter: this parameter is used to define the period over which throttle runs up to speed.

15.4.10. Parameter `Collect. P1 ... P5` (Coll. pitch curve)

![control icon] for control:	`Collect.`
Adjustment range:	−100% ... 0% ... +100% for all curve points P1 ... P5. Curve points can be allocated to a 3-D digi-adjuster (➔ 20.1.)
![pages icon]	Separate curve for each flight phase

The collective pitch curve for model helicopters is set up in the menu ⊥ `Control`, `Collect`. For each flight phase you can set up a separate collective pitch curve with five curve points `P1 ... P5`, in order to match collective pitch to the various flight phases as accurately as possible. The current position of the collective pitch stick is shown in the graph in the form of a vertical dotted line; this is intended as an aid at the set-up stage.

Example 1: Collective pitch curve, flight phase `HOVER`
"Shallower" collective pitch curve from hover collective / stick centre to minimum collective / descent, intended to provide finer control at the hover and when touching down:
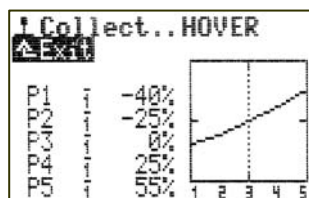
Example 2: Collective pitch curve flight phase `CRUISE`
Linear, symmetrical collective pitch curve for constant collective pitch control characteristics when climbing and descending. Greater maximum collective pitch values overall, as in most cases a higher system rotational speed is set (throttle curve), which in turn makes the helicopter capable of a better climb performance:
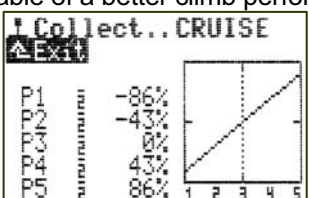
Note:
At any one time the screen can only display the collective pitch curve for the active flight phase. If you wish to change the collective pitch curve for other flight phases, please remember that you must first activate the appropriate flight phase before you actually alter the value.

15.4.11. Parameter `Throttle P1 ... P5` (Throttle curve)

![control icon] for control:	`Throttle`
Adjustment range:	0% (= OFF) ... 100% (= full-throttle) for all curve points P1 ... P5. 0% (= motor OFF) ... 100% for Min. (= idle) Curve points P1 ... P5 can be allocated to a 3-D digi-adjuster (➔ 20.1.)
![pages icon]	Separate curve for each flight phase P1 ... P5

The throttle curve for model helicopters is set up in the menu ⊥ `Control`, `Throttle`. For each of the flight phases 1 - 3 you can set up a separate throttle curve with five points, in order to match motor power to the collective pitch setting of the various flight phases as accurately as possible. The aim is to obtain a constant system rotational speed over the full range of collective pitch. The throttle curve can only be fine-tuned in flight, and varies according to many parameters (motor power, carburettor settings, power characteristics, collective pitch curve, rotor blades, …). If you change any one parameter, you will generally need to adjust the throttle curve again.

The current position of the collective pitch stick is shown in the graph as a vertical dotted line; this is intended as an aid at the set-up stage.

Example 1: Throttle curve, flight phase `HOVER`
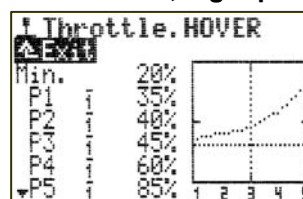
Simple throttle curve for the hover. The least motor power is required for negative collective pitch (= descent - in our example: `P1 = 35%`). The most motor power is required for positive collective pitch (= climb - in our example `P5 = 85%`).

Example 2: Throttle curve, flight phase `ACRO`
Symmetrical V-shaped throttle curve for increased throttle when climbing in normal and inverted flight:
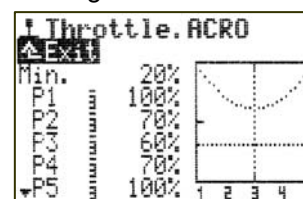
Special case: throttle `Curve = OFF` for electric helicopters with brushless motors in governor mode:
In this case a throttle curve does not need to be set up at the transmitter. When set to governor mode, the speed controller provides for a constant system rotational speed; all it requires is a fixed pre-set value for the requisite system speed in each flight phase. The throttle curve can be switched off by setting the parameter `Curve = OFF` in the menu ⊥ `Control`, `Throttle`. In this case the values of `P1 ... P5` are automatically the same (= fixed value), regardless of the point which you address.

Throttle curve `AUTOROT`(ation):
The fourth flight phase for model helicopters is the auto-rotation phase (`AUTOROT`, auto-rotation = emergency landing if engine / motor fails). This phase always has highest priority amongst the flight phases, i.e. if you operate the switch assigned to auto-rotation, the transmitter immediately switches to the `AUTOROT` flight phase, regardless of the position of the flight phase switch for `Phases 1 - 3`. A curve for `Throttle` is not set; instead a fixed value is used, which allows you to set a fixed throttle position (e.g. safe motor idle

or motor OFF in the case of an electric power system). The auto-rotation flight phase is primarily used for practising auto-rotation landings.

Points `P1 ... P5` cannot be set separately, i.e. changing any one value also changes all the other points. The fixed throttle value for auto-rotation is reduced or increased:

```
‼Throttle.AUTOROT
⌂Exit
Min.        20%
P1    ↓     25%
P2    ↓     25%
P3    ↓     25%
P4    ↓     25%
P5    ↓     25%  1 2 3 4 5
```
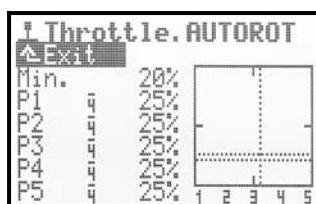
Note:
At any one time the screen can only display the throttle curve for the active flight phase. If you wish to change the throttle curve, please remember that you must first activate the appropriate flight phase before you actually alter the value.

15.4.12. Parameter Throttle `Min.` (idle, throttle limiter)

The parameter `Min.` defines the idle speed of the power system when the throttle limiter is at minimum or idle. If your model is powered by a glow engine, this is the speed which is required for starting the engine and maintaining a safe idle (approx. `20%`). For electric-powered models the setting should be `0%` (= motor OFF). This parameter applies to all flight phases, and can be adjusted if necessary using the idle trim (trim buttons for the collective pitch stick) (⇕).

The horizontal dotted line in the graph shows the position of the throttle limiter in all flight phases. The throttle limiter restricts the throttle setting.

⌀ **Tip:**

If you wish to adjust the idle (parameter `Min.`), first move the throttle limiter to the idle position. The change in the Idle setting `Min.` can then be seen directly from the horizontal dotted line which indicates the throttle limiter:

```
‼Throttle.HOVER        ‼Throttle.HOVER
⌂Exit                  ⌂Exit
Min.        20%        Min.        20%
P1    ↓     35%        P1    ↓     35%
P2    ↓     40%        P2    ↓     40%
P3    ↓     45%        P3    ↓     45%
P4    ↓     60%        P4    ↓     60%
P5    ↓     85% 1 2 3 4 5   P5    ↓     85% 1 2 3 4 5
```
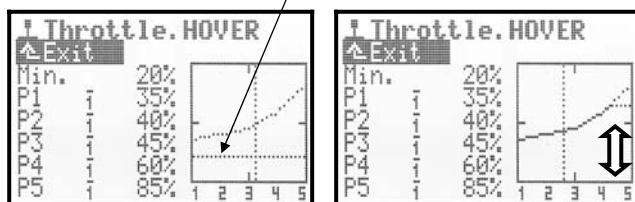
16. Main menu Σ Mixer

The main menu `Mixer` is opened by pressing this button:

$$\Sigma$$
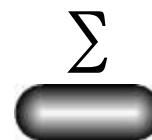
The menu is **dynamic**, i.e.:

- The menu content is different for fixed-wing models and model helicopters.
- Only those mixers are displayed to which at least one servo has been assigned.
- Certain mixers are always present for fixed-wing model aircraft and model helicopters (➔ 16.1. and 16.2.).

❷ **Gyros in fixed-wing model aircraft:**

If you have assigned the gyro function to a servo, then `Gyro` also appears in this menu. You will find a description of this function in Section (➔ 16.2.2.).

16.1. Menu `Mixer` ✈ Fixed-wing models

Mixers which are always present:
Three mixers are always present in the `Mixer` menu, regardless of the servo assignments. You will find them at the start of the dynamic section with the free mixers:

```
Σ Mixer
⌂Exit
Combi-Sw.      ....
Ail.Diff       ....
Control Mix    ....
```

16.1.1. `Combi-Sw.` (Combi-Switch)

Separately variable for each flight phase, switch is defined under `CS/DTC` in the menu:⌂ `Assignment, Switches:`

```
Σ Combi-Sw..NORMAL
⌂Exit

Combi-Sw.    <N  ↓*
Ail < rudder? OFF
```

In our example the `Combi-Sw.` menu shows the switch used (`<N` on the left side of the transmitter), the direction for "ON" (↓ = back) and the current position (* = ON).

Adjustment range:
```
  -200%        OFF        200%
Ail < rudder   Default   Ail. > rudder
Increment: 2%
```

❷ **Flight phase specific!**

16.1.2. `Ail.Diff.` (aileron differential)

✈	**For fixed-wing models only**
Adjustment range:	`Diff.:-100% ... OFF ... 100%` Prefix (+/-) reverses direction => reduction of aileron up-travel or down-travel
🗐	Separate values for differential (`Diff.`) can be set for each flight phase
⊛	The differential value (`Diff.`) can be allocated to the 3-D digi-adjuster (➔ 20.1.)

A simple description of aileron differential:
If ailerons are set up with symmetrical travels, i.e. the same deflections up and down, then the down-going aileron on the outside of the turn generates more drag than the up-going aileron on the inside of the turn. This results in a negative turning moment (known as adverse yaw) which tends to push the model out of the turn. The model yaws - nose-high - as it turns.

Aileron differential reduces the adverse yaw effect by reducing the deflection of the down-going aileron. Aileron differential is only possible if a separate servo is installed for each control surface. The effect of `100%` differential is that the ailerons only deflect in the "up" direction (sometimes known as "split mode").

Aileron differential is not generally required for high-speed powered model aircraft with symmetrical wing sections. Model gliders usually feature cambered airfoils, and in such cases a good starting point is about `50%` differential. The optimum values can only be established through practical flight testing. The more highly cambered the wing section, the more differential is generally needed. That is why the system allows you to set different levels of aileron differential for each individual flight phase.

Example:
Glider with the following flight phases:
NORMAL: `Ail.Diff. = 50%`
THERMAL*:   `Ail.Diff. = 65%`
SPEED**:   `Ail.Diff. = 40%`

* The ailerons (and in some cases the camber-changing flaps) are lowered slightly for the Thermal task:
=> Airfoil camber increased
=> Greater aileron differential required

** The ailerons (and in some cases the camber-changing flaps) are raised slightly for the Speed task:
=> Airfoil camber reduced
=> Less aileron differential required.

Parameter `Mode`**:**
The `Mode` parameter is used to activate or disable the Aileron Differential mixer (switch it ON or OFF).

If both ailerons are raised in order to act as a landing aid, then `+SPOILER` should be selected as the Mode. This suppresses aileron differential when the landing aid (transmitter control: `Spoiler`) is extended. The effect of this arrangement is that more aileron response is available on the landing approach, since the aileron travels are not reduced:

```
ΣAil.Diff..NORMAL
⌂Exit


Mode        ON
Diff.    ⌷  50%
```

```
ΣAil.Diff..NORMAL
⌂Exit


Mode       +SPOILER
Diff.    ⌷  50%
```
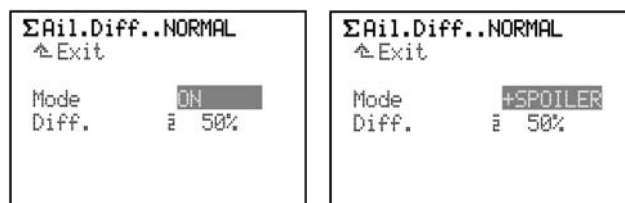
Parameter `Diff.`**:**
This is the point where the differential value itself is set. If the differential works the wrong way round (aileron up-travel reduced, instead of down-travel), simply reverse the value using the **REV/CLR** button.

Aileron differential can be set separately for each flight phase. To set the values, activate the appropriate flight phase using the flight phase switch "`Phases 1-3`" (the active flight phase is displayed in the top line, and also by the number before the parameter) and set the desired value for `Diff.`:

```
ΣAil.Diff..NORMAL
⌂Exit


Mode       +SPOILER
Diff.    ⌷  65%
```
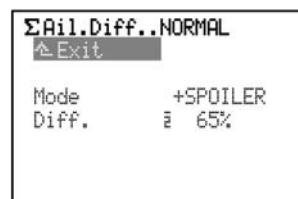
16.1.3. `Controls Mix` (transmitter control mixer)
❷ **These mixers are not global, but model specific, i.e. they can be set separately for each model.**
The transmitter `Controls Mix` mixes the signal from any second control (`Source`) into any other transmitter control (`Target`). The mixing affects all servos which are connected to the `Target` control either directly or via a free mixer:

```
ΣControls Mix.NORMAL
⌂Exit

Travel    ⌷ OFF

Source    ----------
Target    ----------
Switch    ON      *
```
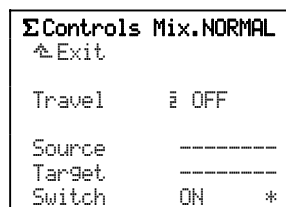
Symmetrical mixer.

Adjustment range:
    -100%   OFF   100%
Increment: 1%

❷ **Variable for each flight phase separately!**

The mixer can be switched on and off using a mixer switch (`Mix-1` to `Mix-3`).

The options are as described for the free mixers under (➔ 14.2.3.):

ON, Mx1, Mx2, Mx3, `OFF`, Mx1N, Mx2N, Mx3N.
The assigned switch and the switch status are displayed in the list Assignment, Switches.

16.1.4. Setting up free mixers

For fixed-wing model aircraft!

"Free mixers" are all those mixers which are defined in the menu Setup, Mixer def. (➔ 14.2.). The mixers (maximum fourteen) defined at that point are set up in the Menu Σ Mixer according to the requirements of the particular model.

🕭 Notes:

The mixers defined in the menu Setup, Mixer def. can only be used in fixed-wing model aircraft, i.e. not in model helicopters.

In the interests of clarity, the menu Σ Mixer only lists those mixers which are used in the currently selected model, i.e. which have been assigned in the menu Servo, Assignment (➔ 17.2.):

```
ΣMixer
  ⏏Exit
  Combi-Sw.      ....
  Ail.Diff.      ....
  Controls Mix   ....
  V-TAIL+         ....
  AILERON+        ....
```

The mixers Combi-Sw., Ail.Diff. and Controls Mix are always included in the list.

The next section explains the method of setting up a "free mixer" using the example of the mixer AILERON+, which is pre-defined as standard, and is used in several model templates:

Mode of working of the input   *"Dynamic" heading of the marked input*

```
Σ5x Mixer.AILERON+
 ⏏Exit
 ⇕        trv↑  trv↓
 Aileron ‾ ----- 100% *
 Spoiler ‾  OFF  -65% *
 Flap    ‾  OFF   18% *
 Ele ‾Tr ‾  15%  OFFG*
```

Mixer inputs   *Values*   *Mixer switch status*
Allocation indicator
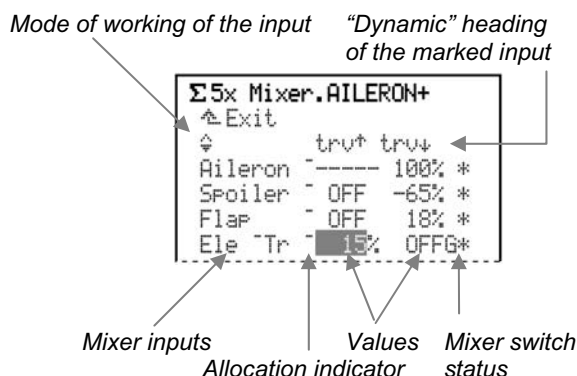
This example shows the method of setting the mixer AILERON+ (➔ the various aileron travels), as they might be set up for a model glider with a four-flap wing.

What does the menu show?
The **third line** of this menu is a "dynamic" heading for the parameter(s) of the marked mixer input. The information actually displayed at this point varies according to the selected mixer input:

- On the left the screen shows the symbol for the method of working of the mixer input (➔ 14.2.2.).
- The percentages indicate the significance of the values. The possibilities are as follows:

-----	No setting
trv↑	Travel setting for asymmetrical inputs
trv↓	Travel setting for asymmetrical inputs
trv	Travel setting for symmetrical inputs
offs	Offset
dead.	Deadband
pt1	Curve point for control centre position
pt2	Curve point for control end-points.

The **bottom five lines** display the following data:
- The transmitter control which generates the mixer input
- % values of the mixer inputs:
  Range: -100% OFF 100%
- Status of the mixer inputs:
*	Mixer input active
‾	Mixer input **not** active.

  In the case of switched inputs:
G*	Switch G, input switched on
G‾	Switch G, input switched off.

The **Allocation indicator** shows that the % values of the mixer input can be allocated to one of the 3-D digi-adjusters and - once unlocked - altered in flight (➔ 20.1.).

The defintions of the pre-defined mixers can be found in the Section (➔ 22.2.).

16.2. Menu: Mixer ⛵ Helicopters

Mixers which are always present:
The mixer `Comp. Mixer` (compensation mixer) is always available for model helicopters (➔ 16.2.1.).

Mixers which vary according to servo assignment:
`Gyro` and `TAIL` are always present in models based on the `HELImech` or `HELIccpm` templates, as the `TAIL` servo and `Gyro` servo (for gyro gain control) are included in the templates. However, if you remove the `Gyro` and / or `TAIL` servos from the servo assignment, the associated mixers also disappear from the menu.

The `Rotor head` mixer appears if you have selected `HELIccpm` as template, or if the `HEAD f/b` (front / back) servos have been assigned to the mixer:

```
Σ Mixer
  ⌂ Exit
  Comp. Mixer    ....
  Gyro           ....
  TAIL           ....
  Rotor head     ....
```

16.2.1. `Comp. Mixer` (compensation mixer)
This menu contains three transmitter control mixers.

