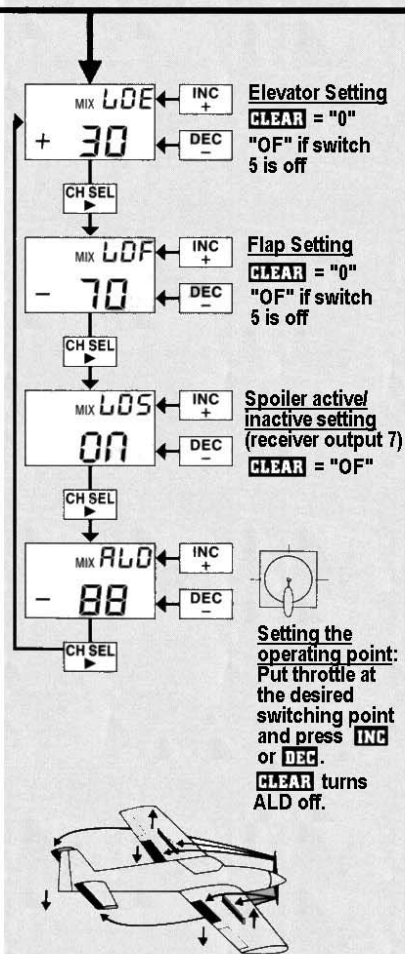## ❾ MIX A-R (Aileron ➔ Ruder)

Combi-Mix
When an aileron command is given, the rudder also moves to a pre-programmed extent (0 ... ±125%).
The mixer can be switched on and off via an external switch connected to socket 3.
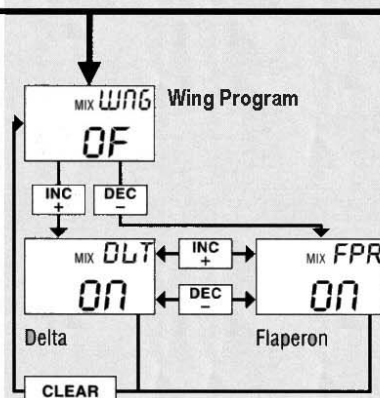
⓫ MIX E-F (Elevator ➔ Flap)

Elevator ➔ Flap
When the elevator servo is operated, the flaps are fed a pre-set signal (0 ... ±125%)
The mixer can be switched on and off if an external switch is connected to socket 4.
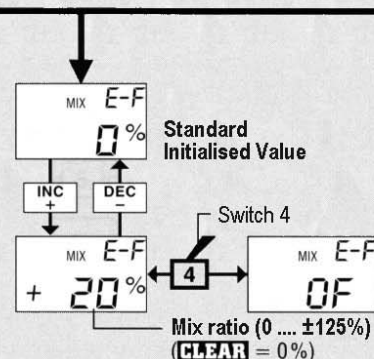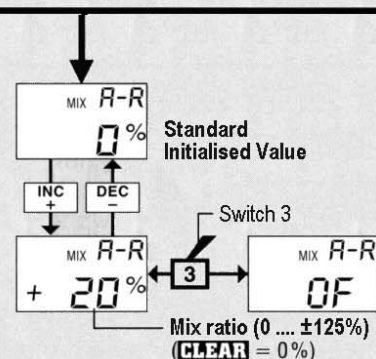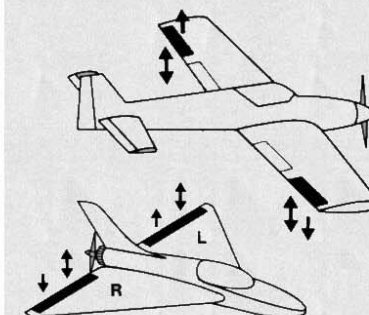
㉓ MIX WNG (Wing)

Delta "DLT" & Flaperon "FPR" mix
1. "DLT": Delta mixer operating channels 2 and 3.
2. "FPR": Flaperon
The receiver outputs 2 and 6 are mixed so that control stick 2 gives aileron operation and the flap slider gives a flap function.

❻ MIX A11, B11, C11

Freely Programmable Mixer
Both the mixer program (servo functions 1 ... 8) and the mixer ratio (0 ... ±125%) can be selected individually.
The mixers can be set permanently "ON" or switched on and off via the associated external switch

---

Column 1:

MIX LOE INC+ DEC−
+ 30
CH SEL ▼

Elevator Setting
CLEAR = "0"
"OF" if switch 5 is off

MIX LOF INC+ DEC−
− 70
CH SEL ▶

Flap Setting
CLEAR = "0"
"OF" if switch 5 is off

MIX LOS INC+ DEC−
ON
CH SEL ▼

Spoiler active/inactive setting (receiver output 7)
CLEAR = "OF"

MIX ALO INC+ DEC−
− 88
CH SEL ▶

Setting the operating point:
Put throttle at the desired switching point and press INC or DEC.
CLEAR turns ALD off.