In each case the **Source** is Roll, Pitch or Yaw (`Aileron`, `Elevator`, `Rudder`).

As **Target** (destination) you can select from Roll, Pitch, Yaw (`Aileron`, `Elevator`, `Rudder`), `Throttle` and Collective pitch (`Collect.`):

```
Σ Comp. Mixer.HOVER
  ⌂ Exit
  Aileron ⇕ ----> Throttle
   Travel      ⫶ OFF
  Elevator⇕ ----> Throttle
   Travel      ⫶ OFF
  Rudder  ⇕ ----> Throttle
 ▾ Travel+     ⫶ OFF
 ·································
   Travel-     ⫶ OFF
```

Adjustment range for all travels:
  –100%   OFF   100%

🕀 **Flight phase specific**

Important: Roll and Pitch (`Aileron` and `Elevator`) work symmetrically, and are based on a V-curve!

The mixer always works in the same direction, regardless of the direction of movement of the roll or pitch stick.

Typical application: the mixer is always required to compensate for increased energy requirement by applying more throttle, regardless of whether the roll command is to right or left.

16.2.2. `Gyro` (Gyro mixer)

The gyro mixer included in the ***ROYALpro*** can be used for both fixed-wing model aircraft and helicopters, provided that the gyro features an input for gain adjustment from the transmitter.

The gyro mixer of the ***ROYALpro*** provides a means of setting the optimum stabilisation level of any model axis under all flying conditions, using either simple gyros or modern Heading gyros. The gyro mixer of the ***ROYALpro*** can be set to suit the two gyro types `Damping` and `Heading`:
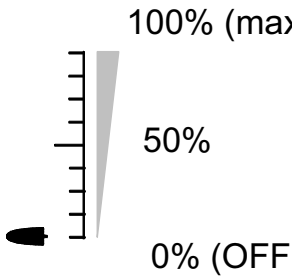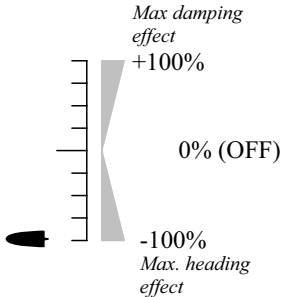
```
Σ Gyro.HOVER
  ⌂ Exit
  Type of Gyro Damping
  Control    ⫶ E
  Suppression  OFF
```
```
Σ Gyro.HOVER
  ⌂ Exit
  Type of Gyro Heading
  Control    ⫶ E
  Suppression  OFF
```

In the case of model helicopters it is assumed that the vertical axis (yaw / tail rotor) is stabilised using a gyro system.

The following table lists the characteristics of the two gyro systems in common use today:

Damping gyro (normal gyro)	Heading gyro (heading-lock gyro)
The gyro brakes the rotational movement of the model around the axis to which the stabilisation is applied.	The gyro brakes the rotational movement of the model around the axis to which the stabilisation is applied, and also returns the model to its initial heading. The prefix to the gain setting determines whether the gyro works in "damping" mode or "heading-lock" mode.
Gain setting range 0% ... 100%:	Gain setting range -100% ... +100%:

What does the menu show?

```
┌─────────────────────────────┐
  Type of Gyro Damping
  Control       ≋ E
  Suppression   OFF
└─────────────────────────────┘
```

a. Type of Gyro
   Heading or Damping can be selected.

b. 2nd line gain = 0%
   If Control appears in this line, the gain is set to
   0%. In this case you will see on the right of the
   screen the code letter for the transmitter control
   which you have assigned to the Gyro function in
   the sub-menu Setup, Assignment, Controls
   (e.g. Slider E).

c. 2nd line gain ≠ 0%
   - for **Damping gyro** this means:
     Adjustment range +1% to +100%
   - for **Heading gyro** this means:
     Adjustment range −100% to +100%
     Heading indicator from −100% to −1%
     Damping indicator from +1% to +100%.

d. Suppression
   Gyro gain can be reduced automatically when con-
   trol commands are applied. In the case of model
   helicopters this occurs when the **Yaw** stick is
   moved, for fixed-wing model aircraft when the **Ai-
   leron** stick is operated.

   Adjustment range OFF to 200%
   At the 200% setting, gyro effect is reduced to
   0% when the stick is only at half of full travel.

Note:

Many gyro systems feature their own suppression
function. In this case the transmitter's gyro suppression
function should generally be disabled (Suppression
OFF). Please refer to the appropriate notes in the
operating instructions supplied with your gyro system.

❽ Caution!

Before operating the model helicopter for the first
time, do ensure that the gyro is working correctly,
and is set up to counteract any unwanted yawing
movement. If the gyro is set up incorrectly, it will
amplify the unwanted movement, and the model
will be rendered uncontrollable.

16.2.3. TAIL (tail rotor mixer)

The **ROYAL*pro***'s TAIL mixer conceals the function
"static tail rotor compensation", which is also some-
times known as REVO-MIX (revolution mixer). The
TAIL mixer always appears automatically in the main
menu Mixer when you set up a model based on the
model templates HELImech or HELIccpm.

When a helicopter makes the transition from the hover
into a climb or descent, the torque which the tail rotor
has to compensate becomes larger or smaller, with
the result that the helicopter yaws in one direction.
Once set up correctly, the TAIL mixer compensates
for these torque fluctuations, and prevents the model
yawing. It also eases the task of the gyro system, so
that you can set higher gyro gain and thereby obtain
very good tail rotor stabilisation. Four parameters are
required for this.

Coll.(pitch)+, Coll.(pitch)−, Offset, Zero point.

```
┌─────────────────────────────┐
 Σ TAIL.HOVER
 ⌂ Exit
   Coll.+      ≋ OFF
   Coll.−      ≋ OFF
   Rudd.Diff.  ≋ OFF
   Offset      ≋ OFF
   Zero point    0%
   Collect.      0%
└─────────────────────────────┘
```

Notes:

It is important to complete all the rotor head settings
(including collective pitch curve) before you set up the
mixer TAIL. The throttle curve must also be adjusted
carefully before you attempt to carry out fine-tuning
with the model in the air. If you subsequently change
the throttle curve, you will normally have to correct the
settings in the TAIL mixer.

If you are using a heading-lock gyro in heading mode,
the TAIL mixer must not be used, and should be
switched off permanently.

Preparation:
- You must assign TAIL in the menu ⊟Servo.Assign,
  otherwise the mixer TAIL will not appear in the
  menu ΣMixer.

- A two-point calibration is sufficient when setting up
  TAIL. Important: take care that the servo is not
  stalled (mechanically obstructed) at its end-points
  (P1, P5).

a. Basic Offset value

To compensate for the torque at 0° collective pitch
(main rotor), a small tail rotor pitch angle (= Offset)
is required; the value can be set separately in each
flight phase. This will be necessary if you set different
system rotational speeds in the various flight phases.

In the flight phase AUTOROT (Auto-rotation) the Off-
set can be changed so that no tail rotor pitch is pre-
sent at all. This is particularly important if your model
helicopter features a driven tail rotor.

b. Collective pitch to tail (Revo-Mix)

The Collective pitch → tail rotor mixers are set using
the parameters Coll.+ / Coll.−, separately for climb
and descent, and for each flight phase:

   Coll.+   → correction for climb
   Coll.−   → correction for descent

The exact values can only be established through a
programme of flight testing, as they vary according to
many parameters.

c. Mixer Zero point

The Zero point is where you set the starting point for
the static tail rotor compensation mixer. The collective
pitch → tail rotor mixer takes effect from this collective
pitch angle in the direction of "climb", using the value
set under Coll.+. In the other direction (descent) the
value set under Coll.− takes effect.

Procedure:

Move the collective pitch stick to the position equating
to 0° collective (use a rotor blade gauge if available).
Note: you should first set up the collective pitch curve
completely.

The Collective pitch value (`Collect.` / last line) cannot be changed, as it simply shows the current position of the collective pitch stick, and serves as an aid when setting-up. This value is set in the `Zero point` parameter.

d. Differential yaw (rudder) travel

The purpose of the Yaw (rudder) differential parameter (`Rudd.Diff.`) is to reduce the tail rotor travel in one direction. This is necessary if the model behaves differently when yawing (yaw commands) to left and right (angular velocity). Since the tail rotor has to counteract the torque generated by the main rotor, "Yaw" is usually weaker when the model is required to turn against the direction of the main rotor.

A separate value can be set for each flight phase.

16.2.4. `Rotor head` (swashplate mixer)

The *ROYAL**pro*** features a universal swashplate mixer (CCPM) which can be used to control all types of swashplate fitted with three or four linkage points / servos.

Three parameters are required to set up the mixer. `Geometry`, `Rotation`, `Lever +/-`:
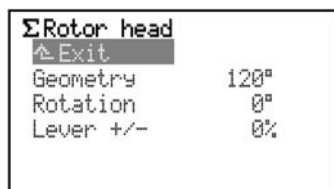
Note:

The main menu `Mixer` is a dynamic menu, i.e. it only displays those mixers which are used for the current model. The mixer `Rotor head` only appears if you have selected the model template `HELIccpm`.

To ensure that the swashplate moves in the required manner, the swashplate servos must be connected to the receiver in the correct sequence. The channel assignment varies according to the selected servo configuration and can be viewed at any time in the menu `Servo`, `Assignment` (➔ 17.2.):

Servo	Note
HEAD f/b	Front or back swashplate servo
HEAD le	Left swashplate servo (as seen from the tail)
HEAD ri	Right swashplate servo (as seen from the tail)
HEAD 4	Fourth swashplate servo

Parameter: `Geometry`

Adjustment range:	90° ... 150° / -90° ... -150° Default 120°

The parameter `Geometry` describes the angle between the swashplate servo `HEAD f/b` and the two symmetrically positioned servos `HEAD le` and `HEAD ri`.

Note:
The angle must be entered with a **negative** prefix " – " if the servo `HEAD f/b` is at the **front** when seen from the tail, looking forward (Example 2).

Example 1: 3-point 120° swashplate

Geometry	+120°
Rotation	+0°
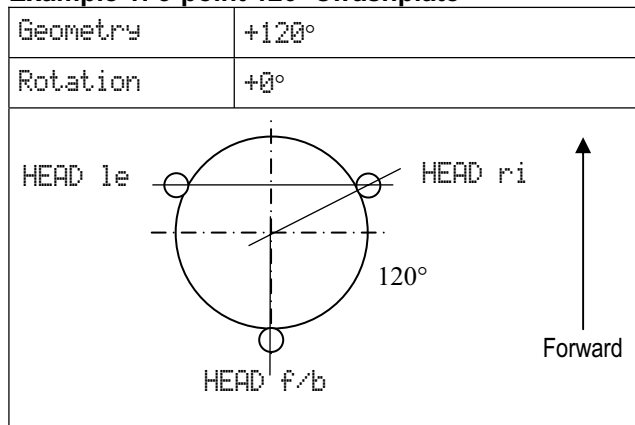
Example 2: 4-point 90° swashplate

Geometry	-90°
Rotation	+0°
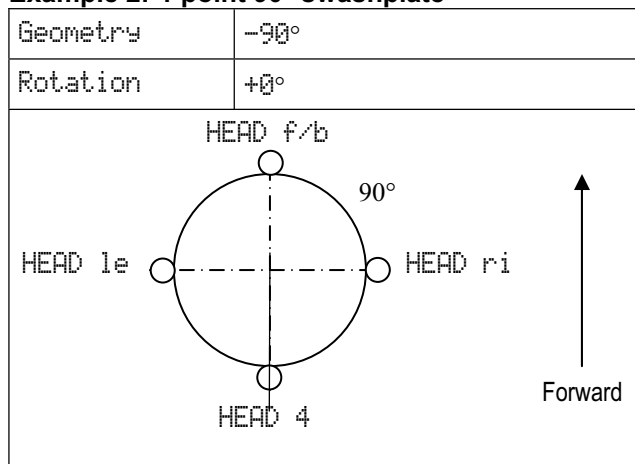
Parameter: `Rotation`

Adjustment range:	Range -100° ... 0° ... 100° Default 0°

The `Rotation` parameter (also known as virtual swashplate rotation) must be used if:

a. the swashplate is positioned physically in the model in such a way that the servo `HEAD f/b` is not located on the centreline,

b. the model (typically) tends to roll when a pitch-axis (elevator) command is given.

Virtual rotation required in the clockwise* direction
→ negative values for `Rotation`

Virtual rotation required in the anti-clockwise* direction
→ positive values for `Rotation`

*Swashplate viewed from above
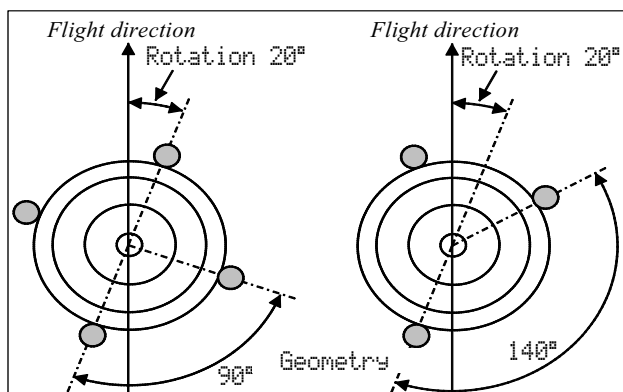
Parameter: Lever +/-

Adjustment range:	Range −100° ... 0° ... 100° Default 0°

The parameter Lever +/- is only required for three-point swashplate linkages whose linkage points are not equi-distant from the rotor shaft centreline, usually for mechanical reasons.

The difference is set as a percentage of the radial dimension (rotor shaft centre ➔ linkage point) of the servo HEAD f/b to the two side-mounted servos HEAD le and HEAD ri. The lateral levers are set to 100%.

Example:
Distance HEAD f/b: 40 mm
Distance HEAD ri / le: 50 mm (= 100%)

In our example the lever for the fore-and-aft linkage (HEAD f/b) is 20% shorter than the levers for the two side-mounted linkages.

➔ The correct setting is: Lever +/-   −20%.
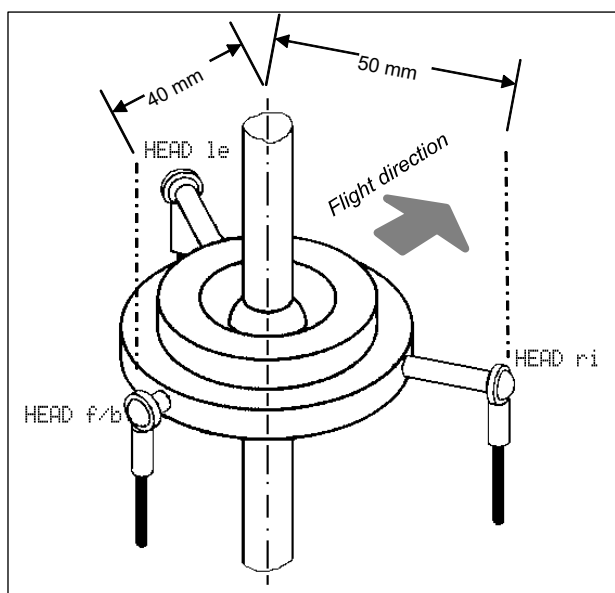
⌨ Tip:
Once you have entered the mechanical values of the swashplate as Parameters for the Rotor head mixer, the next step should be to carry out a careful and thorough calibration of the Head servos; this is carried out in the menu ⌂Servo.Calibrate (➔ 17.1.). This step is essential if accurate swashplate control is required. The direction of servo rotation can be checked by giving collective pitch commands from the transmitter: if any servo rotates in the wrong direction, you will need to reverse it (REV). It can be useful to disconnect the pushrods between the swashplate and the rotor head for the servo calibration process, as this makes it easier to calibrate the maximum travels (P1, P5).

The settings for roll, pitch and collective pitch travels are entered in the menu ⊥Control (➔ 15.2.).

⌨ Tip: Helicopters with Heim mechanics
If you wish to fly a helicopter fitted with the HEIM mechanical system, please follow this procedure:

1. Select HELIccpm as template for the new model.

2. Assign Elevator (pitch) to an unused servo channel.

3. Set Geometry to 90° in the mixer Rotor head.. This means that the servos HEAD le and HEAD ri are controlled only by the transmitter controls for Aileron and Elevator (roll and pitch).

4. The servo Head f/b is not required; this channel is left unused at the receiver.

17. Main menu Servo 🛱

The main menu Servo is opened by pressing this button:

```
🛱 Servo
 ⌃ Exit
 Calibrate    ....➜17.1.
 Assignment   ....➜17.2.
 Monitor      ....➜17.3.
 Test run     ....➜17.4.
```
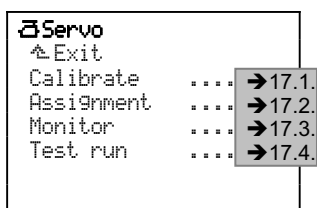
The settings in the menus Calibrate and Assignment are model-specific, i.e. they only apply to the current model.

The menu Monitor shows the information which is passed on to the servos in graphic or numerical form.

17.1. Menu Calibrate

In the Calibrate menu you can adjust the travels, centre and (if required) intermediate points for all servos in such a way that they move evenly and run to the end-points required for your model.

```
🛱 Servo.Calibrate          🛱 Servo.Calibrate
 ⌃ Exit                      ⌃ Exit
 1 AILERON+   ....           1 HEAD f/b   ....
 2 ELEVATR+   ....           2 HEAD le    ....
 3 Rudder     ....           3 TAIL       ....
 4 Throttle   ....           4 HEAD ri    ....
 5 AILERON+   ....           5 Throttle   ....
 ⌄6 Spoiler   ....           ⌄6 Gyro      ....
```
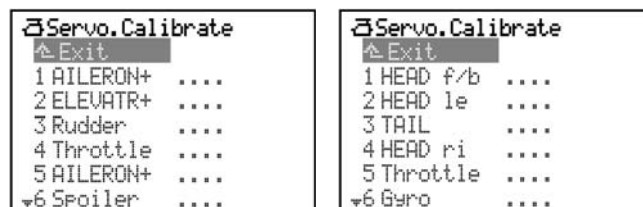
Servo list, fixed-wing model   *Servo list, helicopter*

When you open the menu Calibrate, the screen shows a list of all the servos which can be used with your transmitter type (7, 9 of 12 servos). You can also use the 3-D digi-adjuster to select servos 7 to 12, which are not immediately visible when you open the Calibrate menu.