Column 2:

MIX A-R
0 %
INC+ DEC−

Standard Initialised Value

MIX A-R
+ 20 %
— Switch 3
3 ↔ MIX A-R OF

Mix ratio (0 .... ±125%)
(CLEAR = 0%)

Column 3:

MIX E-F
0 %
INC+ DEC−

Standard Initialised Value

MIX E-F
+ 20 %
— Switch 4
4 ↔ MIX E-F OF

Mix ratio (0 .... ±125%)
(CLEAR = 0%)

Column 4:

MIX WNG
OF
INC+ DEC−

Wing Program

MIX DLT INC+ DEC−
ON ↔ MIX FPR ON

Delta   Flaperon

CLEAR

"DLT": The mix proportions are adjusted using the Dual-Rates function for control functions 2 and 3.
"FPR": The ratio for the aileron function is set using the Dual-Rate function for channel 2.
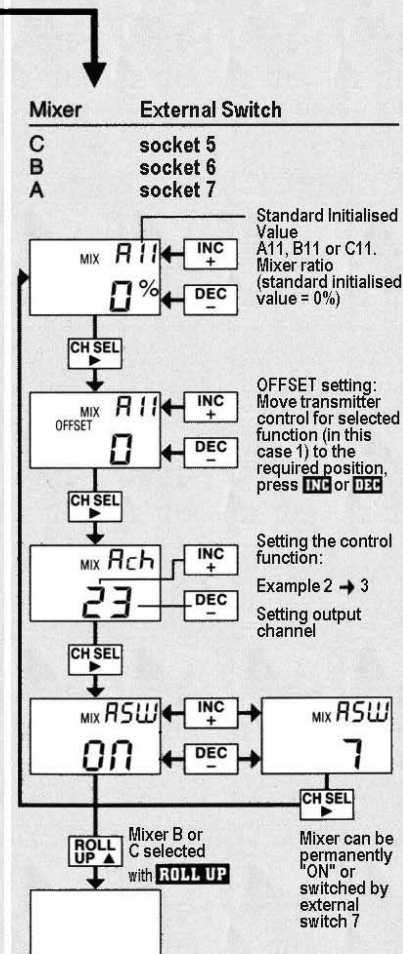The flap setting is adjusted using the Servo Travel Adjustment code for control function 6.

Column 5:

Mixer   External Switch
C   socket 5
B   socket 6
A   socket 7

MIX A11 INC+ DEC−
0 %
CH SEL ▶

Standard Initialised Value
A11, B11 or C11.
Mixer ratio (standard initialised value = 0%)

MIX A11 OFFSET INC+ DEC−
0
CH SEL ▶

OFFSET setting:
Move transmitter control for selected function (in this case 1) to the required position, press INC or DEC

MIX Ach INC+ DEC−
23
CH SEL ▶

Setting the control function:
Example 2 ➔ 3
Setting output channel

MIX ASW INC+ DEC−
ON ↔ MIX ASW 7
CH SEL ▶

ROLL UP ▲ Mixer B or C selected with ROLL UP

Mixer can be permanently "ON" or switched by external switch 7

MIX SR2
OF

AUTOMATIC MANOEUVRE

Two Snap-Roll programs
(access via Set-Up Menu)

The switches to operate the Snap-Roll program must be connected to socket 6 and/or 7 of the transmitter board. This code allows the programming of aileron, elevator and rudder positions, plus the pre-setting of the throttle position. Two Snap-Roll programs are available, i.e. Snap-Roll to left and right. To control this function, momentary switches, part No. 4160.11, 4160.44 or kick-switch M4144, are needed to select the Snap-Roll program "SR…", and to turn off the function immediately the switch is released.
The both programs differ as shown in the following tables, The final program to be activated is always indicated in the display.
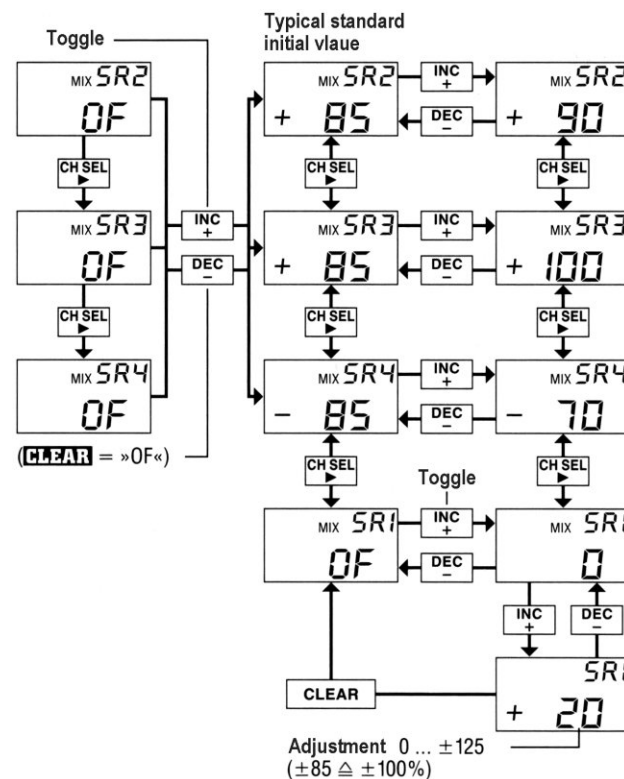
Switch	Display	Function	Ch
Socket 6	SR1	Throttle	1
	SR2	Aileron	2
	SR3	Elevator	3
	SR4	Rudder	4
Socket 7	SRT	Throttle	1
	SRA	Aileron	2
	SRE	Elevator	3
	SRR	Rudder	4

Note:
If two separate momentary switches are used, and both are turned on together, the one connected to socket 7 has precedence. Simultaneous activation of the Automatic Landing (code 22) using switch 5, the Snap-Roll program will be inactive underneath the switch point of the Automatic Landing

Consecutive presses of the CH SEL button moves through the channels "SR2" through "SR4" and/or "SRA, "SRE", and "SRR". The three channels can be set independent of the position of switches 6 and 7, or turned off using the CLEAR button. The first of the codes "SR1" and/or "SRT" for the throttle control is actually the fourth code that appears. The function selection is changed by the CH SEL button, with the CLEAR button cancelling a setting.

Now the servo setting for each sub-code "SR…" can be set using the INC and/or DEC buttons in the range 0 … ±125%

Momentary operation of switch 7 changes the display between "SRA", "SRE", "SRR", "SRT".

D/R AT4
EXP OF

DUAL-RATE / EXPO- AUTO-COUPLING

Automatic switching of control characteristics
(access via Set-Up Menu)

The normal Dual-Rate (D/R) and Exponential functions for channels channel 4 (rudder), see page 20, can be linked to the throttle control stick to automatically switch between the two settings at about 70% of full throttle.
Example:

0 … 70% throttle	Rudder travel increased to 125%, with linear motion ("LN").
70% … 100% throttle	Rudder travel decreased to 40% and exponential set to 50%.

The auto-coupling function will only operate if the external switch at connection 2 is turned off.
In the D/R / Exponential setting, the selection for rudder (channel 4) below 70% throttle travel is indicated by "ch4", with above 70% being shown by "CH4".
With the auto-coupling disabled, i.e. AT4 = "OF", the D/R and Exponential for the rudder uses the normal switching, as described on page 20
or
With the "AT4" function activated, the external D/R / Exponential switch (connection 2) must be in the off position for the auto-coupling to function. The desired values are set using INC & DEC.

Note:
The auto-coupling affects control function 4 in accordance with the block diagram on page 52. Thus to the left of the output point for mixers, it can operate other control paths using the freely programmable mixers A, B and C, and the same from the right of the input point for mixers. For example mix "A47" and a setting of 100% would give similar auto-coupling effect to control paths 4 and 7.

MIX LDE 0 AUTO-LANDING

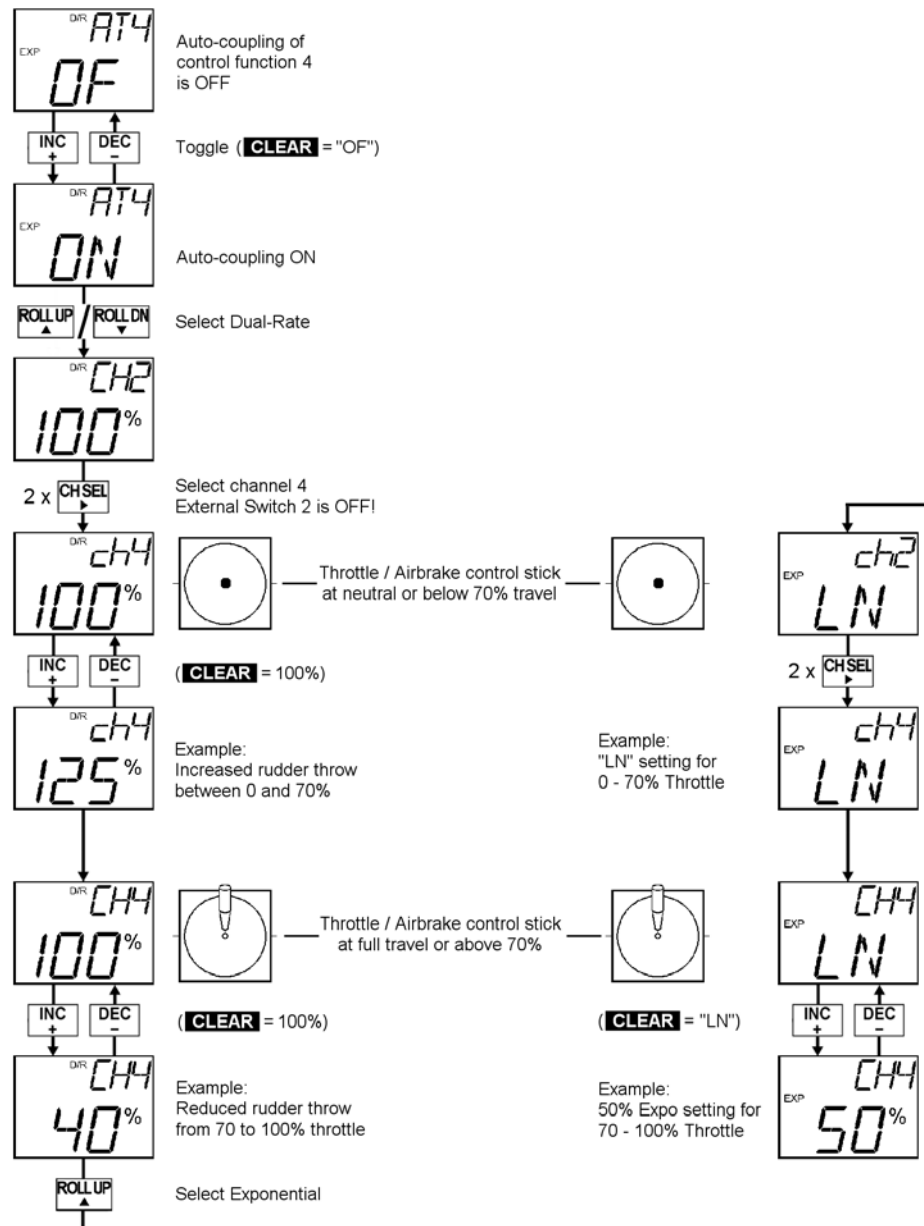Automatic Landing Assistance
(access via Set-Up Menu)