17.1.1. Sub-menus for individual servos

Rotate the 3-D digi-adjuster to select the servo to be calibrated, then press the 3-D digi-adjuster to open the Calibration sub-menu.

The sub-menus show the settings for REV/TRM and the two to five curve points P1 to P5:

```
🛱 Calibr.AILERON+          🛱 Calibr.HEAD f/b
 ⌃ Exit        SERVO:1       ⌃ Exit        SERVO:1
 REV/TRM    0                REV/TRM    0
 P1      -100%               P1      100%
 P2       ---                P2       ---
 P3        0%                P3        0%
 P4       ---                P4       ---
 P5      100% 1 2 3 4 5      P5     -100% 1 2 3 4 5
```
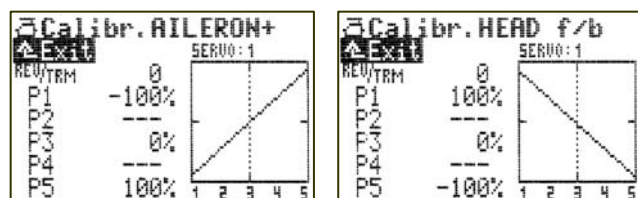
Example: Fixed-wing model Aileron servo   *Example: Helicopter Rotor HEAD f/b servo*

All changes to the parameters REV/TRM and the servo calibration points P1 … P5 are immediately reflected in the diagram, making it quick and easy to check the overall settings.

Line 1 always shows the name of the servo. Above the diagram you will see the channel number (receiver output) for the selected servo.

The numbers 1 … 5 below the diagram (X-axis) correspond to the servo calibration points P1 ... P5.

Parameter REV/TRM:
The first parameter REV/TRM has two functions:

a. Servo reverse (REV) alters the direction of rotation of the servo.

   To reverse the servo simply select the parameter value and press the **REV/CLR** button:
   ⇒ the curve is "reversed"
   ⇒ the prefix changes
       (only if the value for REV/TRM is **not** 0%).

b. Servo trim (TRM) shifts all points on the servo curve in parallel.

   Servo trim is used in order to compensate for discrepancies from the correct neutral point of any one control surface. This may occur, for example, if you are using servos which do not feature adequate temperature compensation, and are therefore subject to fluctuating neutral points.

   The set trim value acts as an offset on all calibration points P1 to P5, and produces a parallel shift of the curve, although the shape of the curve remains unchanged. The effect is the same as the standard trim procedure.

❶ Note:
Use TRM only for temporary corrections!
The servo trim TRM should only be used to correct trim deviations which occur when you are operating the model, and not when setting up a new model. In the latter case it is always better to adjust the mechanical servo linkage.

Parameter P1 … P5:
You can solve many problems by making adjustments to the servo calibration points (Parameter P1 … P5). In detail these are:

- Establishing the maximum working range of the servo:
  The values (servo travels) set at this point are never exceeded (Protection from mechanical servo stalling, Limit).

- Setting symmetrical control surface travels.

- Matching the travels of multiple servos to each other:
  This prevents individual servos placing other servos under stress when two (or more) servos are connected to the same control surface.

- Compensating for mechanical differences in the control surface linkage:
  For example, if the individual control surfaces of a multi-flap wing do not move exactly synchronously, you can correct this by adjusting the intermediate points P2 and P4.

Careful and accurate calibration is particularly important with servos to which a mixer has been assigned.

❶ Note:
First adjust the mechanical linkage as accurately as possible, and only then fine-tune the system using the Calibrate menu.

Servo calibration should only be used for fine-tuning. Careful and thorough mechanical adjustment is strongly recommended. Never reduce the maximum servo travels (P1 and P5) by more than about 10 - 20%, otherwise you will forfeit servo resolution, and any play in the servo gearbox will be amplified unnecessarily.

17.1.2. The procedure for calibrating a servo

a. Servos controlled by basic functions

(e.g. Aileron, Elevator, Rudder, L. gear, ...): First check that the servo rotates in the correct direction ("sense") relative to the control movement. If necessary, change the direction in the Parameter REV/TRM. If you later reverse the servo, you will need to re-calibrate it.

b. Servos controlled by mixers

(e.g. AILERON+, DELTA+, V-TAIL+, ...): In the case of servos to which a mixer has been assigned, the direction of servo rotation is initially irrelevant, as the correct direction for the control surface deflection can be set within the mixer itself.

c. Select a calibration point (P1 to P5) and activate the value (percentage figure highlighted). Now press the digi-adjuster allocation button ⟨☉⟩.

The servo (or servos, if multiple servos are controlled by the same function or mixer) automatically takes up the position corresponding to the percentage figure at the selected calibration point. With one hand you can now easily and conveniently measure and check the control surface deflection (ruler, calliper), while the other hand remains free to change the value using the UP / DOWN buttons ▲ / ▼ or one of the two 3-D digi-adjusters.

d. When the deflection is correct, press the digi-adjuster allocation button ⟨☉⟩ again, and the servo (or servos) takes up the position corresponding to the position of the associated transmitter control.

The number of servo calibration points (min. 2, max. 5 points) varies according to the selected setting when you initially assigned the servos (➔ 17.2.).

☝ Tip: Vertical line for orientation!

The vertical dotted line shows the current position of the associated transmitter control, and is an aid to orientation. If you activate a value using the digi-adjuster allocation button ⟨☉⟩, the vertical line jumps to the corresponding point and remains there until you press the allocation button again, or move the associated transmitter control.

17.2. Menu Assignment

Like the MULTIPLEX radio control series PROFImc 3000 and 4000, the **ROYAL*pro*** offers the facility to define the receiver output sequence without restriction. Compared with radio control systems with a fixed receiver output sequence, this feature offers the advantage that, for example, the signal for a second aileron servo (generally present at the higher channels, e.g. channel 5) can be transferred to any channel you like, and this can make it possible to use a small four-channel receiver.

| | Column 1: Servo No. | Column 2: Control or mixer | Column 3: Servo signal format | Column 4: Number of calibration points |

More information in the table relating to the menu Servo, Assignment (➔ next page).

Free assignment: defaults in the model templates for MULTIPLEX or the standards of other makes.

All 7, 9 or 12 possible servos (according to the transmitter type) are included in the list.

Up to five mixers can be assigned to each model, each of them more than once.

How to carry out the assignment process:

a. Select the servo,
   then press the 3-D digi-adjuster.

b. Select the function (transmitter control or mixer),
   then press the 3-D digi-adjuster.

c. Select the signal format (only if required),
   then press the 3-D digi-adjuster.

d. Select the number of calibration points,
   then press the 3-D digi-adjuster.

   The input cursor jumps back to the servo number.

   This completes the assignment process for one receiver output.

How to erase an assignment:

a. Select the servo,
   then press the 3-D digi-adjuster.

b. Press the button **REV/CLR**,
   then press the 3-D digi-adjuster.

   You will now see a string of hyphens in the menu instead of the original assignment:

Example: Assignment for servo 4 has been erased

Menu `Servo.Assign`:

```
⌂Servo.Assign
 Exit
 1 Aileron   UNI   3P
 2 ELEVATR+  UNI   3P
 3 Rudder    UNI   3P
 4 Throttle  UNI   3P
 5 Aileron   UNI   3P
▼6 Spoiler   UNI   3P
```

Column   *1*   *2*   *3*   *4*

Table for the menu `Servo.Assign`:

Column 1	**Servo number / receiver output**
	ROYALpro 7 ⇒ maximum 7 servos
	ROYALpro 9 ⇒ maximum 9 servos
	ROYALpro 12 ⇒ maximum 12 servos
	The corresponding transmission mode (PPM 6 / 7 / 8 / 9 / 10 or PPM 12) is set automatically.
	If M-PCM modulation is used, the information for twelve servos is always transmitted.
Column 2	**Signal source for servo/receiver output**
	At this point you select the transmitter control or mixer whose signal is to be fed to the servo.
	"––––––––" means that the receiver output is not in use. In this case a neutral signal is present at the output.
Column 3	**Servo signal format**
	You already selected the signal format (MPX / UNI) when you set up a new model (➜ 12.2.4.).
	If some of the servos / speed controllers / gyros connected to the receiver do not use the same signal format, at this point you can change it for each receiver output separately (not in M-PCM or 12-channel PPM mode).
Column 4	**Servo calibration points**
	Here you can determine how many calibration points are to be available in the menu `Servo.Calibrate` (➜ 17.1.):
	2P 2 points (e.g. for `Throttle`, `Tow rel.`)
	3P 3 points (e.g. for `Elevator`, `Rudder`)
	5P 5 points (if you need to correct or generate non-linear servo travel).

17.2.1. *ROYALpro 12 only*: Special features relating to servo 11 and / or servo 12 (PPM modulation)

The *ROYALpro 12* automatically switches the output signal to 12-channel MPX format as soon as you assign a function to servos 11 and / or 12 (PPM modulation). This format can be processed by all MULTIPLEX 12-channel receivers.

If you are using an older 12-channel receiver (RX 12 DS), the jumper at servo socket 12 must be removed to ensure that the signal is decoded correctly. All recent 12-channel PPM-receivers (RX-12 DS IPD, RX-12-SYNTH DS IPD) automatically detect the 12-channel format and switch to the correct method of processing.

17.2.2. Non-MULTIPLEX receivers with ten channels

Other makes of ten-channel receiver continue to use the "standard" signal format. If such receivers are to work properly in conjunction with the *ROYALpro 12*, you must not assign functions to the eleventh and twelfth servos.

17.3. Menu `Monitor`

The Servo Monitor acts as a substitute for a receiving system with servos connected to it, and enables you to detect errors and check the function / operation of speed controllers, gyro systems, speed governors, … .

Two types of screen display are available: graphic, with a display of output signals in bar-chart form, and numerical, with all values stated as percentages. You can toggle between the two displays using the UP / DOWN buttons (▲ / ▼); alternatively you can switch between them using one of the two 3-D digi-adjusters:
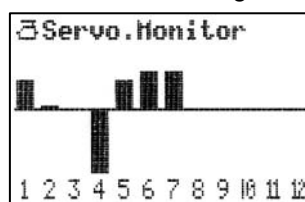
```
⌂Servo.Monitor          ⌂Servo.Monitor

                         1:   46%      2:    5%
                         3:   -1%      4: -100%
                         5:   47%      6:   62%
                         7:   62%      8:    0%
                         9:    0%     10:    0%
 1 2 3 4 5 6 7 8 9 10 11 12   11:    0%     12:    0%
```

Bar graph display   *Numerical display*

17.4. Menu: `Test run`

Automatic servo operation, which can be used for test or demonstration purposes, or as an "electronic" aid when range-checking the system:

```
⌂Servo.Test run          ⌂Servo.Test run
 Exit                     Exit

 Control   Rudder         Control   Rudder
 Time      2.0s           Time      2.0s
```

Servo test with rudder active *Servo test halted*

As soon as you select a transmitter control, the transmitter generates a steady signal which moves the servo from one end-point of the control to the other and back. All servos which are operated by this control - either directly or via a mixer - start running.

You can halt the servo test in either of two ways:
- Press the **REV/CLR** button: `Control` appears
- Select no transmitter control: - - - - - - -

The transit speed can be set to any value within the range `OFF` via `0.1s` to `6.0s` (seconds).

🛇 **Caution: Servo test using the** `Throttle` **control!**
To ensure that no danger or damage occurs as a result of the motor bursting into life, use this procedure:

a. `Set` the transit `Time` to `OFF`.
b. Select the desired transmitter control.
c. Set the transit time to the desired value.

18. Main menu Timer 00:00

The main menu Timer is opened by pressing this button:

00:00

The **ROYALpro** has five timers; four of them are found in the main menu ⏱ Timer:
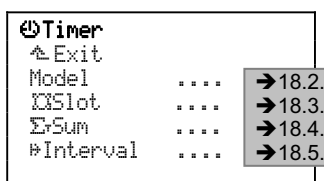
```
⏱Timer
 ⌂Exit
 Model      ....  →18.2.
 ⌑Slot      ....  →18.3.
 Σ Sum      ....  →18.4.
 ▶Interval  ....  →18.5.
```

The fifth timer records the transmitter's operating time, and is only displayed in Status display 4 (➔ 10.6.4.).

18.1. Slot, Sum and Interval timers: display and reset

The timers Slot, Sum and Interval are shown in Status display 3, but only if a switch has been assigned to them:

Counting direction   Assigned switch

```
<⌂-------- 🔒 -------->
⌑ 0:00:18 ⟨P          ← Slot
  --:--:--              ← Sum
  --:--:--              ← Interval
```
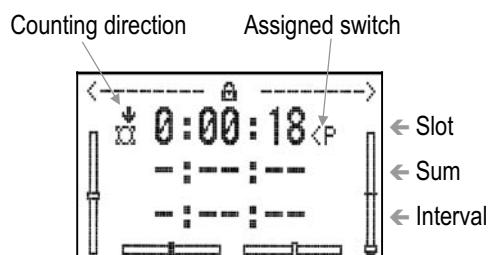
In this example no switches have been assigned to the Sum and Interval timers.

This Status display includes the direction of counting and the assigned switch as well as the current timer status.

How to locate Status display 3:
If one of the other Status displays is already on-screen, you can leaf through all four Status displays using the ▲ or ▼ buttons until you arrive at the Timer summary. If you now call up a menu, repeatedly pressing any main menu button takes you to a Status display. From this point on you can leaf through the other displays.

Resetting the timers:
Press the **REV/CLR** button, and all the timers will be reset to the set alarm time.

How the timers behave when they are reset:
a. Slot timer
   This timer is reset to the set alarm, and always stops when reset. To re-start the timer the assigned switch must first be moved to the OFF position, and then back to the ON position.

b. Sum timer
   This timer is reset to the set alarm time. If the assigned switch is at the ON position, the timer re-starts immediately.

c. Interval timer
   This timer is reset to the set alarm time. If the assigned switch is at the ON position, the timer re-starts immediately.

18.2. Menu ⏱Timer, Model for flight time per season / session

This timer is present for each model memory. It runs constantly when the transmitter is switched on, when the corresponding model is selected, and when **an RF signal is being transmitted** (Status LED flashes). This means that periods of adjustment or programming - when the RF module is switched off - are not counted as part of the model's operating time.

The menu for the Timer Model looks like this:

```
⏱Model
 ⌂Exit

 Time           0h00m
```
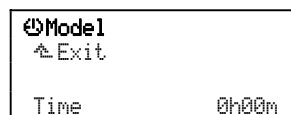
The maximum of 1000 hours enables the timer to record a model's operating time over the whole season, for one day's flying, and also for one individual flight.

18.2.1. Summary Timer Model

Effect	For active model only, RF must be switched on, value is stored when the transmitter is switched off
Range	1000 h 00 m
Erase	**REV/CLR** button in menu Timer, Model, at Time

18.3. Menu ⏱Timer, ⌑Slot

The term "slot" refers to a time window (limited period) which this timer can monitor.

Time slots are used in competitions such as F3B events, when a particular flight task must be completed within a prescribed time (e.g. ten minutes). Slot times also make sense at other types of contest or event in order to control the progress of activities.

The special feature of this timer is that it starts the first time you operate the assigned switch. It **cannot** be stopped again during the remainder of the slot time (alarm).

Slot time elapsed:
If the slot time has elapsed **and** the assigned switch is still in the ON position, the timer continues to count upward, acting like a sum timer.

Slot time (alarm) set to 0:00:00:
If the slot time (alarm) is set to 0:00:00, the Slot timer acts like a Sum timer. If the assigned switch is still at the ON position, the timer continues to count upwards.

18.3.1. Example: monitoring the slot time (time limit)

For our example we assume the following:
  The slot time is ten minutes.
  The time is to start the first time the stick is moved.

Preparing the slot timer:
a. Assigning the switch
  Menu ↘, Assignment, Switches, ⟐Slot:

```
  ⟐Slot        ⊽I⊥ ⇑
  ΣSum         --- -
  ⊳⊳Interval   --- -
```
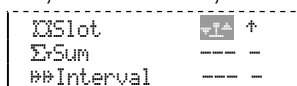
In our example the Slot timer starts when the stick is moved forward (towards full-throttle) for the first time.

b. Setting the Alarm (slot time, time limit)
  Menu ⏱Timer, ⟐Slot, Alarm:

```
⏱ ⟐Slot
 ⬆Exit
                         Line
 Time        0:03:24     1
 Alarm       0:█0:00     2

 Difference ↓0:06:36     3
 Switch      ⊽I⊥  ⇑*     4
```

Once you have selected the Alarm line, you can select the alarm number by pressing the 3-D digi-adjuster, and set the time by turning the adjuster. Now press the 3-D digi-adjuster repeatedly until Alarm is highlighted. This concludes the set-up procedure.

Line 1: Time
This is the period which has elapsed since the timer started (in our example 3 min 24 sec). If you select this field, you can reset the time to the set alarm time by pressing the **REV/CLR** button.

Line 2: Alarm = Slot time
This is where the slot time is displayed and adjusted (in the above example: ten minutes).

Line 3: Difference (display only!)
At this point the time represents the difference between time and alarm; this value also appears in Status display 3. The arrow before the difference in-dicates the direction of running of the timer:

  ⇑   Timer counting up
  ↓   Timer counting down

Line 4: Switch (display only!)
At this point the screen displays the switch which is used to control the timer (⊽I⊥), and the location of the "ON" position (⇑ = forward). If the switch is in the selected ON position, the timer runs, and an asterisk "*" appears after the arrow.