Around the landing approach, in particular to reduce the speed of very fast F3A models, this code offers the possibility, when falling below a certain pre-selectable engine speed, of putting the elevator and flaps into a defined position. Both functions, however, remain separately controllable. Optionally an airbrake / spoiler can also be driven out. This landing aid can be switched off during the flight using an external switch attached to socket 5 of the main board.

After selection of this code, four different subroutines are available in the information display, successively selected using the **CH SEL** button:

In the program "LDE" the elevator adjustment can be set using the **INC** and/or **DEC** buttons over a range of ±125 steps. The setting for the flaps takes place in the same way using the program "LDF". If the **CH SEL** button is pressed again, it can be decided whether the airbrake is to be driven out on activation of the automatic landing aid.

If required "LDS" is toggled between "ON" and "OF" by pressing the **INC** or **DEC** button: The airbrake servo is to be attached to the receiver output 7, which is reserved for this function. As long as "LDS" remains on "ON", the output 7 is closed and the servo drives from its neutral point to the end position. The servo excursion is over the code "servo way attitude", page 21, to specify.

The subroutine "ALD" is used to specify the position of the throttle stick, below which the automatic landing aid is to be activated. The throttle stick is moved to the required operating position and the **INC** or **DEC** buttons is pressed to store the position. The current value is indicated in the display. If the throttle stick is above this position, or if the entire program is switched off using external switch 5, the message "OF" will appear in the display for the codes "LDE" and "LDF".
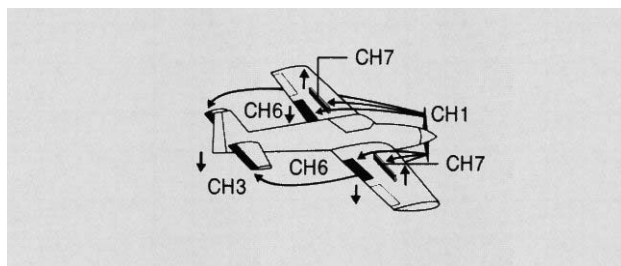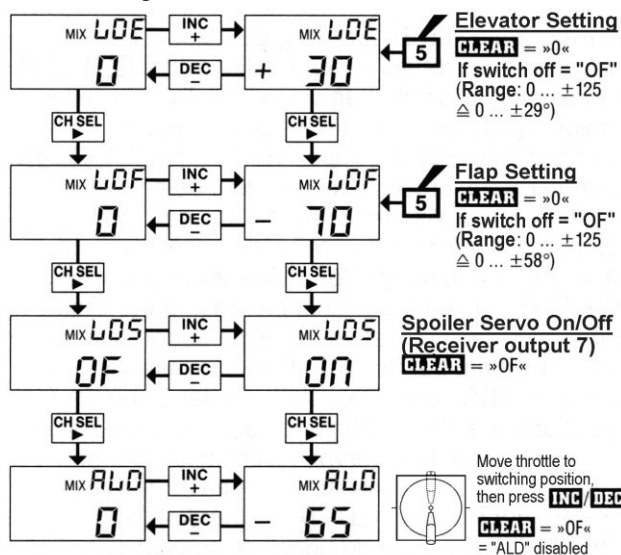

Left column diagram labels:

AT4 OF — Auto-coupling of control function 4 is OFF

INC DEC — Toggle (CLEAR = "OF")

AT4 ON — Auto-coupling ON

ROLL UP / ROLL DN — Select Dual-Rate

CH2 100% —

2 x CH SEL — Select channel 4 External Switch 2 is OFF!

ch4 100%

Throttle / Airbrake control stick at neutral or below 70% travel

INC DEC (CLEAR = 100%)

ch4 125% — Example: Increased rudder throw between 0 and 70%

CH4 100% — Throttle / Airbrake control stick at full travel or above 70%

INC DEC (CLEAR = 100%)

CH4 40% — Example: Reduced rudder throw from 70 to 100% throttle

ROLL UP — Select Exponential

Example: 50% Expo setting for 70 - 100% Throttle

(CLEAR = "LN")

Right sub-diagram labels:

ch2 LN — Example: "LN" setting for 0 - 70% Throttle

2 x CH SEL

ch4 LN

CH4 LN

INC DEC

CH4 50%

If the "ALD" subroutine were previously switched off by pressing CLEAR, can move the elevators, flaps and airbrake to their pre-determined auto-landing positions by operating external switch 5.

The settings for the control surfaces must be determined experimentally during flight and then adapted to the requirements.

Warning:
If the automatic manoeuvre, see page 56 is simultaneously switched on, it will be inactive when control function 1 is below the switching point for auto-landing!


Elevator Setting
CLEAR = »0«
If switch off = "OF"
(Range: 0 ... ±125
≙ 0 ... ±29°)

Flap Setting
CLEAR = »0«
If switch off = "OF"
(Range: 0 ... ±125
≙ 0 ... ±58°)

Spoiler Servo On/Off
(Receiver output 7)
CLEAR = »OF«

Move throttle to switching position, then press INC/DEC
CLEAR = »OF«
= "ALD" disabled

---

⑨ ⧉MIX A-R 0%⧉ COMBI-MIX

Aileron ➡ Rudder Mixer
(access via Set-Up Menu)

In the case of operating the ailerons, the rudder is deflected by a programmable mix proportion. The rudder can, however, be steered separately at any time with priority.
After call of the code "A-R", the mix proportion is adjusted using the INC / DEC buttons and is stopped to automatically at the maximum value of ±125%.
The combi mixer can also be disabled by an external switch attached to socket 3 on the transmitter board.

Standard Inital Value

Switch 3

Mix ratio 0 ... ±125%
(CLEAR = 0%)

---
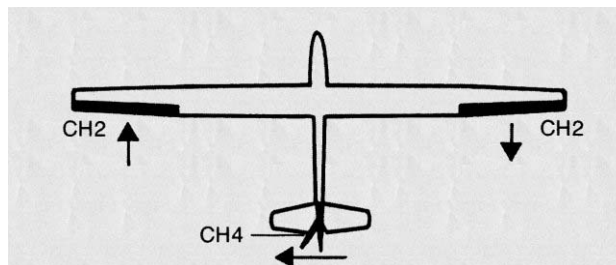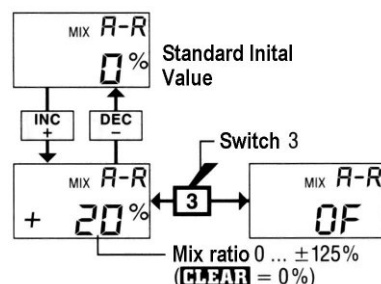
⑩ ⧉MIX F-E 0%⧉ FLAP ➡ ELEVATOR MIXER

Flap ➡ Elevator Mixer
(access via Set-Up Menu)

To assist the elevator with close turning flight and aerobatics, the flaps can be linked to the elevator and are driven out proportionally to the increase the wing lift. The value in the code "E-F" can be varied using, the INC and DEC buttons between 0 and ±125%. The mixer can be also switched off with an external switch connected to socket 4.

Standard Inital Value

Switch 4

Mix ratio 0 ... ±125%
(CLEAR = 0%)

❷❸
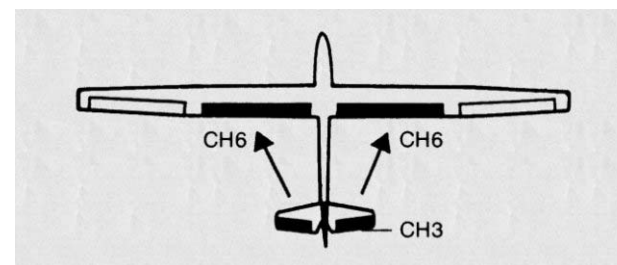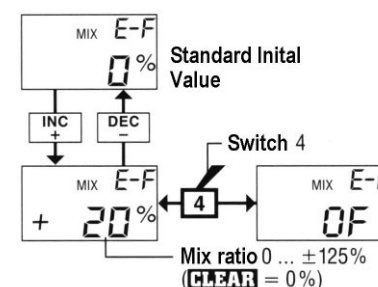
WING TYPE PROGRAMS

Wing Mixer for Delta and Flaperon models
(access via Set-Up Menu)

After calling this program "WNG OF" appears in the Info-Display . Two special mixers are available with this code, which can be selected using INC/DEC.

1. For Delta models, "DLT" combines the functions of Ailerons and Elevators, where the servos are connected to receiver outputs 2 and 3 (Throttle to 1, Rudder to 4). The mix ratio is adjusted using the code "Dual-Rate" (Control function 2 for Ailerons and 3 for Elevator, see page 20).

   Note:
   Depending on the installation of the servos, the direction of rotation and neutral position may be adjusted using the appropriate codes on page 21.
   Servo travel adjustment:
   Ch 2 affects the servo travel for servo 2.
   Ch 3 affects the servo travel for servo 2 during aileron control, but it affects both Servos 2 + 3 together during elevator travel. For safety reasons, the servo travel must amount to at least 50%!

2. Aileron / Flap mixer: "FPR" stands for Flaperon and affects two servos attached to receiver output 2 and 6 as follows:

   ● Aileron, if the control stick for control function 2 is moved.