Using buttons H and M for Timer functions:
There are two methods of using the buttons "H" and "M". One of the two modes is activated according to the mode of operation you set in the Switch field at the assignment stage:

1. Change-over (toggle) "⌐":
Press button = timer runs
Press button again = timer stops.

2. Momentary "⊓":
Press button = timer runs
Release button = timer stops.

18.3.2. Summary: Timer 1 ⟐Slot

Effect	For active model only, the current status when the transmitter is switched off is **not** stored. With alarm 0:00:00: Effect as Sum timer, but without stored value when switched off
Start at alarm time ≠ 0:00:00 Note: ≠ means unequal	When the assigned switch (switch / slider / stick) is first operated
Reset	**REV/CLR** button in menu or in Status display 3 (Timer)
Range	Variable alarm: 3:30:00 (3 h 30 min) Time (upwards): 4:30:00
Alarm, only if alarm time ≠ 0:00:00	From 10 sec. before elapse of alarm time One brief beep every second (◀⧏ , …), When the alarm time is reached: one long beep (◀⧏ ▭)

The single beep identifies the timer as Timer 1, Slot

18.4. Menu ⏱Timer, ΣSum

This timer adds (sums) times. The timer runs constantly as long as the assigned switch is in the ON position.

Important: Timer status is stored
The timer status (e.g. residual motor run time) is stored when the model memory is changed or you switch the transmitter off.

18.4.1. Example: recording motor run time
For this example we assume the following:
  The motor is controlled using switch G (throttle switch for an electric motor).
  The full-throttle switch position is forward.

Preparing the Sum timer:
a. Assign the switch (➔ 14.3.2.)
  Menu ↘, Assignment, Switches, ΣSum:

```
  ⟐Slot        ⊽I⊥ ⇑
  ΣSum         G⟩  ⇑
  ⊳⊳Interval   --- -
```
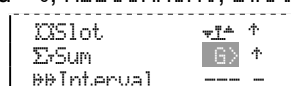
b. In our example the Sum timer continues to run as long as the switch is at full-throttle (forward).

c. Set the Alarm
   Menu ⏱Timer, ΣrSum, Alarm:

```
⏱ΣrSum
⌂Exit

Time         0:03:24
Alarm        0:▮0:00

Difference  ↑0:06:36
Switch       G>  ↑*
```

d. Once you have selected the `Alarm` line, you can select the number of the alarm by pressing the 3-D digi-adjuster, and set it by rotating it. Now press the 3-D digi-adjuster repeatedly until `Alarm` is highlighted again. This concludes the set-up procedure.

The Sum timer can be used in two different modes:

a. Alarm set to 0:00:00
The timer starts at zero, runs upwards, adds the time, and is stopped and re-started using the assigned switch.

The timer can be reset to zero by pressing the **REV/CLR** button in Status display 3, or in this menu. In this case there is no alarm.

b. Alarm not set to = 0:00:00
The timer starts at the set alarm time, counts down, and sounds the alarm when the selected time has elapsed.

18.4.2.   Summary Timer 2 ΣrSum

Effect	For active model only, the current status is stored when the transmitter is switched off or the model memory is changed. With alarm = 0:00:00 counts up, otherwise down
Start	Runs as long as the assigned switch (switch / slider / stick) is at the ON position
Reset	**REV/CLR** button in the menu or in Status display 4 (Timer)
Range	Variable alarm: 3:30:00 (3 h 30 min) Time (upwards): 4:30:00
Alarm, only if alarm time ≠ 0:00:00	From 5 min before elapse of alarm time: one double beep (◀◀≶) per minute. After 10 sec before elapse of alarm time: one double beep (◀◀≶) per second. When the alarm time is reached: Long double beep (◀◀≶ ▭ ▭)

The double beep identifies the timer as Timer 2, Sum

18.5.   Menu ⏱Timer, ▶▶Interval

The purpose of the `Interval` timer is to monitor a preset time once or repeatedly.

Every time you switch the transmitter on, the set interval time (alarm) re-starts.

Once the set interval time has elapsed, an audible alarm sounds; the timer then continues to count up until it is switched off.

18.5.1.   Example:
Monitoring motor run time per climb
For this example we assume the following:
The motor is to run for a maximum of one minute per climb.

Switch G is used to start the interval timer for the motor run time (G simultaneously controls the motor and the motor's total run time).

Preparing the `Interval` timer:
a. Assigning the switch (➔ 14.3.2.)
   Menu ↘, Assignment, Switches, ▶▶Interval:

```
⌧Slot        ┅I⌐  ↑
ΣrSum         G>  ↑
▶▶Interval    G>  ↑
```

b. The `Interval` timer is started and counts down when switch G is at the "forward" position.
c. Setting the alarm (interval time)
   Menu ⏱Timer, ▶▶Interval, Alarm:

```
⏱▶▶Interval
⌂Exit

Time         0:00:00
Alarm        0:0▮:00

Difference  ↓0:00:00
Switch       G>  ↑
```

d. Once you have selected the `Alarm` line, you can select the number of the alarm by pressing the 3-D digi-adjuster, and set the value by rotating it. Now press the 3-D digi-adjuster repeatedly until `Alarm` is highlighted. This completes the set-up procedure.

How the `Interval` timer is used:
As soon as switch G is moved to "full-throttle", the `Interval` timer starts from the set time.

The **last 2 seconds** are indicated by a brief triple-beep (◀◀◀≶).

The **end of the Interval time** is signalled by a long triple beep (◀◀◀≶ ▭ ▭ ▭). Following this, the transmitter emits an audible signal for a period of five seconds. However, the interval timer then continues to run until switch G is returned to the "back" position. In this case the screen displays the time by which you have exceeded the set interval (i.e. landed too late).

18.5.2. Summary Timer 3 ▸▸Interval

Effect	For active model only, the current status is **not** stored when the transmitter is switched off or you change the model memory. With alarm = 0:00:00 behaves as Sum timer, otherwise counts down
Start	Runs as long as the assigned switch (switch / slider / stick) is at the ON position
Reset	**REV/CLR** button in the menu or in Status display 4 (Timer), or when re-started using the associated switch
Range	3:30:00 (3 h 30 min)
Alarm	2 sec before elapse of alarm time: one triple beep (◀◀◀ξ) per second. When the alarm time is reached: long triple-beep (◀◀◀ξ ▭ ▭ ▭), followed for five seconds by: audible signal

The triple beep identifies the timer as Timer 3, Interval

18.6. Total transmitter operating time

The fifth timer records the transmitter's operating time, and is only displayed in Status display 4 (➜ 10.6.4.):

```
┌ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ┐
  ...
  ...
  Operation time   44.8h
└ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ┘
```
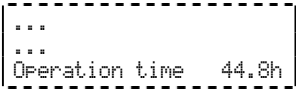
After a total transmitter operating time of 1000 hours the display is automatically reset to 0.0 h.

---

19.   Main menu Memo 🗁

The main menu Memo is started by pressing this button:

🗁
⬭
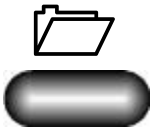
This menu is used for managing model memories. It contains the following functions:

- Setting up a new model (memory)
- Selecting, copying, erasing a model (memory)
- Unlocking and locking flight phases
- Interrogating and modifying the characteristics of the model memory
- Modulation
  Selects one of the two operating modes
  FM/PPM or FM/M-PCM,
  sets FAIL-SAFE in FM/M-PCM transmission mode:

```
🗁Memory
 ⬑Exit
 Select model ....
 Copy         ....
 Erase        ....
 Flight phase ....
 Properties   ....
 ↓New model   ....
 Modulation   ....
```
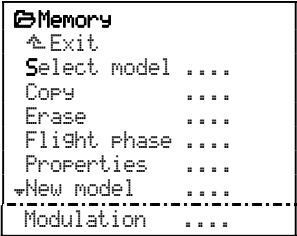
19.1.   Selecting a model memory

In this menu you select the model memory, i.e. the model you wish to work on.

In the main menu Memory choose the Select model point.

A list of all model memories is now displayed:

```
🗁Select model
 ⬑Exit
 1 EasyStar
 2 Twister        x ←   Current model
 3 Gemini     ←        Selected target
 4 ----------  ←
 5 Cularis             Vacant memory
 ↓6 FunJet red
```
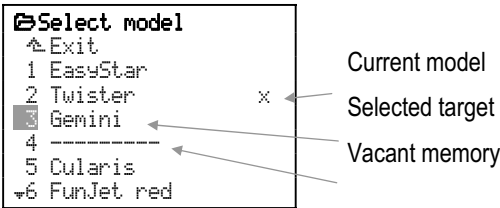
Use the 3-D digi-adjuster to select the model which you wish to fly (or set up).

Press the 3-D digi-adjuster or the **ENTER** button to confirm your selection and execute the memory switch.

Note: Throttle-Check when you change memories
(➜ 14.1.2.)
If you have activated Throttle-Check (Check Thr.) in the menu ⬙Setup, Transmitter:

```
Check Thr.   ON
```

the software checks whether the throttle control is in the Idle position when you switch to a different model memory.

If so, the transmitter switches to the selected model, and one of the four Status displays appears.

If not, you will see the warning message:

```
!  NOTE  !
      THR
   Move to idle
      ▾I▴
throttle release
```
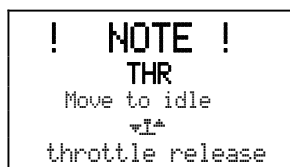
In this case you can either move the throttle control to the Idle position, or skip the warning message by pressing the **REV/CLR** button.

🕱 **Caution!**

If you press a button to "unlock the throttle", even though the throttle control is not at the Idle position, you run the risk of injury or damage should the motor burst into life unexpectedly.

19.2.   Copying a model memory

In the main menu 🖿Memory activate the Copy point.

The first step in this menu is to select the model memory which is to be copied.

The screen now displays a list of all model memories:

```
🖿Copy
  ⌃Exit
 1 EasyStar
 2 Twister          ×
 3 Gemini
 4 ------------
 5 Cularis           c
▾6 FunJet red
```
⟵ Current model
⟵ This model has been selected for copying

Selecting the source (the model to be copied):
Use the 3-D digi-adjuster or the ▲ / ▼ buttons to select the model which you wish to copy. This can also be the currently active model (marked with ×).

Confirm your selection by pressing the 3-D digi-adjuster or the **ENTER** button. The model's name is now highlighted on the screen, and a "c" appears at the end of the line for "copy".

Selecting the target memory:
Use the 3-D digi-adjuster or the ▲ / ▼ buttons to shift the selected model to the target memory. The highlighted model name and the "c" also move.

Press the **ENTER** button or the 3-D digi-adjuster to confirm the copy process.

a. Target memory vacant
The model data is copied into the selected target model memory, and the model name is also adopted.

b. Target memory occupied by a model
To ensure that you do not accidentally overwrite an existing model, this situation generates a request to confirm the overwrite process:

```
Copy over existing
      model?
Yes->REV/CLR
No->ENTER
```
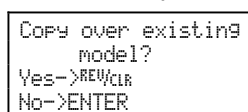
If you now press the **REV/CLR** button, the existing model data is overwritten by the copy of the selected source memory. Pressing **ENTER** interrupts the copy process.

19.3.   Erasing model memories

Move to the main menu 🖿Memory and activate the point Erase.

In this menu the first step is to select the model memory which is to be erased.

A list of all model memories is now displayed:

```
🖿Erase
  ⌃Exit
 1 EasyStar
 2 Twister          ×
 3 Gemini
 4 ------------
 5 Cularis
▾6 FunJet red
```
⟵ Current model memory
Model memory selected for erasure
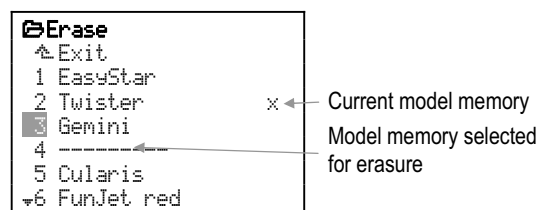
Use the 3-D digi-adjuster or the ▲ / ▼ buttons to select the model which you wish to erase.

Note: you cannot erase the current model
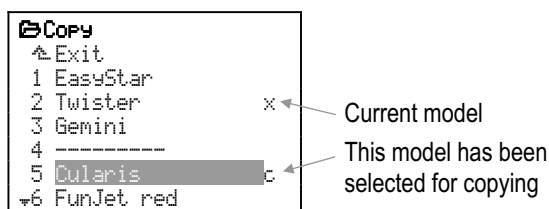The current model (marked with ×) cannot be erased. If you wish to erase the current model, you must first select any other model (➔ 19.1.).

Now press the 3-D digi-adjuster or the **ENTER** button in order to initiate the erasure process.

The screen now displays a request to confirm the erasure; this is intended to prevent you accidentally erasing a model:

```
Erase selected
     model?
Yes->REV/CLR
No->ENTER
```
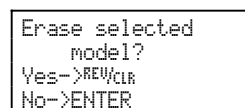
Pressing the **REV/CLR** button erases the model, whereas pressing **ENTER** interrupts the process, leaving the model data in the memory unchanged.

19.4.   Managing Flight phases

Flight phases are simply settings / data sets for a model which can be called up by operating a switch. The data sets are optimised for particular flight tasks.

Flight phases enable you to adjust the transmitter control settings to suit the requirements of the task in hand, e.g. reduced control travels for SPEED flying, lowered flaps for LANDING, different collective pitch and throttle curves for model helicopters, etc.; all this can be carried out separately for each flight phase. All the settings which may be changed between flight phases are marked with the flight phase code number 1 … 4 in the transmitter control menus (➔ 14.). The *ROYALpro* also features digital trims which are flight phase specific, i.e. the trims can be set differently and stored for each flight phase. This simply means that it is possible to trim the model perfectly for each flight phase.

The *ROYALpro* allows you to set up four flight phases. However, by default the assignment lists contain no assigned flight phase select switches.

It is possible to set up a "soft" transition (1, 2 or 4sec (seconds)) when switching from one flight phase to another; this avoids abrupt changes in servo position when you select the next phase.

If you set the Time parameter to `OFF`, the change-over occurs immediately.

Note:
The helicopter flight phase "Auto-rotation" is the exception to this rule. When you operate the `AUTOROT` switch, the software immediately switches to the `AUTOROT` flight phase.

The `Flight Phase` menu may look like this for a fixed-wing model (Fig. 19.4.1.) or a helicopter (Fig. 19.4.2):

```
┌─Flight Phase          ┌─Flight Phase
 ↑ Exit                  ↑ Exit
 1 SPEED        J>        1 HOVER        J>
 2 NORMAL    x  J>        2 CRUISE    x  J>
 3 THERMAL1     J>        3 3D           J>
 4 START1       ---       4 AUTOROT      ---

   Time        2sec         Time        OFF
```

Fig. 19.4.1.:
Flight phases, fixed-w.

Fig: 19.4.2.:
Flight phases, helicopter

Fig. 19.4.1. shows the following information:
a. The first column shows the number of the flight phase, followed by its name.
b. Flight phases 1 and 3 and 4 are locked (names crossed-through).
c. Flight phase 2 `NORMAL` is active (x after the name).
d. The flight phase switch is `J>` on the right-hand side.
e. `Time` shows the flight phase transition time.

The same applies to the four helicopter flight phases which are shown in Fig. 19.4.2.

19.4.1. Selecting flight phase names
You can assign to each flight phase any of the thirteen names included in the list below:

`NORMAL, START1, START2, THERMAL1, THERMAL2, SPEED1, SPEED2, CRUISE, LANDING, AUTOROT, HOVER, 3D, ACRO`

The sole purpose of the flight phase name is to provide additional information. In terms of the properties of the phase it is the number of the phase which is crucial, ie. flight phases of the same name do not necessarily have the same settings or properties.

Changing a flight phase name:
Use the ▲ / ▼ buttons (or alternatively one of the two 3-D digi-adjusters) to select a flight phase, and confirm your choice by pressing the **ENTER** button or one of the 3-D digi-adjusters.

The cursor jumps to the name input field.

You can now select a suitable name using the ▲ / ▼ buttons or one of the two 3-D digi-adjusters.

Pressing the **ENTER** button or pressing one of the 3-D digi-adjusters once concludes the input process.

Note: changing the name of the active flight phase
When you have selected the active flight phase (marked with the letter "x"), you must press the 3-D digi-adjuster or **ENTER** twice in order to conclude the procedure.

19.4.2. Locking / unlocking flight phases
The flight phases are unlocked or locked using the **REV/CLR** button. By locking a flight phase you can avoid the danger of launching with a flight phase selected which does not contain the correct settings.

If you operate a flight phase switch to select a locked flight phase, you will hear a continuous beep to warn you of your error. The last used flight phase remains active, and its number is shown in Status displays 1, 2 and 3 (→ 10.6.2.). The name of the locked flight phase which you tried to access is shown crossed out.

How to lock / unlock flight phases:
First select a flight phase, and confirm your choice by pressing the **ENTER** button or one of the 3-D digi-adjusters.

The cursor now jumps to the flight phase name. At this point you can toggle between "free" and "locked" using the **REV/CLR** button.
Selecting a different name using the 3-D digi-adjuster also unlocks a locked flight phase.

Note:
The active flight phase (marked with an x) cannot be locked.

19.4.3. Copying flight phases
If you wish to start using different flight phases, we recommend the following procedure:

First fly the model using just one flight phase, leaving the other phases locked. Test-fly and adjust the model until you are confident that it is trimmed perfectly. At this stage the first flight phase should be copied. Now when you switch to the new flight phase(s) you can be sure that the model will continue to fly in the usual way. All you have to do at this stage is carry out the desired changes in the additional flight phases.

The active flight phase is marked with an x. The only flight phase you can copy is the active one. The following steps are required:

a. Select the active phase (x) using the UP / DOWN buttons (▲ / ▼), or alternatively using one of the two 3-D digi-adjusters.
b. Press the 3-D digi-adjuster (or ENTER) twice,
   ⇒ the cursor jumps to the x.
c. Select the target phase to receive the copy, using the UP / DOWN buttons (▲ / ▼) or alternatively one of the two 3-D digi-adjusters. A letter c (= **c**opy) appears after the target phase name.
d. Press the **ENTER** button or one of the 3-D digi-adjusters to conclude the copy process.
e. In the main menu `Memory` activate the point `Flight Phase`:

```
┌─Flight Phase
 ↑ Exit
 1 HOVER
 2 NORMAL    x  J>
 3 THERMAL1     J>
 4 START1       I>

   Time        OFF
```
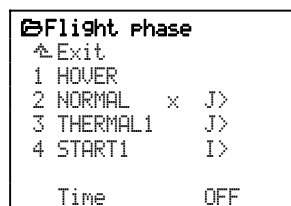
19.4.4. Setting the flight phase transition time

In the bottom line of the menu you can set the transition time (Time) for moving between flight phases:

OFF   1sec   2sec   4sec

⊗ **Exception: auto-rotation**
Switching into the AUTOROT flight phase always occurs without any delay!