   ● Flap, if the control element for function 6 is moved.

   Note:
   Depending on the installation of the servos, the direction of rotation and neutral position may be adjusted using the appropriate codes on page 21.
   Servo travel adjustment:
   Servo 2 can be altered using the code servo travel adjustment for "CH2". The setting for "CH6" affects both exits when control function 6 is used for the flap position.
   The mix portion of the aileron control, function 2. can be changed using the Dual-Rate and Exponential settings. The setting doe CH2 affects both outputs 2 and 6 together.
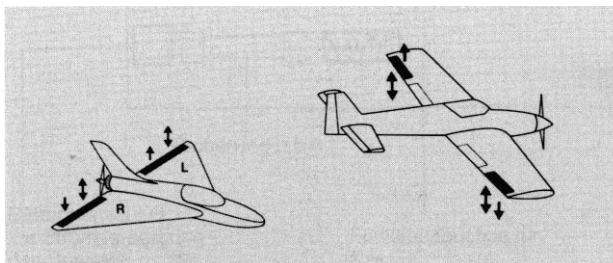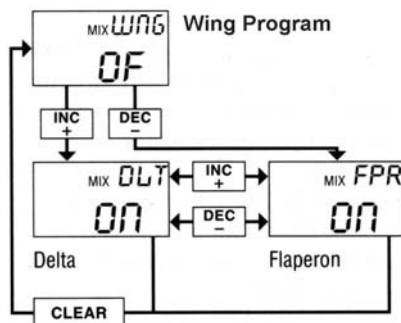
HELICOPTER MODELS – General Information

With these helicopter programs the mc-16/20 transmitter provides all the options for the controlling a modern model helicopter.

To facilitate programming the following helicopter specific functions are available:

- Idle Up
- Throttle curve
- Pitch curve
- Autorotation
- Static
- Dynamic
- Mixer
- Gyro control

Additionally the functions previously described in the Fixed Wing section can be used:

- Dual-Rate
- Exponential
- Servo reverse
- Servo neutral point
- Servo travel adjust
- Free mixers
- Stopwatch and alarm timer
- Fail safe memory & battery fail safe

Warning

RC Helicopters are complicated aircraft which can not the mastered simply. They are aerodynamically unstable and can fly in any direction if control is lost. There is a constant danger of injury when operating them.

Beginners are strongly recommended to find an experienced modeller, club or model flying school. Further advice is available from model shops and modelling publications.

Preparations

Before reviewing the setting of the model into the transmitter, the model should be set accurately using the mechanical adjustments.

That is:

- All controls are set in accordance with the respective helicopter instructions.

- All controls are assembled so that with the control linkages at the middle position, and the trim neutral, the servo arm is at a right angle to the control rod.

- With the control sticks centred, the main rotor head is horizontal, and the tail rotor blades are at the required pitch angle.

- The size of the servo arm was chosen such that the throttle control rod movement matches the carburettor movement required between idle and full throttle, and that the motor will idle with the joystick fully back and the trim appropriately set. The servo movement is unrestricted and does not foul by appropriate mechanical or electronic limits.

The user should familiarise himself with the individual programs starting on page 66.

Programming a Helicopter, model type "HE"

The initial set-up of the transmitter for helicopter models is achieved using the System Menu, see pages 14 – 17. The basic set-up depends less on the model itself than on the general control preferences of the pilot.

The most important setting, above all others, is the control mode (MOD), including whether the throttle stick should pushed or pulled for maximum pitch (THR). Both settings should be reviewed in all cases before beginning with the set-up of the model.

The model dependent parameter settings are grouped in the Set-Up Menu, that is activated from the initial position of the transmitter and/or leaving the System Menu by pressing of the key `ENTER`.

In both menus, the desired functions are displayed by scrolling through the options by pressing the `ROLL UP` and/or `ROLL DN` buttons.
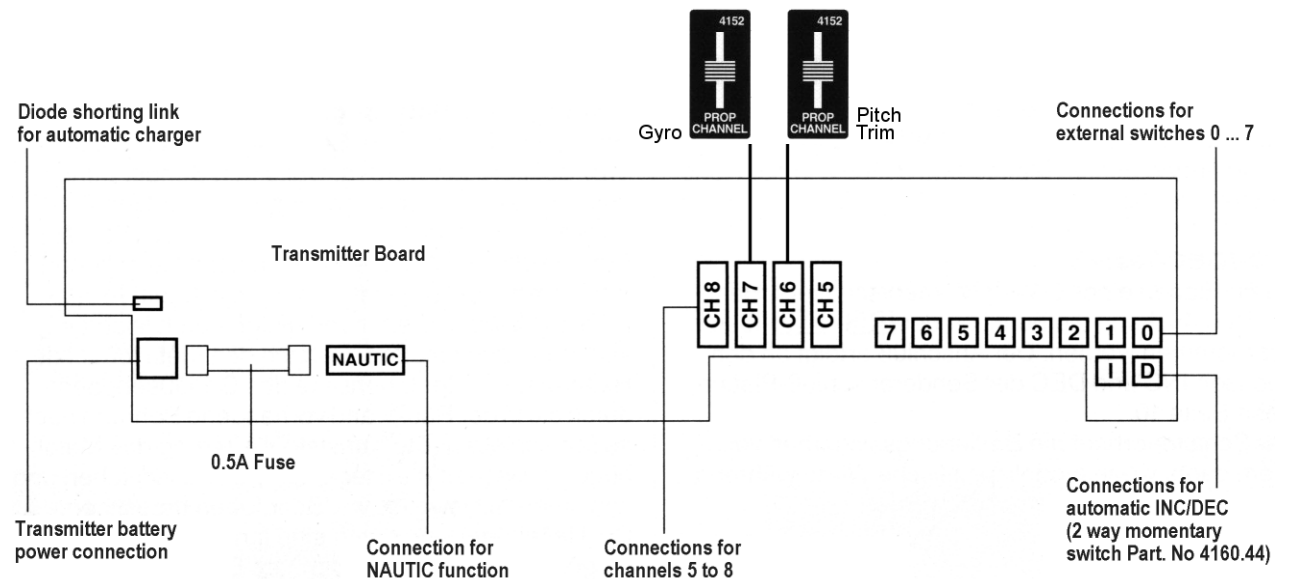
Connection of external control elements to the transmitter board for the helicopter program