19.5. Checking / changing the Properties of the current model memory

Menu ▱ Memory, Properties:

19.5.1. What is displayed?

⊟Properties
⚏Exit
Template   GLIDER   → Template used to create the model
Mode   4: ⇕⇔   → Selected stick mode (elevator / rudder right)
Assignment GLIDER   → Selected assignment
Name   Cularis   → Model name

Template (cannot be changed!):
If you have used an "unsuitable" Template when setting up a new model, you must erase the model and create it anew.

19.5.2. What can be changed?
Stick Modes 1 to 4 are available:
The double arrows indicate the sticks which are used to control elevator (⇕) and rudder (⇔) (→ 14.3.).

Assignment:
When you set up a new model you select one list from the five assignment lists. Your selection can be changed subsequently in this menu (→ 14.3.).

Model Name:
The model name can be entered using up to sixteen characters (→ 11.1.1.).

19.6. Setting up a New model

Menu: ▱ Memory, New model:

⊟New model
⚏Exit
Memory nr.   3   ⇨ a.
Template   GLIDER   ⇨ b.
Servo conf. MPX-UNI   ⇨ c.
Mode   4: ⇕ ⇔   ⇨ d.
Assignment   GLIDER   ⇨ e.
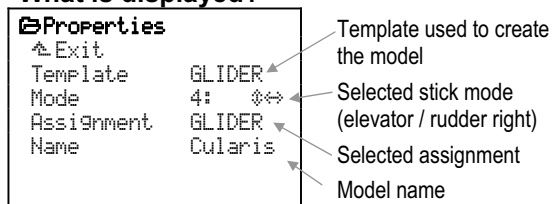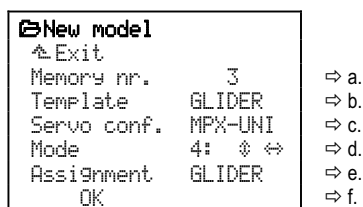   OK   ⇨ f.

a. Memory nr.
For a new model the software uses the transmitter's first available vacant memory. It is not possible to choose the memory.

If you wish to store the new model in a different memory, you can subsequently copy the new model into a different memory location (→ 19.2.).

If all the memories are occupied, the screen shows:

Memory nr.   -1

If you still attempt to set up the new model by pressing OK, you will see the following on-screen warning:

No memory free
Press ENTER

If you see this message, please leave the menu. You cannot store a new model until you have erased a model which you no longer need (→ 19.3.).

b. Template
Under Template you determine the basic model type which applies to the new model you wish to set up. Your fundamental choices are Helicopter and Fixed-wing, and each basic group contains several model templates.

You must select one of the eight templates for each new model. The template determines which basic settings are adopted for the model.

The advantage of using model templates to set up a new model is that many basic settings are already carried out for you; all you have to do is fine-tune the values. For a detailed description of the model templates please see Chapter (→ 21.).

c. Servo conf.
For each make of receiver, the servo configuration defines the sequence in which the servos must be connected to the receiver. If you are using MULTIPLEX equipment, Throttle is servo 4, Rudder is servo 3, and so on. If you have already flown the model using a different make of transmitter, the assignment process will be quicker if you select the appropriate configuration. In menu ▱, Assignment, you can change the sequence in any way you like.

You can choose from any of the following configurations (→ 21.3.):

M-PCM   Sequence for M-PCM receivers
MPX-UNI   Sequence as MULTIPLEX
Futaba   Sequence as robbe / Futaba
JR   Sequence as Graupner / JR

The signal format is always Universal (servo centre = 1.5 ms).

d. Mode 1 to 4, variable
The double arrows indicate which sticks are used to control elevator (⇕) and rudder (⇔).

Mode determines the assignment of the primary sticks. In our example the right-hand stick operates rudder (⇔) and elevator (⇕). This setting can be changed at any time. Please refer to Chapters (→ 12.2.5.) and (→ 13.2.5.).

e. Assignment
You must select one of the five assignment lists when you set up a new model (→ 22.1.).

The `Assignment` determines which of the possible assignment lists for transmitter controls and switches is to be used for this model. This setting can be changed subsequently.

f. `OK`
Once you have set all the parameters described above, you must click on the `OK` field by pressing the **ENTER** button or one of the 3-D digi-adjusters to conclude the set-up procedure for the new model. The memory now switches automatically to the model you have just created, and you can immediately start fine-tuning the settings.
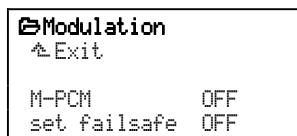
19.7.   Menu: `Modulation`

In this menu you can activate the new MULTIPLEX M-PCM encoding process.

If you activate this encoding process, it is also possible to set the Fail-Safe positions for all servos together.

🛑 Note:
Any change to the modulation only applies to the current model memory.

```
🗁Modulation
 ⬆Exit

 M-PCM         OFF
 set failsafe  OFF
```

a. Activating `M-PCM`
   If you select this menu point and then change the setting to `ON`, then the control signal will be encoded using the `M-PCM` process.

   Switching `M-PCM to` `OFF` sets the transmitter to the PPM encoding method, which works with all makes of equipment.

b. Setting Fail-Safe (`set failsafe`)
   Requirement:
   - `M-PCM` **must be active.**
   - **The model must be switched on, and under control from the transmitter.**

   At this menu point you can set the fail-safe positions for the individual servos in the model from the transmitter:

   Open the menu point `OFF`.

   Move the transmitter controls to the positions which are to be stored as the fail-safe settings.

   If you now press the **REV/CLR** button, the data is transferred to the receiver. The screen display changes briefly to `ON` (< 1 sec). When the transmission is complete, the marker jumps back to `OFF`.

   Press the **ENTER** button to quit this menu point. The marker now jumps back to `set failsafe`.

20.   Special facilities

20.1.   Using the 3-D digi-adjuster to alter settings in flight

Many model settings can only be optimised when the model is in the air. A typical example of this is aileron differential, or Expo settings.

Each of the two 3-D digi-adjusters can be assigned any of the parameters which are marked in the menus with a small hyphen "−".

Button ⟨⟩ is used to **unlock / lock** the allocated values for alteration:

Example - aileron differential:
1. Select the parameter Aileron differential
   Select the menu `ΣMixer`, `Ail.Diff.` and press **ENTER** to confirm. Select `Diff.` and confirm again with **ENTER**:

```
Σ Ail.Diff.THERMAL1
 ⬆Exit

 Mode           ON
 Diff.        ▤▉51%
```

2. Press the Accept button ⟨⟩
   The 3-D digi-adjuster symbol now appears on the screen instead of the percentage value (%) for the parameter:

```
Σ Ail.Diff.THERMAL1
 ⬆Exit

 Mode           ON
 Diff.        ▤⊙%
```

   Now press one of the 3-D digi-adjusters to select the one (left or right) which you wish to use to alter the value in flight.

3. You can now leave the menu and return to the Status display.

   The top line in Status displays 1 - 3 now shows that aileron differential `Ail.Diff.` can be adjusted using the right-hand 3-D digi-adjuster:

```
<---------🔒 Ail.Diff>
🗁 2:Elektro-Master
|7.3V▭▭▭▭▭▭▭▭▭▭|
    J>⌁───┓
 3:THERMAL 1
```

   If you now press or rotate the appropriate 3-D digi-adjuster, the current set-up value for the parameter appears on the screen for a moment:

```
<---------🔒 Ail.Diff>
🗁 2:Elektro-Master
|7.3V▭▭▭▭▭▭▭▭▭▭|

    50%
```

A closed padlock indicates that the value cannot be altered at the moment (guarding against accidental changes):
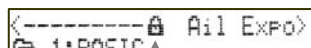
Aileron expo allocated to the right-hand 3-D digi-adjuster

Value locked

If you wish to alter the value, press the allocate button ⊕ for the 3-D digi-adjuster: the symbol changes to an open padlock, and the values can now be adjusted. Any change you make is immediately stored:

Aileron expo allocated to the right-hand 3-D digi-adjuster

Value unlocked

Another press on the allocate button for the 3-D digi-adjuster blocks access to the values again (symbol: closed padlock).

The locking / unlocking process applies to both 3-D digi-adjusters together.

What can be allocated?

Virtually any parameter with numerical values can be allocated. However, there are a few exceptions. For example, the following screen shows that the parameter Step (trim increment size) cannot be allocated in this way:
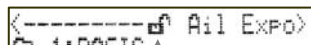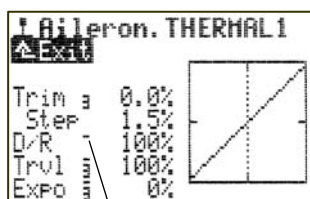

Numerical-value parameters which can be allocated are marked with a high-set hyphen following the parameter name. If you attempt to allocate a parameter which cannot be altered in this way, the following symbol appears when you press the 3-D digi-adjuster:

and an error beep sounds when you press one of the 3-D digi-adjusters.

Erasing an allocation:

This is the procedure for erasing an allocation:

1. Press and hold the corresponding 3-D digi-adjuster in one of the "Status display" menus.
2. Press the (**REV/CLR**) button
   ⇒ the screen in the status displays 1 – 3 now shows "----------", to indicate that the allocation has been erased.

Alternatively you can "overwrite" an existing allocation at any time simply by allocating a new parameter.

Note:

Allocated parameters cannot be reversed, i.e. it is not possible to adjust the value beyond 0 or OFF, in order to guard against accidentally reversing a function.

If you use the flight phase switching facility:

Set-up parameters which have different values in the various flight phases are displayed according to the currently active flight phase, and can therefore be adjusted separately for each flight phase using the appropriate 3-D digi-adjuster.

20.2.   Diagnosis mode operations

It is possible to connect your model directly to the transmitter using a Diagnosis lead, so that you can check the system and carry out adjustment work without transmitting an RF signal (➔ 20.6.4.). Connecting the lead switches off the transmitter's RF module.

This is the procedure:
a. Connect the transmitter (multi-function socket) to the receiving system in the model using the appropriate diagnosis lead (# 8 5105). The receiving system must include a switch harness with integral charge socket, e.g. # 8 5039.
b. Switch the transmitter ON first (RF stays off).
c. Switch the receiving system ON.

20.3.   PC data back-up / updating

The multi-function socket on the underside of the *ROYALpro* provides the functions Charge, Trainer, and Diagnosis mode, and also acts as a serial interface to a PC. Two functions are possible via this interface:

- Access to transmitter data.
- Operating model flight simulators.

Data exchange between transmitter and PC enables you to carry out the following functions:

- Saving model data on a PC (back-up).
- Loading new software into the transmitter.

The last point in particular provides an entirely new means of updating the transmitter software, and of changing the on-screen language, using the Internet.

The software required for this is "*ROYALpro* Data Manager", which you can download from our Internet website.

You will also need a connecting lead # 8 5148 (USB) or # 8 5156 (serial connection, COM port), both of which are available as accessories.

20.4.   Using a flight simulator

Many manufacturers of flight simulators offer interface leads which can be used to connect MULTIPLEX transmitters directly to a PC. The MULTIPLEX interface leads (# 8 5148 or # 8 5156) are not designed for use with simulators.

The free **F**lying **M**odel **S**imulator (**FMS**) can be used with our USB simulator interface, # 8 5153. It can be downloaded at no charge from our website www.multiplex-rc.de.

If you have further queries regarding the use of the *ROYALpro* transmitter with other flight simulators, please contact the simulator manufacturer.

20.5.   Error messages

Every time you switch the transmitter on, the *ROYAL pro* checks the content of its memory. If it detects an error, the following error message appears:

```
Memory Error
```

If this should occur, please note that the transmitter must not be used again, and no changes should be made to settings.

The PC back-up and update program *ROYALpro* DataManager (➔ 20.3.) can be used to correct data errors. This is accomplished by reading out the transmitter data using the *ROYALpro* DataManager, and then transferring the data back into the transmitter again.

If the error message recurs after this procedure, a serious data error is present. The cause is often a hardware defect (possibly caused by failure to observe the transmitter battery charging instructions, or by using an unsuitable or faulty battery charger). In this case the transmitter must be sent to a MULTIPLEX Service Centre for checking and repair.

20.6.   Accessories

20.6.1.   HFM-S M-PCM/PPM Synthesizer RF module
 # 4 5600   35 MHz A-band and B-band
 # 4 5601   40/41 MHz band

RF module exploiting the latest Synthesizer technology. The transmission channel can be selected quickly and coveniently using the Channel Set menu. No transmitter crystals are required.

Important: which channels may be used?
The national regulations regarding the operation of radio-controlled models vary from country to country. Before you use the RF module, it is important to determine which channels are approved for use in the region where you wish to fly the model.

20.6.2.   Scanner for HFM-S M-PCM/ PPM Synthesizer RF module
 # 4 5178   35 MHz A-band and B-band
 # 4 5179   40/41 MHz band

The scanner is used to monitor the frequency band and to guard against channel clashes (two transmitters on one frequency). The Scanner module is simply plugged into the HFM-S M-PCM/PPM Synthesizer RF module, and is easy to install at any time.

The Scanner can carry out two tasks:

Checking the channel when you switch on (Channel-Check):
When you switch on, the Scanner checks the channel selected for the Synthesizer. If your channel is already in use, the transmitter does not start transmitting; a warning message is displayed to alert you to the situation. If the Scanner picks up no signal during the check, the transmitter switches to normal operation:

```
CHANNEL: 067

Frequence 35.070MHz
    Channel used

    Use scanner?
                      ENTER
```

Scanning the whole frequency band:
All channels on the frequency band are interrogated in turn. All signals present are displayed in bar-form on the screen; the height of the bar reflects the strength of the signal:

```
Scan: K067 35.070MHz
ENTER Menu              MOVE


         -

      -   I
255   259   063   061   071
```
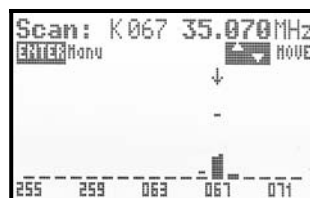
Detailed instructions on using the Scanner module with the HFM-S M-PCM/PPM Synthesizer RF module are supplied with the Scanner module.

20.6.3. Trainer lead
8 5121

The **ROYALpro** can be used both as Teacher transmitter and as Pupil transmitter in a Trainer system.

Any MULTIPLEX transmitter with a five-pin DIN socket (MULTIPLEX multi-function socket) can be used as a Pupil transmitter (➔ 14.4.).

20.6.4. Diagnosis lead
8 5105

The receiver can be controlled via a cable, without the transmitter generating an RF signal, even if the channel is in use by another transmitter. This is known as Diagnosis mode (Direct Servo Control), and is useful when you need to make adjustments to the model. The transmitter (MULTIPLEX multi-function socket) is connected to the receiver (charge socket on switch harness # 8 5039) using the Diagnosis lead. Diagnosis mode is only possible with MULTIPLEX receivers fitted with a combined Battery / Diagnosis socket marked "B/D".

20.6.5. Aluminium stick top with switch or button - installation and functions
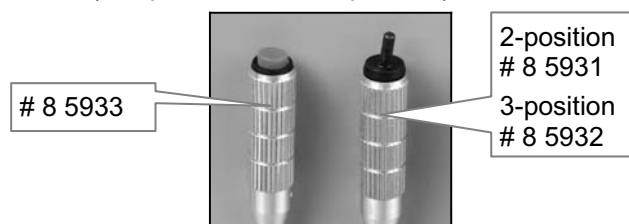
Available as an option for the **ROYALpro** is a pair of aluminium stick tops with integral push-button or switch (two-position or three-position):

The transmitter can be expanded as follows:

		Clamp A B C D	Supp. switch *set to*	Assigned *as*
a.	1 switch	A B C	KSw	KSw
b.	1 button	C D	---	KTa
c.	1 switch **and**	A B C	KSw	KSw
	1 button	C D	---	KTa
d.	1. button	B C	K〉 or 〈P	K〉 or 〈P
	2. button	C D	---	KTa

a. Installing the stick tops
The aluminium stick tops are installed in a similar manner to the standard plastic stick tops (➔ 9.5.):

1. Remove the old stick tops, open the transmitter and remove the battery.
2. Thread the wires through
   The wires can be pushed through the stick shafts when the transmitter is open.
   Tip:
   You will find it easier to slip the wires through if you curve the cable ends slightly and hold the stick in one corner position.
3. Install the stick top
   Set the stick top to your preferred length, then tighten the M2 grubscrew on the side to secure it. If the stick unit has an integral switch, the direction of operation of the toggle must also be considered.

b. Using the stick switches
The switch connected to the terminal clamps ABC must first be assigned to the switch KSw using the transmitter's software. This is the procedure:

Main menu: Setup
Menu: Assignment
Menu point: Switches
Parameter: Extra Sw.

> Extra Sw. -> KSw

This applies to all assignment lists!

c. Connecting the stick button
The stick button in the aluminium stick top must be connected to the screw-clamps CD:
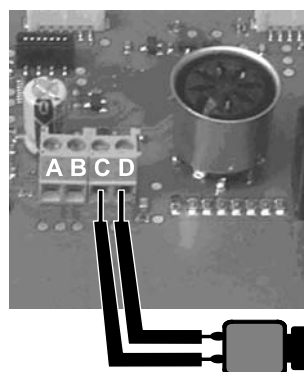
Stick button connections

The stick button must be entered as KTa at the appropriate point in the menu Assignment, Controls / Switches.

Example: using the button to activate the primary flight phase
If you wish to activate the primary (flight) phase when the button is pressed in, use this procedure:

Main menu: Setup
Menu: Assignment
Sub-menu: Switches
Parameter: Open Main phase
Confirm the warning message by pressing **ENTER**.
Press and hold the stick button.
Conclude the assignment by pressing **ENTER**.