In the helicopter program, you can connect up to eight external switches, which have the following functions :

0   Dual Rate / Exponential Roll

1   Dual Rate / Exponential Pitch

2   Dual Rate / Exponential Tail Rotor

3   Autorotation

4   Throttle and Collective Pitch curve (1)

5   Throttle and Collective Pitch curve (2)

6   Static & Dynamic mixers and freely programmable mixer B

7   Gyro control and freely programmable mixer A

Also on the board of the transmitter are additional connectors that allow the installation of two slider controls for the following functions:
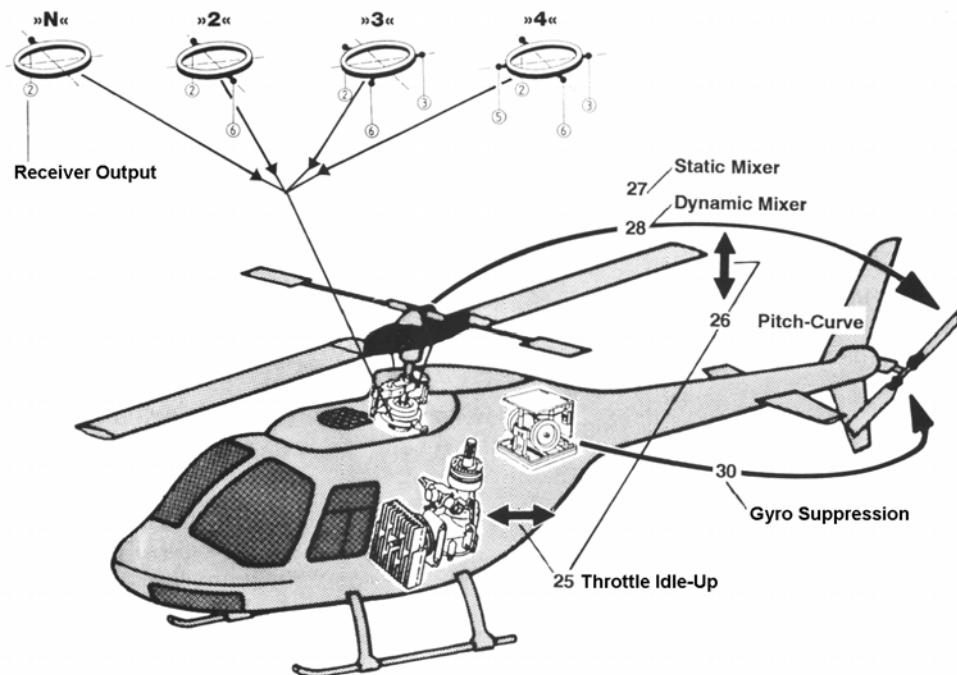
CH6   Collective Pitch Trim
With this slider control the Collective Pitch setting can be adjusted independently to the throttle servo up to around 25% of the maximum servo travel.

CH7   Setting for the Gyro

Diode shorting link for automatic charger

Gyro

Pitch Trim

Connections for external switches 0 ... 7

Transmitter Board

CH 8   CH 7   CH 6   CH 5

7 6 5 4 3 2 1 0

I D

NAUTIC

0.5A Fuse

Transmitter battery power connection

Connection for NAUTIC function

Connections for channels 5 to 8

Connections for automatic INC/DEC (2 way momentary switch Part. No 4160.44)