The Main phase line in the menu must now look like this:

> Main phase KTa ↓*

The asterisk "*" at the end of the line will be displayed as long as you hold the button pressed in.

d. Connecting a stick switch or second stick button
The stick switch in the aluminium stick top must be connected to the clamps ABC (see picture below).

Alternatively a second stick top with button can be connected instead of the switch. In this case you must use terminal clamps B and C. The following illustration shows the method of connecting a switch or push-button:
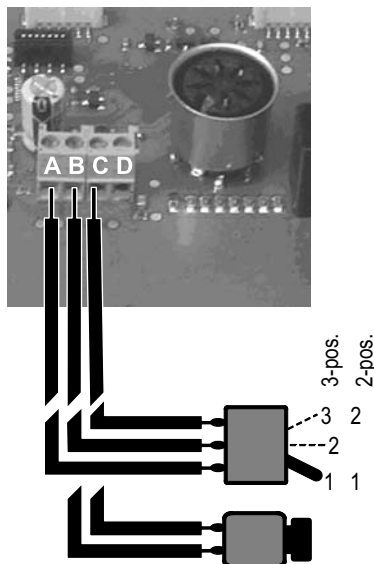
Extra switch connections switch or push-button

This also determines the name by which the switch is addressed in the transmitter software. The Extra Switch can be used as a transmitter control (e.g. retract switch, spoilers, …) or as a simple switch (e.g. flight phases, …).

☻ The Extra Switch has priority!
The Extra Switch has priority over the physical controls P, K and the stick switch KSw (➜ 9.5.). The control element installed in the transmitter for the Extra Switch can be left in the transmitter, but the software ignores it.

Example: 2-position switch for retracts
Once the switch is installed and connected to the ABC terminals, the procedure is as follows:

1. Assigning the Extra switch
Main menu: ⤢ Setup
Menu:　　　 Assignment
Sub-menu: Switches
Parameter: Extra Sw.
Open by pressing **ENTER**, confirm the warning message, then select KSw.:

| Extra Sw. -> 　KSw　　　 |

Confirm with **ENTER**.

2. Assigning a control for retracts (landing gear)
Main menu: ⤢ Setup
Menu:　　　 Assignment
Sub-menu: Controls (not Switches!)
Parameter: L. gear
Open by pressing **ENTER**, confirm the warning message, then move the stick switch (Quick-Select):

| L. gear　　　 KSw ↓* |

and confirm with **ENTER**.

3. Assigning a servo for retracts (landing gear)
Main menu: ⤢ Servo
Menu:　　　 Assignment
Select desired servo (e.g. Servo 9), open by pressing **ENTER**:

| 9 L. gear UNI 2P |

then confirm with **ENTER**.
Select UNI or MPX as signal format, confirm with **ENTER**.
Select 2P, as only the two end-points are of interest for servo travel settings, confirm with **ENTER**.

4. Reversing the servo and adjusting the end-points
Main menu: ⤢ Servo
Menu:　　　 Calibrate
Sub-menu: 9 L. gear
Parameter: REV/TRM (to reverse)
　　　　　　 P1 and P5 (end-points).

5. Set the transit time if required
Main menu: ⼯ Control
Menu:　　　 L. gear
Parameter: Time

| Time　　　　 4.5s |

maximum setting 6.0 seconds.

e. Using the second stick button
If one stick button is already installed, the second must be connected to the terminal clamps BC.

The button connected at this point must be allocated as Extra Sw. K> or <P in the software before it can be assigned as a control or switch.

☖ Tip:
Assign it to <P if the button is in the left-hand stick, and K> if it is in the right-hand stick.

Main menu: ⤢ Setup
Menu:　　　 Assignment
Menu point: Switches
Parameter: Extra Sw.

| Extra Sw. -> 　K>　 |

☻ The assignment for Extra Sw. applies to all the assignment lists. Any switch installed at K or P and connected to the corner unit is disabled once you have assigned the Extra Sw.

20.6.6. Retro-fitting switches K and / or P

Two-position or three-position switches can be retro-fitted at positions **K** and **P** at any time:
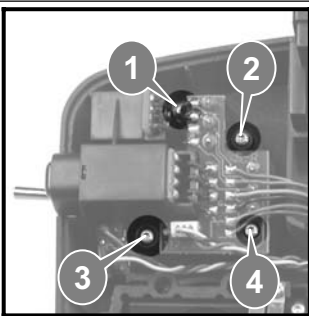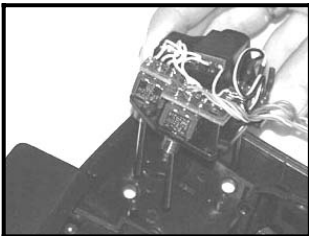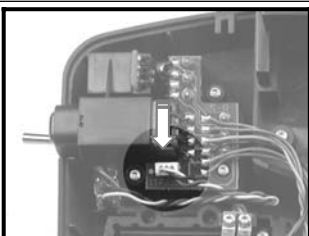

If you wish to install switches in both positions, please note that the following combinations are possible:

> 2 x 2-position
> 1 x 2-position and 1 x 3-position

NOTE: it is not possible to install two three-position switches.

To accomplish this you must remove the appropriate corner unit from the transmitter:

a.) Use the T6 TORX screwdriver (located in clips in the transmitter back panel) to undo the four TORX screws holding the appropriate corner unit.	
b.) Set the switches to centre, then carefully withdraw the corner unit from the transmitter. When you remove the unit, the rotary knob fitted to the 3-D digi-adjuster on that side will come loose.	
c.) The switch is fitted in the corner unit and held in place by the retaining nut supplied. Keep the wiring the correct way round: yellow wire facing the transmitter battery.	
d.) Use a small screwdriver to press the blind cover out of the front case panel from the inside.	
e.) Re-install the corner unit, fit the retaining screws, and push the knob back onto the shaft of the 3-D digi-adjuster (note the correct knob position: internal shoulder). Insert the connector directly into the micro socket located on the corner unit (illustration shows switch K).	

a. Two-position switch

The two-position switches with the Order No. # 7 5748 can be installed in the wells P and / or K. Once installed, they must be connected to the appropriate sockets on the left or right corner unit:
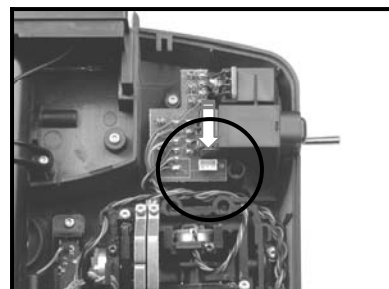
Corner unit with socket for switches P and K (illustration shows switch P)

The switches can be used directly as controls P and / or K in the menus ⚲ Assignment, Switches and ⚲ Assignment, Controls. No software assignment is required for the Extra Sw..

b. Three-position switch

If you install a three-position switch in position P or K, you **must** connect it to the terminal clamp on the main circuit board (ABC ➔ Fig. in 20.6.5.d.). For this reason the wires attached to this switch have bare wire ends (Order No. # 7 5749).

This switch must also be assigned as K⟩, ⟨P or KSw before it is used. This procedure is carried out in the menu ⚲ Assignment, Switches under Extra Sw..

20.6.7. Additional accessories, replacement parts

Item	
Transmitter case	*# 76 3323*
Transmitter aerial, 140 cm, stainless st.	*# 89 3001*
Stub helical aerial, 35 MHz	*# 7 5126*
Stub helical aerial, 40 / 41 MHz	*# 7 5127*
ROYALpro stub aerial adapter	*# 7 5117*
ROYALpro / evo transmitter tray	*# 8 5307*
PROFI transmitter neckstrap	*# 8 5646*
Neckstrap pad for # 8 5646	*# 8 5641*
"Cross-over" transmitter support strap	*# 8 5640*
USB PC lead	*# 8 5148*
Transmitter charge lead	*# 8 6020*
2 aluminium stick tops, long	*# 8 5930*
2 aluminium stick tops, long 1 x with two-position switch	*# 8 5931*
2 aluminium stick tops, long 1 x with three-position switch	*# 8 5932*
2 aluminium stick tops, long 1 x with push-button	*# 8 5933*
2 aluminium stick tops, short	*# 7 5304*
ON / OFF switch for P or K	*# 7 5748*
ON / OFF / ON switch for P or K Connection to screw terminal clamp instead of stick with switch / button	*# 7 5749*

For more information on accessories and replacement parts please refer to the current main catalogue, or our Internet website: www.multiplex-rc.de.

21.	Model templates in detail

21.1. Fixed-wing model aircraft

🔧 The next two steps must **always** be carried out when you are setting up a new fixed-wing model:

a. Check stick functions (aileron / elevator / rudder). Select different stick mode if necessary:
 ↘, Assignment, Mode

b. Check direction of servo rotation for all functions Reverse servo directions if necessary (REVERSE):
 ⎚, Calibrate, select servo,
 Parameter REU/TRM.

Note regarding V-tail models:
If your model is fitted with a V-tail, change the Assignment in the menu ⎚ Servo as follows:
 Elevator or ELEVATR+
  replace with V-TAIL+,
 Rudder
  replace with V-TAIL+.

🔧 **The descriptions in the model templates will only be correct if the mixer definitions and the transmitter control and switch assignments still match the factory default settings.**

Details in the model template descriptions.
The following points are listed in the descriptions:

Suitable for:
Model category, and several models as examples of what can be operated using the template in question.

Assigned transmitter controls and switches:
Transmitter control and switch functions assigned by default. The standard settings are as follows:
 Transmitter Controls to 100%,
 D/R (Dual Rate) to 100%,
 Expo to 0%.

Assigned servos / receiver outputs:
What is controlled using which receiver output or servo. When setting up a New model you can choose any of four different servo configurations.

🔧 **To avoid the illustrations becoming too cluttered, the four possible assignments are grouped together in the summary (➔ 21.3.) "Servo configurations".**

Timer settings:
How the Timers in the model template are prepared, and the method of controlling them.

Additional functions:
E.g. Tow rel. in the model template GLIDER.

Fine-tuning:
What must and can be checked or adjusted when you are setting up a model in the model memory.

Mixers:
Summary of the default Mixer facilities.

21.1.1. BASIC model template

Suitable for:
Simple power models
with one or two aileron servos,
with spoilers (airbrakes or landing flaps).

Typical models:
EASYCUB, MiniMag, Mentor,
TwinStar, Big Lift.

Assigned transmitter controls and switches:
Assignment used: POWER
Not used: Flap (F)

You will find an overview of the global assignment of transmitter controls and switches in Chapter (➜ 22.1.).

Assigned servos / receiver outputs:
To ensure that the template can be used for as many models as possible, more servos are assigned than are required for the model shown in the illustration:

Servo configuration MPX-UNI

Timer setting: motor run time
Sum timer Σᵣ controlled by Throttle (╼⌐▲).

Fine-tuning:

❽   Steps a. and b. (➜ 21.1.),
      Check functions.

c. **Activate throttle to elevator mixer**
   Σ, select ELEVATR+, select Thr -Tr input,
   set 10% down-elevator.
   If you wish to adjust the value in flight, allocate it to one of the 3-D digi-adjusters (➜ 20.1.).

Mixers:

Mixer	Input	Note
Combi Sw.		Mixer: Combi-Switch ➜ 12.11.2.
Ail-Diff.		Aileron differential ➜ 12.6.
Controls Mix		Mixer: Controls Mix ➜ 16.1.3.
ELEVATR+	Elevator	trv↑ = Control surface deflection for down-elevator trv↓ = Control surface deflection for up-elevator
	Spoiler	Elevator trim correction for Spoiler (airbrakes): pt1 = Elevator compensation for half-deployed spoilers pt2 = Elevator compensation for fully deployed spoilers
	Flap	Elevator trim correction for Flap (Flaperon): trv↑ = Elevator compensation for (e.g.) thermal setting trv↓ = Elevator compensation for (e.g.) speed setting
	Thr -Tr	Elevator trim correction for throttle (motor): dead = Dead-zone / from which point does elevator correction take effect? trv = Elevator compensation for full-throttle
V-TAIL+ *	Elevator	trv↑ = Control surface deflection for down-elevator trv↓ = Control surface deflection for up-elevator
	Rudder	trv↑ = Control surface deflection for rudder in one direction (e.g. up) trv↓ = Control surface deflection for rudder in the other direction (e.g. down)
	Spoiler	Elevator trim correction for Spoiler (airbrakes): pt1 = Elevator compensation for half-deployed spoilers pt2 = Elevator compensation for fully deployed spoilers
	Flap	Elevator trim correction for Flap: trv↑ = Elevator compensation for (e.g.) Thermal setting trv↓ = Elevator compensation for (e.g.) Speed setting
	Thr -Tr	Elevator trim correction for throttle (motor): dead = Dead-zone / from which point does elevator correction take effect? trv = Elevator compensation for full-throttle

* only appears if V-TAIL+ is active

21.1.2. ACRO model template

Suitable for:

Power models such as F3A (formerly RC1), F3AX, Fun-fly models.

Typical models:

Sky Cat, AcroMaster.

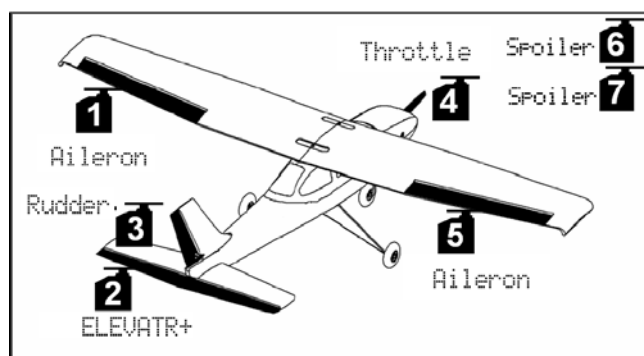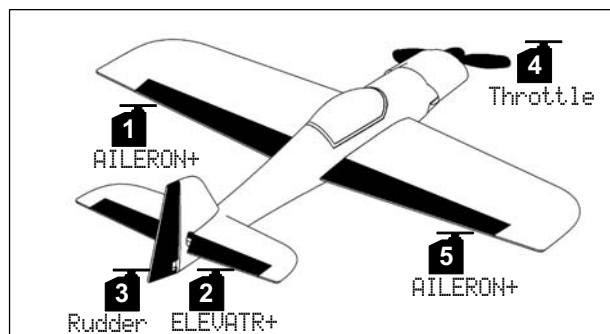**Assigned transmitter controls and switches:**

Assignment used: POWER
Not used: Flap (F)

You will find an overview of the global assignment of transmitter controls and switches in Chapter (➜ 22.1.).

Assigned servos / receiver outputs:

Servo configuration MPX-UNI

Timer setting: Motor run time

Sum timer Σ controlled by Throttle (⇥I⬆)

Fine-tuning:

❽   Steps a. and b. (➜ 21.1.).
          Check functions.

c. **Activate throttle to elevator mixer**
   Σ, select ELEVATR+, select Thr -Tr input,
   set 10% down-elevator.
   If you wish to adjust the value in flight, allocate it to one of the 3-D digi-adjusters (➜ 20.1.).

d. **Activate flap to elevator mixer**
   Σ, select ELEVATR+, select Flap input,
   trv⬆ = 5%, trv⬇ = set 10%.
   If you wish to adjust the value in flight, allocate it to one of the 3-D digi-adjusters (➜ 20.1.).

Mixers:

Mixer	Input	Note
Combi Sw.		Mixer: Combi-Switch ➜ 12.11.2.
Ail-Diff.		Aileron differential ➜ 12.6.
Controls Mix		Mixer: Controls Mix ➜ 16.1.3.
ELEVATR+	Elevator	trv⬆ = Control surface deflection for down-elevator trv⬇ = Control surface deflection for up-elevator
	Spoiler	Elevator trim correction for Spoiler (airbrakes): pt1 = Elevator compensation for half-deployed spoilers pt2 = Elevator compensation for fully deployed spoilers
	Flap	Elevator trim correction for Flap (Flaperon): trv⬆ = Elevator compensation for (e.g.) thermal setting trv⬇ = Elevator compensation for (e.g.) speed setting
	Thr -Tr	Elevator trim correction for throttle (motor): dead = Dead-zone / from which point does elevator correction take effect? trv = Elevator compensation for full-throttle
AILERON+	Aileron	Setting for maximum aileron travel when the Aileron transmitter control is operated: trv = Symmetrical deflections (⇒ equal aileron travels up and down) Aileron differential is set and adjusted in the mixer Ail.Diff.
	Spoiler	When the Spoiler control is operated, both ailerons move in the same direction (e.g. up) to act as landing aid: offs = Offset value trv = Aileron deflection at full Spoiler travel
	Flap	When the transmitter control Flap is moved, both ailerons move up or down together to alter the camber of the wing section in order to optimise the wing for thermal and speed flying: trv⬆ = Aileron deflection, e.g. up for speed flying trv⬇ = Aileron deflection, e.g. down for thermal flying
	Ele -Tr	When the elevator stick is operated, both ailerons deflect up or down in order to amplify the elevator effect for aerobatics ("snap-flap mixer"): trv⬆ = Aileron deflection when down-elevator is applied trv⬇ = Aileron deflection when up-elevator is applied This mixer can be switched off and on at any time using the SNAP-FLAP switch

V-TAIL+ *	Elevator	trv↑ =	Control surface deflection for down-elevator
		trv↓ =	Control surface deflection for up-elevator
	Rudder	trv↑ =	Control surface deflection for rudder in one direction (e.g. up)
		trv↓ =	Control surface deflection for rudder in the other direction (e.g. down)
	Spoiler	Elevator trim correction for Spoiler (airbrakes):	
		pt1 =	Elevator compensation for half-deployed spoilers
		pt2 =	Elevator compensation for fully deployed spoilers
	Flap	Elevator trim correction for Flap:	
		trv↑ =	Elevator compensation for (e.g.) Thermal setting
		trv↓ =	Elevator compensation for (e.g.) Speed setting
	Thr -Tr	Elevator trim correction for throttle (motor):	
		dead =	Dead-zone / from which point does elevator correction take effect?
		trv =	Elevator compensation for full-throttle

* only appears if V-TAIL+ is active

21.1.3. HOTLINER model template

Suitable for:
F5B.

Typical models:
BLIZZARD (V-tail required (➔ 21.1.)), Bonito, Akro, Akro Star.