HELICOPTER MODELS

Block Diagram for the HELICOPTER "HE" Program

24 Swashplate Type

»N« »2« »3« »4«

Receiver Output

Static Mixer
27
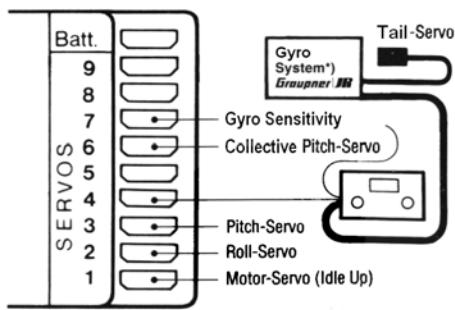Dynamic Mixer
28

26 Pitch-Curve

30
Gyro Suppression

25 Throttle Idle-Up

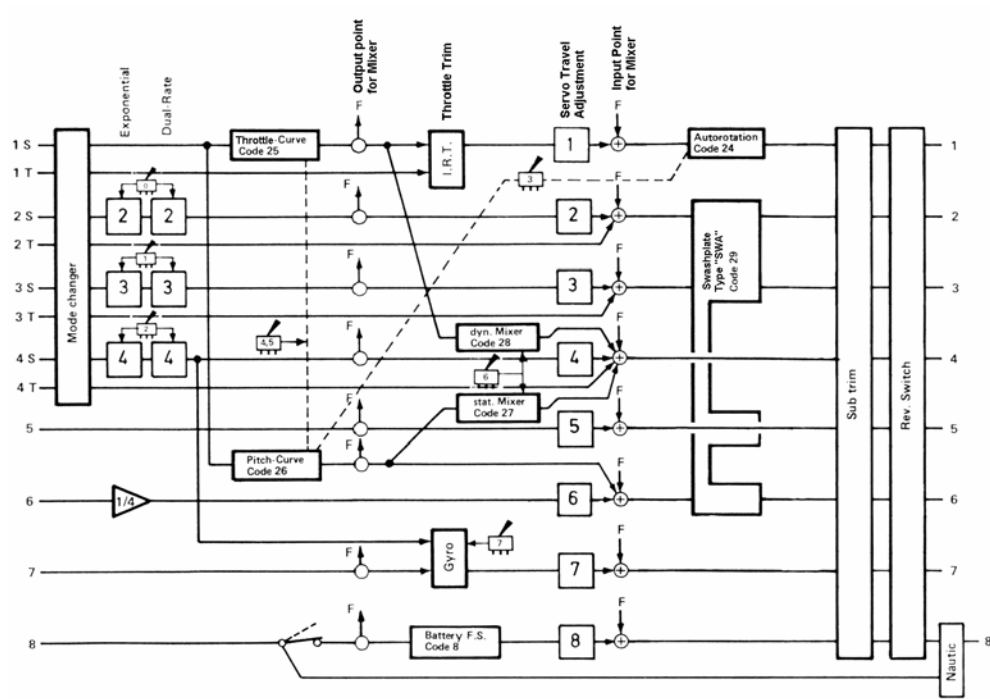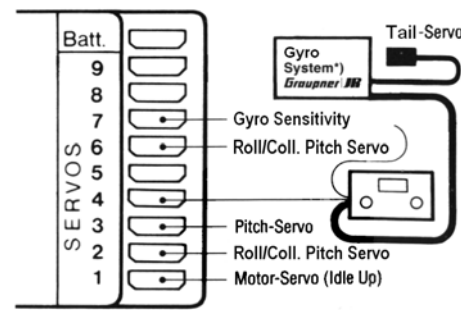**Allocation of Receiver Connections (Ch 1 – 8)**

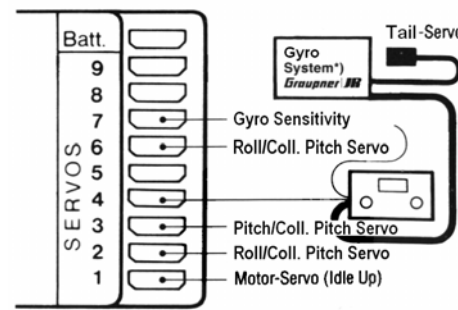The servos must be connected to the radio receiver as shown in the diagrams below:

*) Gyro	Part No	*) Gyro	Part No
Mini-Gyro	3274	NEJ-1001	3906
NEJ-120BB	3277	Piezo 2000	3285
NEJ-120BB ECO	3278		

Swashplate Type N

Batt.
9
8
7 — Gyro Sensitivity
6 — Collective Pitch-Servo
5
4
3 — Pitch-Servo
2 — Roll-Servo
1 — Motor-Servo (Idle Up)
Tail-Servo
Gyro System*) Graupner JR

Swashplate Type 2

Batt.
9
8
7 — Gyro Sensitivity
6 — Roll/Coll. Pitch Servo
5
4
3 — Pitch-Servo
2 — Roll/Coll. Pitch Servo
1 — Motor-Servo (Idle Up)
Tail-Servo
Gyro System*) Graupner JR

Swashplate Type 3

Batt.
9
8
7 — Gyro Sensitivity
6 — Roll/Coll. Pitch Servo
5
4
3 — Pitch/Coll. Pitch Servo
2 — Roll/Coll. Pitch Servo
1 — Motor-Servo (Idle Up)
Tail-Servo
Gyro System*) Graupner JR

Swashplate Type 4

Batt.
9
8
7 — Gyro Sensitivity
6 — Roll/Coll. Pitch Servo
5 — Pitch/Coll. Pitch Servo
4
3 — Pitch/Coll. Pitch Servo
2 — Roll/Coll. Pitch Servo
1 — Motor-Servo (Idle Up)
Tail-Servo
Gyro System*) Graupner JR