Assigned transmitter controls and switches:
Assignment used: POWER
Not used: Combi-Switch (N),
                              Spoiler (E), Flap (F).

You will find an overview of the global assignment of transmitter controls and switches in Chapter (➔ 22.1.).

Assigned servos / receiver outputs:
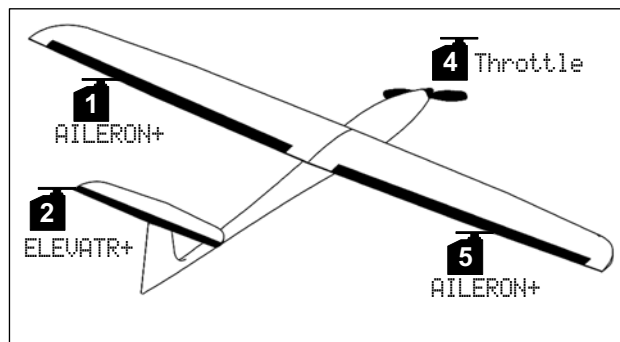
Servo configuration MPX-UNI

Timer setting: Motor run time
Sum timer Σ controlled by Throttle (⊽I⌃).

Fine-tuning:

❓   Steps a. and b. (➔ 21.1.),
         Check functions.

c. **Ailerons raised as landing aid**
This function is already programmed in the template (all mixer inputs = 0%) and is operated using the transmitter control Spoiler (slider E). You may need to add the trim correction input (15%) to the ELEVATR+ mixer.

d. **Activate throttle to elevator mixer**
Σ, select ELEVATR+, select Thr -Tr input, set 10% down-elevator.
If you wish to adjust the value in flight, allocate it to one of the 3-D digi-adjusters (➔ 20.1.).

Mixers:

Mixer	Input	Note
Combi Sw.		Mixer: Combi-Switch → 12.11.2.
Ail-Diff.		Aileron differential → 12.6.
Controls Mix		Mixer: Controls Mix → 16.1.3.
ELEVATR+	Elevator	trv↑ = Control surface deflection for down-elevator trv↓ = Control surface deflection for up-elevator
	Spoiler	Elevator trim correction for Spoiler (airbrakes): pt1 = Elevator compensation for half-deployed spoilers pt2 = Elevator compensation for fully deployed spoilers
	Flap	Elevator trim correction for Flap (Flaperon): trv↑ = Elevator compensation for (e.g.) thermal setting trv↓ = Elevator compensation for (e.g.) speed setting
	Thr -Tr	Elevator trim correction for throttle (motor): dead = Dead-zone / from which point does elevator correction take effect? trv = Elevator compensation for full-throttle
AILERON+	Aileron	Setting for maximum aileron travel when the Aileron transmitter control is operated: trv = Symmetrical deflections (⇒ equal aileron travels up and down) Aileron differential is set and adjusted in the mixer Ail.Diff.
	Spoiler	When the Spoiler control is operated, both ailerons move in the same direction (e.g. up) to act as landing aid: offs = Offset value trv = Aileron deflection at full Spoiler travel
	Flap	When the transmitter control Flap is moved, both ailerons move up or down together to alter the camber of the wing section in order to optimise the wing for thermal and speed flying: trv↑ = Aileron deflection, e.g. up for speed flying trv↓ = Aileron deflection, e.g. down for thermal flying
	Ele -Tr	When the elevator stick is operated, both ailerons deflect up or down in order to amplify the elevator effect for aerobatics ("snap-flap mixer"): trv↑ = Aileron deflection when down-elevator is applied trv↓ = Aileron deflection when up-elevator is applied This mixer can be switched off and on at any time using the Snap-Flap switch
V-TAIL+ *	Elevator	trv↑ = Control surface deflection for down-elevator trv↓ = Control surface deflection for up-elevator
	Rudder	trv↑ = Control surface deflection for rudder in one direction (e.g. up) trv↓ = Control surface deflection for rudder in the other direction (e.g. down)
	Spoiler	Elevator trim correction for Spoiler (airbrakes): pt1 = Elevator compensation for half-deployed spoilers pt2 = Elevator compensation for fully deployed spoilers
	Flap	Elevator trim correction for Flap: trv↑ = Elevator compensation for (e.g.) Thermal setting trv↓ = Elevator compensation for (e.g.) Speed setting
	Thr -Tr	Elevator trim correction for throttle (motor): dead = Dead-zone / from which point does elevator correction take effect? trv = Elevator compensation for full-throttle

* only appears if V-TAIL+ is active

21.1.4. ⌂DELTA⌂ model template

Suitable for:
Deltas / flying wings, powered or unpowered, jets.

Typical models:
    TWIN-JET, FunJet, TWISTER.

Assigned transmitter controls and switches:
Assignment used: POWER
Not used: Combi-Switch (N),
                     Spoiler (E), Flap (F)

You will find an overview of the global assignment of transmitter controls and switches in Chapter (➔ 22.1.).

Assigned servos / receiver outputs:
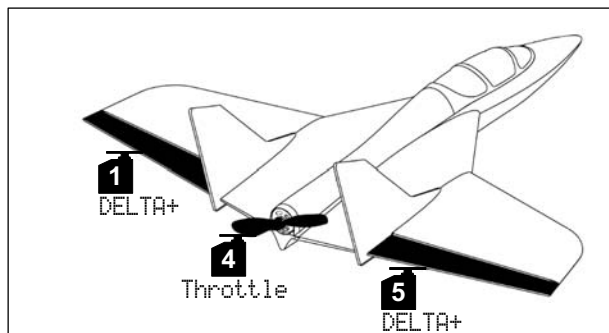
Servo configuration MPX-UNI

Timer setting: Motor run time
Sum timer Σ᷉ controlled by Throttle (▽Ⅰ△).

Fine-tuning:

❽   Steps a. and b. (➔ 21.1.),
      Check functions.

c. **Using receivers with fewer than five channels**
   Change servo assignment: ⌂ Servo, Assignment:
   e.g. 1 DELTA+, 2 DELTA+, 3 Throttle.

d. **Control surface travels too large or too small**
   Σ , select DELTA+ mixer, adjust Elevator and / or Aileron inputs.

e. **Activate throttle to elevator mixer**
   Σ, select DELTA+, select Thr -Tr input,
   set 10% down-elevator.
   If you wish to adjust the value in flight, allocate it to one of the 3-D digi-adjusters (➔ 20.1.).

Mixers:

Mixer	Input	Note
Combi Sw.		Mixer: Combi-Switch ➔ 12.11.2.
Ail.Diff.		Aileron differential ➔ 12.6.
Controls Mix		Mixer: Controls Mix ➔ 16.1.3.
DELTA+	Aileron	Setting for maximum deflection of the elevons (opposite directions) when the transmitter control Aileron is moved: trv = Symmetrical travels (Same aileron travels up and down) If you require differential aileron travel, use Ail.Diff.
	Elevator	trv↑ = Elevon travel for down-elevator trv↓ = Elevon travel for up-elevator
	Thr. -Tr	Elevator trim correction for throttle (motor): dead. = Dead-zone / from which point does elevator correction take effect? trv = Elevator compensation for full-throttle

21.1.5. GLIDER model template

Suitable for:
Gliders with two wing flaps (ailerons only),
with electric power system, also with V-tail.

Typical models:
EasyGlider.

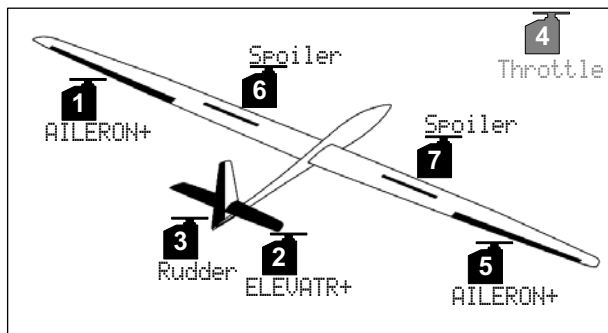**Assigned transmitter controls and switches:**
Assignment used: GLIDER
Not used: Flap (F)

You will find an overview of the global assignment of transmitter controls and switches in Chapter (➔ 22.1.).

Assigned servos / receiver outputs:

Servo configuration MPX-UNI

Timer setting: motor run time
Sum timer Σᵣ controlled by Throttle (⬇I⬆).

Tow release:
If your model features a tow release instead of a power system, you can operate it using servo 4. The following steps are necessary:

1. Assign transmitter controls
   ✎, Assignment, Controls, then select Tow rel..
   Select transmitter control (e.g. button M).

2. Assign servo
   ☐ , Assignment, select servo 4, change from Throttle to Tow rel..

3. Adjust servo
   The direction of rotation and end-points for servo 4 are set under ☐, Calibrate.

Fine-tuning:

❽ Steps a. and b. (➔ 21.1.),
   Check functions.

c. **Ailerons raised as landing aid ...**
   ... if your model has no airbrakes (servos 6 / 7):
   Σ , select AILERON+, set Spoiler input to 90%.
   Adjust the correction input for ELEVATR+ if necessary.

d. **Activate throttle to elevator mixer**
   Σ, select ELEVATR+, select Thr –Tr input,
   set 10% down-elevator.
   If you wish to adjust the value in flight, allocate it to one of the 3-D digi-adjusters (➔ 20.1.).

Mixers:

Mixer	Input	Note
Combi Sw.		Mixer: Combi-Switch ➔ 12.11.2.
Ail-Diff.		Aileron differential ➔ 12.6.
Controls Mix		Mixer: Controls Mix ➔ 16.1.3.
ELEVATR+	Elevator	trv↑ = Control surface deflection for down-elevator trv↓ = Control surface deflection for up-elevator
	Spoiler	Elevator trim correction for Spoiler (airbrakes): pt1 = Elevator compensation for half-deployed spoilers pt2 = Elevator compensation for fully deployed spoilers
	Flap	Elevator trim correction for Flap (Flaperon): trv↑ = Elevator compensation for (e.g.) thermal setting trv↓ = Elevator compensation for (e.g.) speed setting
	Thr –Tr	Elevator trim correction for throttle (motor): dead = Dead-zone / from which point does elevator correction take effect? trv = Elevator compensation for full-throttle
AILERON+	Aileron	Setting for maximum aileron travel when the Aileron transmitter control is operated: trv = Symmetrical deflections (⇒ equal aileron travels up and down) Aileron differential is set and adjusted in the mixer Ail.Diff.
	Spoiler	When the Spoiler control is operated, both ailerons move in the same direction (e.g. up) to act as landing aid: offs = Offset value trv = Aileron deflection at full Spoiler travel
	Flap	When the transmitter control Flap is moved, both ailerons move up or down together to alter the camber of the wing section in order to optimise the wing for thermal and speed flying: trv↑ = Aileron deflection, e.g. up for speed flying trv↓ = Aileron deflection, e.g. down for thermal flying
	Ele –Tr	When the elevator stick is operated, both ailerons deflect up or down in order to amplify the elevator effect for aerobatics ("snap-flap mixer"): trv↑ = Aileron deflection when down-elevator is applied trv↓ = Aileron deflection when up-elevator is applied This mixer can be switched off and on at any time using the Snap-Flap switch

V-TAIL+ *	Elevator	trv↑ =	Control surface deflection for down-elevator
		trv↓ =	Control surface deflection for up-elevator
	Rudder	trv↑ =	Control surface deflection for rudder in one direction (e.g. up)
		trv↓ =	Control surface deflection for rudder in the other direction (e.g. down)
	Spoiler	Elevator trim correction for Spoiler (airbrakes):	
		pt1 =	Elevator compensation for half-deployed spoilers
		pt2 =	Elevator compensation for fully deployed spoilers
	Flap	Elevator trim correction for Flap:	
		trv↑ =	Elevator compensation for (e.g.) Thermal setting
		trv↓ =	Elevator compensation for (e.g.) Speed setting
	Thr →Tr	Elevator trim correction for throttle (motor):	
		dead =	Dead-zone / from which point does elevator correction take effect?
		trv =	Elevator compensation for full-throttle

* only appears if V-TAIL+ is active

21.1.6. 4 FLAPS model template

Suitable for:
F3B, F3J,
Gliders with four wing flaps, with electric power system, also with V-tail.
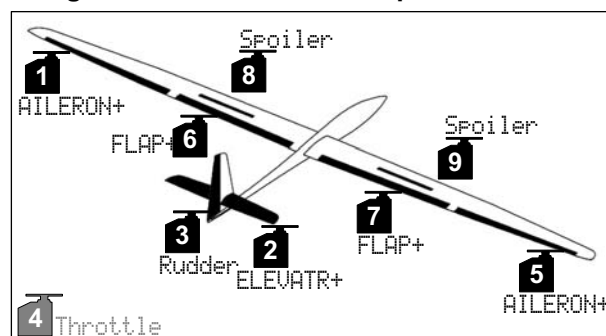
Typical models:

DG 600, ASW 27, Milan, EURO / ELEKTRO-MASTER, Alpina, ASH 26.

Assigned transmitter controls and switches:
Assignment used: GLIDER

You will find an overview of the global assignment of transmitter controls and switches in Chapter (➜ 22.1.).

Assigned servos / receiver outputs:

Servo configuration MPX-UNI

Timer setting: Motor run time
Sum timer Σт controlled by Throttle (E).

Tow release instead of Throttle: (➜ 21.1.5.) GLIDER.

Fine-tuning:

❽   Steps a. and b. (➜ 21.1.),
Check functions.

c. **Activate throttle to elevator mixer**
Σ, select ELEVATR+, select Thr →Tr input,
set 10% down-elevator.
If you wish to adjust the value in flight, allocate it to one of the 3-D digi-adjusters (➜ 20.1.).

d. **Special features when calibrating the servos FLAP+ and AILERON+**
(input: Spoiler, Parameter: offs = OFFSET)
Models with a four-flap wing generally employ what is known as the Butterfly or Crow system as a landing aid: ailerons max. up, camber-changing flaps max. down. For this function the flap servos, in particular, have a highly asymmetrical working range:

The maximum control surface travel in the up-direction (approx. 20°) is required for aileron control. For landing the flaps are required to deflect down as far as possible in order to achieve maximum braking effect (if possible > 60°).

This means that the servo travel must be greatly reduced in the up-direction, unless the servo output lever is not already installed "offset" (mechanical differential). As a result valuable servo travel is forfeited, available servo power is wasted, and you have to accept unnecessarily high gearbox play, reduced servo resolution and increased shock loads on servo gears in hard landings.

This can be avoided using the following procedure:

1. Install the servo output levers for the flap and aileron servos at right-angles to the pushrods.

2. Determine the centre of the working range of the control surface:
   For example: the working range of the control surface (e.g. camber-changing flap) is from +20° ... -60°, starting from the neutral position (flap in line with airfoil)
   ⇒ The centre of the flap's working range is therefore -20°.
   Now adjust the flap pushrod so that the flap is at the -20° point when the servo is at centre.

   🔧 **Tip:**
   First select the servo in the menu `Servo.Calibrate`, then select the percentage value for the point `P3`, and finally press the allocate button for the 3-D digi-adjuster; the servo now runs to its exact centre position.

3. Both servos `FLAP+` and `AILERON+` should now be calibrated at points `P1`, `P3` and `P5` (also points `P2` and `P4` if necessary), so that both pairs of control surfaces are at exactly the same deflection at all points (in our example at +20° / -20° / -60°.

4. Now adjust the parameter `offs` for the mixer input `Spoiler` in the mixers `FLAP+` and `AILERON+` in such a way that the control surfaces line up correctly.

The following diagram clearly shows the principle of this set-up:

Mixers:

Mixer	Input	Note
Combi Sw.		Mixer: Combi-Switch → 12.11.2.
Ail-Diff.		Aileron differential → 12.6.
Controls Mix		Mixer: Controls Mix → 16.1.3.
ELEVATR+	Elevator	`trv↑` = Control surface deflection for down-elevator `trv↓` = Control surface deflection for up-elevator
	Spoiler	Elevator trim correction for Spoiler (airbrakes): `pt1` = Elevator compensation for half-deployed spoilers `pt2` = Elevator compensation for fully deployed spoilers
	Flap	Elevator trim correction for Flap (Flaperon): `trv↑` = Elevator compensation for (e.g.) thermal setting `trv↓` = Elevator compensation for (e.g.) speed setting
	Thr -Tr	Elevator trim correction for throttle (motor): `dead` = Dead-zone / from which point does elevator correction take effect? `trv` = Elevator compensation for full-throttle
AILERON+	Aileron	Setting for maximum aileron travel when the Aileron transmitter control is operated: `trv` = Symmetrical deflections (⇒ equal aileron travels up and down) Aileron differential is set and adjusted in the mixer `Ail.Diff.`
	Spoiler	When the Spoiler control is operated, both ailerons move in the same direction (e.g. up) to act as landing aid: `offs` = Offset value `trv` = Aileron deflection at full Spoiler travel
	Flap	When the transmitter control Flap is moved, both ailerons move up or down together to alter the camber of the wing section in order to optimise the wing for thermal and speed flying: `trv↑` = Aileron deflection, e.g. up for speed flying `trv↓` = Aileron deflection, e.g. down for thermal flying
	Ele -Tr	When the elevator stick is operated, both ailerons deflect up or down in order to amplify the elevator effect for aerobatics ("snap-flap mixer"): `trv↑` = Aileron deflection when down-elevator is applied `trv↓` = Aileron deflection when up-elevator is applied This mixer can be switched off and on at any time using the Snap-Flap switch

FLAP+	Flap	When the transmitter control Flap is operated, the camber-changing flaps move up or down together in order to alter the camber of the wing section for optimising the wing for thermal and speed flying: trv↑ = Flap deflection, e.g. up for speed flying trv↓ = Flap deflection, e.g. down for thermal flying Set the values in such a way that the airfoil camber of the flaps and ailerons is even over the full wingspan
	Spoiler	When the transmitter control Spoiler is operated, both the camber-changing flaps deflect down together to act as a landing aid: offs = Offset for flap servos (see notes below on calibrating the AILERON+ servos for four-flap gliders) trv = Aileron deflection when spoilers are fully deployed When ailerons deflect up and flaps deflect down in response to the Spoiler transmitter control, the result is what is known as the Butterfly or Crow landing system
	Aileron	Maximum setting of camber-changing flap travels (opposite directions) when the transmitter control Aileron is operated: trv↑ = Deflection of both flaps in one direction (e.g. up) trv↓ = Deflection of both flaps in the other direction (e.g. down) If asymmetrical travels are selected, aileron differential (set using Ail.Diff.) can be adjusted to maintain the deflection of the camber-changing flaps, or to set them independently of the ailerons if necessary. This mixer input is switchable if a physical switch is assigned to it. For example, the input can be switched on for aerobatic flying to enhance aileron response
	Ele -Tr	When the elevator stick is operated, both ailerons deflect up or down in order to amplify the elevator effect for aerobatics ("snap-flap mixer"): trv↑ = Aileron deflection when down-elevator is applied trv↓ = Aileron deflection when up-elevator is applied This mixer can be switched off and on at any time using the Snap-Flap switch
V-TAIL+ *	Elevator	trv↑ = Control surface deflection for down-elevator trv↓ = Control surface deflection for up-elevator
	Rudder	trv↑ = Control surface deflection for rudder in one direction (e.g. up) trv↓ = Control surface deflection for rudder in the other direction (e.g. down)

	Spoiler	Elevator trim correction for Spoiler (airbrakes): Pt1 = Elevator compensation for half-deployed spoilers Pt2 = Elevator compensation for fully deployed spoilers
	Flap	Elevator trim correction for Flap: trv↑ = Elevator compensation for (e.g.) Thermal setting trv↓ = Elevator compensation for (e.g.) Speed setting
	Thr -Tr	Elevator trim correction for throttle (motor): dead = Dead-zone / from which point does elevator correction take effect? trv = Elevator compensation for full-throttle

* only appears if V-TAIL+ is active

21.2. Model helicopters

21.2.1. HELImech model template

Suitable for:
Main rotor control system with mechanical mixers.
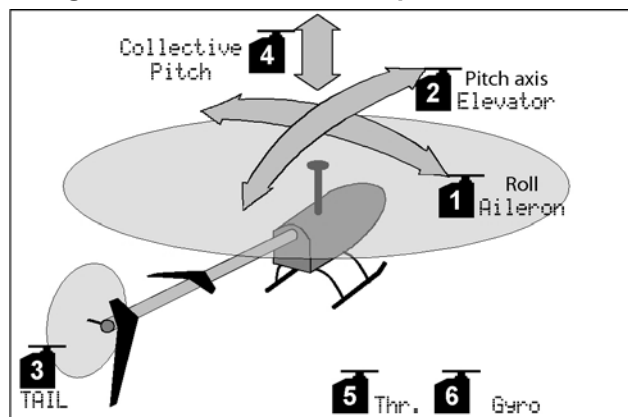
Typical models:
Ergo, Futura, Moskito, Raptor.

Assigned transmitter controls and switches:
Assignment used: HELI

You will find an overview of the global assignment of transmitter controls and switches in Chapter (➔ 22.1.).

Assigned servos / receiver outputs:

Servo configuration MPX-UNI

Timer setting: Motor run time

Sum timer Σ⊤ controlled by throttle limiter (F).

Fine-tuning:
a. Check stick functions (roll / pitch / yaw).
   Select different stick mode if necessary:
   ➘, Assignment, Mode.

b. Check servo directions for all functions.
   Reverse servos if necessary (REVERSE):
   ⛶, Calibrate, select servo, Parameter REV/TRM.

c. Gyro
   (➔ 13.7.).

21.2.2. HELIccpm model template

Suitable for:
Main rotor control system with electronic mixers CCPM (Cyclic Collective Pitch Mixing) with three or four servos, 90° to 150°.

Typical models:
Raptor E550, T-Rex 450 – 600, ECO 8, Logo, Fury, Three Dee NT, Uni-Expert.

Assigned transmitter controls and switches:
Assignment used: HELI

You will find an overview of the global assignment of transmitter controls and switches in Chapter (➔ 22.1.).

Assigned servos / receiver outputs:
In the model template HELIccpm we assume a 120° swashplate with pitch-axis servo at the rear:
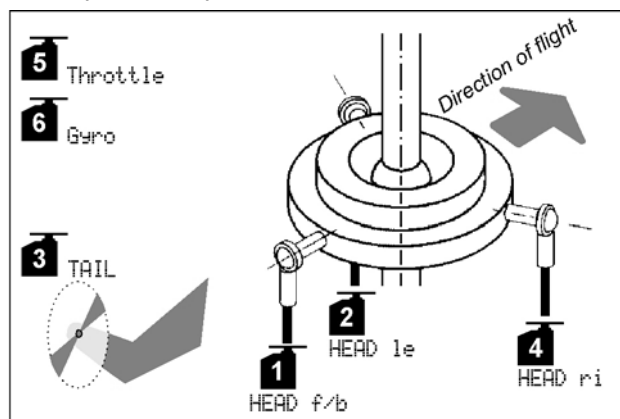
Servo configuration MPX-UNI

Timer setting: Motor run time

Sum timer Σ⊤ controlled by throttle limiter (F).

Fine-tuning:
a. Check stick functions (roll / pitch / yaw).
   Select a different mode if necessary:
   ➘, Assignment, Mode.

b. Check direction of servo rotation for all functions
   Reverse servo direction if necessary (REVERSE):
   ⛶, Calibrate, select servo, parameter REV/TRM.

c. Possible gyro facilities
   (➔ 13.7.).

21.3. Servo configurations

BASIC

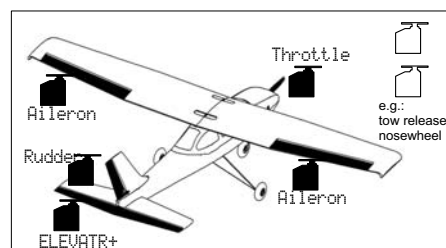|	M-PCM	MPX-UNI	Futaba	JR
1	Aileron	Aileron	Aileron	Throttle
2	Aileron	ELEVATR+	ELEVATR+	Aileron
3	ELEVATR+	Rudder	Throttle	ELEVATR+
4	Rudder	Throttle	Rudder	Rudder
5	Throttle	Aileron	Aileron	Aileron
6	Spoiler	Spoiler	Spoiler	Spoiler
7	Spoiler	Spoiler	Spoiler	Spoiler

Model template BASIC for:

powered trainers,
simple gliders,
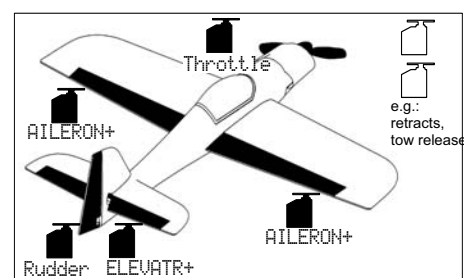power models with landing flaps (assigned as Spoiler),
with one or two aileron servos.

ACRO

	M-PCM	MPX-UNI	Futaba	JR
1	AILERON+	AILERON+	AILERON+	Throttle
2	AILERON+	ELEVATR+	ELEVATR+	AILERON+
3	ELEVATR+	Rudder	Throttle	ELEVATR+
4	Rudder	Throttle	Rudder	Rudder
5	Throttle	AILERON+	AILERON+	AILERON+

Model template ACRO for:

aerobatic models,
FunFlyer
3D.

HOTLINER

	M-PCM	MPX-UNI	Futaba	JR
1	AILERON+	AILERON+	AILERON+	Throttle
2	AILERON+	ELEVATR+	ELEVATR+	AILERON+
3	ELEVATR+	--------	Throttle	ELEVATR+
4	--------	Throttle	--------	
5	Throttle	AILERON+	AILERON+	AILERON+

Model template HOTLINER for:

powered and high-speed powered gliders (hot-liners) with cross-tail or V-tail.

Expansion:
Rudder.
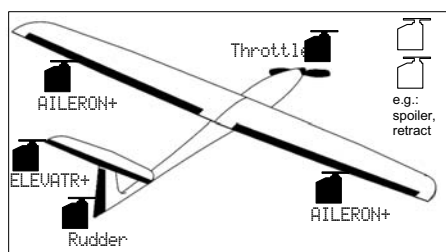
DELTA

	M-PCM	MPX-UNI	Futaba	JR
1	DELTA+	DELTA+	DELTA+	Throttle
2	DELTA+	--------	DELTA+	DELTA+
3	--------	--------	Throttle	--------
4	--------	Throttle	--------	
5	Throttle	DELTA+	--------	DELTA+

Model template DELTA for:

flying wings, powered and unpowered, two wing flaps.

Expansions:
four wing flaps, rudder, ...

GLIDER

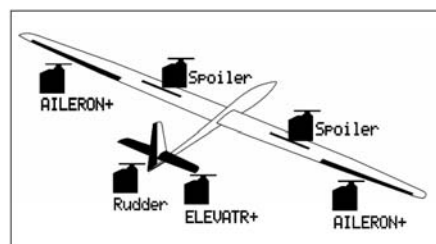|	M-PCM	MPX-UNI	Futaba	JR
1	AILERON+	AILERON+	AILERON+	Spoiler
2	AILERON+	ELEVATR+	ELEVATR+	AILERON+
3	ELEVATR+	Rudder	Throttle	ELEVATR+
4	Rudder	Throttle	Rudder	Rudder
5	Throttle	AILERON+	AILERON+	AILERON+
6	Spoiler	Spoiler	Spoiler	Spoiler
7	Spoiler	Spoiler	Spoiler	Throttle

Model template GLIDER for:
gliders with two wing flaps (ailerons only), with electric power system,
also with V-tail.

Expansion:
Tow-release instead of power system.

4-FLAP

	M-PCM	MPX-UNI	Futaba	JR
1	AILERON+	AILERON+	AILERON+	Spoiler
2	AILERON+	ELEVATR+	ELEVATR+	AILERON+
3	FLAP+	Rudder	Throttle	ELEVATR+
4	FLAP+	Throttle	Rudder	Rudder
5	ELEVATR+	AILERON+	AILERON+	AILERON+
6	Rudder	FLAP+	FLAP+	FLAP+
7	Spoiler	FLAP+	FLAP+	FLAP+
8	Spoiler	Spoiler	Spoiler	Spoiler
9	Throttle	Spoiler	Spoiler	Throttle

Model template 4FLAPS for:
glider with four flaps, with electric power system, with V-tail, F3B, F3J.

p.ex.:
tow release,
spoiler,
retract
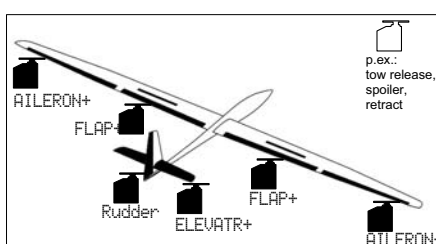
HELImech

	M-PCM	MPX-UNI	Futaba	JR
1	Aileron	Aileron	Aileron	Throttle
2	Elevator	Elevator	Elevator	Aileron
3	TAIL	TAIL	Throttle	Elevator
4	Collect.	Collect.	TAIL	TAIL
5	Throttle	Throttle	Gyro	---------
6	Gyro	Gyro	Collect.	Collect.
7				Gyro

Model template HELImech for:
Main rotor control linkage with mechanical mixers.
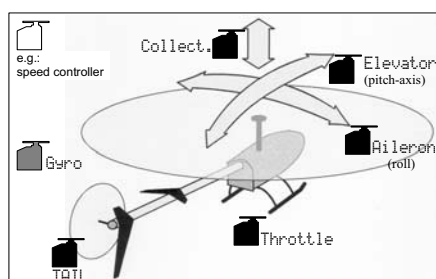
HELIccpm

	M-PCM	MPX-UNI	Futaba	JR
1	HEAD ri	HEAD f/b	HEAD le	Throttle
2	HEAD le	HEAD le	HEAD f/b	HEAD ri
3	HEAD f/b	TAIL	Throttle	HEAD f/b
4	TAIL	HEAD ri	TAIL	TAIL
5	Throttle	Throttle	Gyro	---------
6	Gyro	Gyro	HEAD ri	HEAD le
7				Gyro

Main rotor control system with electronic mixers
CCPM (Cyclic Collective Pitch Mixing),
with three or four servos,
90° to 150°.

Manual
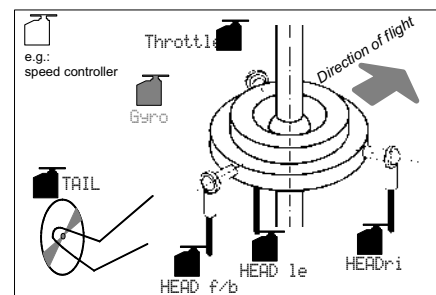
22. Appendix: "global" lists

22.1. Global transmitter control and switch assignments

for fixed-wing models	1. POWER	2. GLIDER	for helicopters	3. HELI	4. 4...... ..	5. 5.......
Controls:			**Controls:**			
Throttle (Idle)*	▼I▲ ↓	E ↓	Throttle	----		
Spoiler (Idle)*	E ↑	▼I▲ ↑	Spoiler	----		
Flap/RPM	F ↓	F ↓	Flap/RPM	----		
L. gear	----	----	L. gear	----		
Tow rel.	----	----	Tow rel.	----		
Brake	----	----	Brake	----		
Gyro	----	----	Gyro	E ↑		
Mixture	----	----	Mixture	----		
AUX1	----	----	AUX1	----		
AUX2	----	----	AUX2	----		
Collect.	----	----	Collect. (minimum)*	▼I▲ ↓		
Thr.lim.	----	----	Thr.limit (minimum)*	F ↓		
Extra Sw.	----	----	Extra Sw.	----		
Switches:			**Switches:**			
DR-ai	L ↓	L ↓	DR-ai (roll)	L ↓		
DR-el	L ↓	L ↓	DR-el (pitch)	L ↓		
DR-ru	L ↓	L ↓	DR-ru (yaw)	L ↓		
CS/DTC	N ↓	N ↓	CS/DTC (Direct Throttle)	N ↓		
Throttle-cut	H ⊓	H ⊓	Throttle-cut	H ⊓		
⌷Slot	----	----	⌷Slot	----		
Σ-Sum	▼I▲ ↑	E ↑	Σ-Sum	F ↑		
▸▸Interval	----	----	▸▸Interval	----		
Mix-1	----	G ↓	Mix-1	----		
Mix-2	----	----	Mix-2	----		
Mix-3	----	----	Mix-3	----		
Teacher	----	----	Teacher	----		
Main phase	----	----	Main phase (auto-rotation)	----		
Phases 1-3	----	----	Phases 1-3	----		
Extra Sw.	----	----	Extra Sw.	----		

22.2. Pre-set mixers

This table contains definitions of all the pre-defined mixers provided by the *ROYALpro*. The following are listed:

- the name of the mixer
- the mixer inputs
- the mixer input switch
- the symbol for the mixer input's method of working

Elevator compensation mixers for cruciform and T-tail

```
⬉Define mixer
  ⬏Exit
  Name        ELEVATR+
1 Elevator ON      ⇕
2 Spoiler  ON      ⇳
3 Flap     ON      ⇕
4 Thr -Tr  ON      ⬇-
5 ————————  ———    ———
```

Elevator compensation mixers for V-tail

```
⬉Define mixer
  ⬏Exit
  Name        V-TAIL+
1 Elevator ON      ⇕
2 Rudder   ON      ⇕2
3 Spoiler  ON      ⇳
4 Flap     ON      ⇕
5 Thr -Tr  ON      ⬇-
```

Delta mixer with throttle compensation input

```
⬉Define mixer
  ⬏Exit
  Name        DELTA+
1 Aileron  ON      ⇕2
2 Elevator ON      ⇕
3 Thr -Tr  ON      ⬇-
4 ————————  ———    ———
5 ————————  ———    ———
```

Mixer for outboard flaps (ailerons), four-flap model

```
⬉Define mixer
  ⬏Exit
  Name        AILERON+
1 Aileron  ON      ⇕2
2 Spoiler  ON      ⬇+
3 Flap     ON      ⇕
4 Ele -Tr  Mx1     ⇕
5 ————————  ———    ———
```

Mixer for inboard flaps (Flap), four-flap model

```
⬉Define mixer
  ⬏Exit
  Name        FLAP+
1 Flap     ON      ⇕
2 Spoiler  ON      ⬇+
3 Aileron  ON      ⇕2
4 Ele -Tr  Mx1     ⇕
5 ————————  ———    ———
```

23. Care and maintenance

The transmitter requires no special maintenance. However, we strongly recommend that you have the system checked by an authorised MULTIPLEX Service Centre at regular intervals (every two or three years), depending on the intensity of use. Regular checks of working systems and range (➜ 3.2.) are, of course, mandatory.

The best method of removing dust and dirt is to use a soft bristle brush. Stubborn soiling, especially grease and oil, is best tackled with a moist cloth, using a mild household cleaner if necessary. Never use powerful cleaning agents such as white spirit or other solvent.

Avoid subjecting the transmitter to pressure and shock loads. The transmitter should always be stored and transported in a suitable container (case or bag).

At regular intervals check that the transmitter case, mechanical parts and - especially - the wiring and contacts are in good condition.

✆ **Switch the transmitter OFF before opening the case, and disconnect the battery before working on it. Avoid touching electrical components and circuit boards.**

24. Disposal

Electrical equipment marked with the crossed-out refuse bin must not be discarded in the household waste; it must be taken to a suitable collection point for proper disposal.

In the countries of the EU (European Union) it is illegal to dispose of electrical apparatus via the domestic waste system (WEEE - Waste of Electrical and Electronic Equipment Directive 2002/96/EG). You can take your unwanted equipment to your local public collection poit (e.g. recycling centre), which will dispose of it in the correct manner at no cost to you.

By recycling your unwanted equipment you can make an important contribution to the protection of the environment.

25. Advice and Service

We have taken great trouble to write and arrange these operating instructions in such a way that you can find an answer to every question quickly and easily. However, if you still have queries regarding your **ROYALpro**, please contact your local model shop in the first instance, where you will find expert advice freely given.

The addresses of our Service Centres abroad can be found on the website:

www.multiplex-rc.de
under
CONTACT / SERVICE PARTNERS