MC-18/U

Graupner | JR

REMOTE CONTROL

COMPUTER-SYSTEM

mc-18

PROFI-ULTRA-SOFT

Transmitter
with accessory
expansion

Programming Manual

PROFI-ULTRASOFT-MODULE 256k

The Graupner PROFI-ULTRASOFT-Module 256k offers the modeller practically all currently imaginable functions for the operation of the most diverse types of sailplanes and powered models, including such complex ones as helicopters. The programs have been developed on the basis of practical experience, in close cooperation with renowned model flyers and, as a result leave barely anything to be desired even for, and in, hard contest environments. The clear, logical design of the various functions, however, enables even the less experienced model flyer to take advantage of these programs in everyday flying conditions and operation.

The complexity of the program and their extreme specialisation on specific model types require separating this programming manual into three sections: a general section which concerns all model types in like manner, another section for fixed-wing power models and sailplane models and a third one for helicopter models. Power models and sailplanes are named fixed-wing models here, to distinguish them from helicopter models.

Fixed-wing model and helicopter sections are arranged in two parts each: the detailed description of the options, which may be called under their specific code numbers, plus a compilation of programming examples which can be used as they are presented here or modified to suit one's own application requirements.

The numbering of the options has been chosen to suit in-house technical deliberation. Their description, however, follows the sequential order in which they'll normally be called when performing the setting-up process of a new model.

The high flexibility of adaptability to individual requirements or demands of the operator necessitate the provision of specific allocations before calling and setting up the options depending on them. Thus the possibility of free allocation of the FUAL RATE switches necessitates – for example – the determination of this allocation, before the DUAL RATE values can be adjusted. The same holds true, in similar manner, for other options, in particular those of the helicopter programs.

The beginner and less experienced model flyer will be advised to study and use the programming examples, as practically usable – adjustments can then be made in the shortest possible time, with the essential operational steps being learned at the same time. This applies to the helicopter gyro in particular, which is enabled to adjust a sensible selection of the extensive offering of the helicopter options, and to learn to use them in the process. However, the experienced R/C pilot will benefit as well in studying the programming examples thoroughly and practising the described adjustments, thereby getting familiar with the operation and handling of the transmitter.

In order to spare the user cross-referencing and the bothersome turning of pages from one section to another, both the fixed-wing and helicopter sections contain descriptions of ALL available options, irrespective of whether descriptions have been published previously. This part of the text may appear several times in this manual, as this will help simplify the use of the

MICRO COMPUTER EXPERT SYSTEM MC-18.

Note:
All functions of the PROFI-ULTRASOFT-MODUL are compatible with any of the MC-18 transmitters. With transmitters up to the '88 series only seven models can be stored without back-up copy, however, Conversion from 7 to 30 models storage capacity can be performed by the Graupner Service.

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Model Type Code				Display Reads	Meaning	Described on	
						Fixed-Wing	Helicopter
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General Information

Applicable to all Model Types

The installation of the module is performed as described in the MC-18 programming manual.

IMPORTANT
After installation of the module ALL model memories should be cleared. If this is not done, it is possible that fragments of previous programs left in the memory may cause malfunction in conjunction with the PROFI-ULTRASOFT-Module.
To this end, after selecting the model No via code 56 ENTER, entering the model number 1…7 (or 1…30[1]), the key CLEAR has to be pressed first instead of just pressing the ENTER, and ENTER is then used to clear the memories. This step should preferably be performed immediately after installation of the module for ALL model memories, one after another.

Therefore input as follows:

ENTER 5 6 ENTER 1 CLEAR ENTER
ENTER 5 6 ENTER 2 CLEAR ENTER
…
ENTER 5 6 ENTER 7 CLEAR ENTER
(…
ENTER 5 6 ENTER 3 0 CLEAR ENTER)

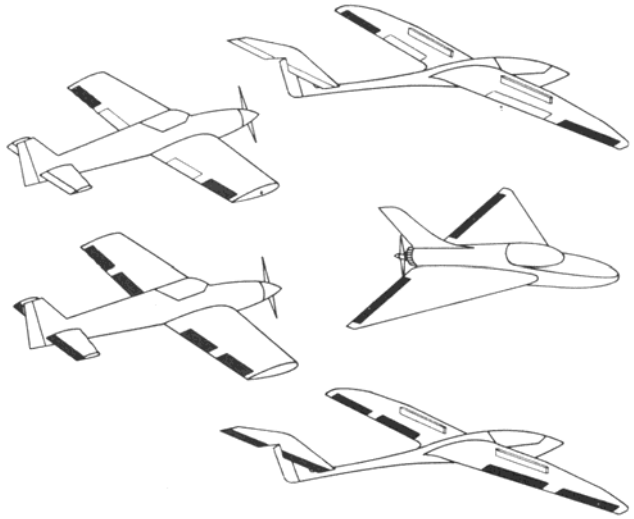
This procedure needs only to be performed this one time.

List of Functions
The PROFI-ULTRASOFT-Module has nine different model types in all, which are selectable via code 58. For obvious reasons model selection must be the first step when programming a new model. This step determines which of the options will be available in the course of the programming process.

[1]TX of series '89 (and later) are designed for 30 model memories.

Basic Programs including Automatic Manoeuvres
MULTISOFT for Aerobatic classes such as F3A and F3B

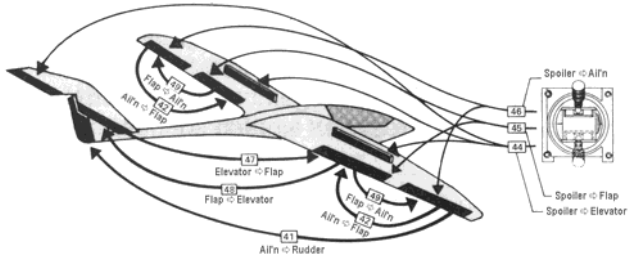
Code	Model Type
58/1	NORMAL Normal Model
/2	NORMAL/DIFF Normal models with 2 Aileron Servos
/3	DELTA/DIFF Delta and Flying Wing models
/4	UNIFLY/DIFF For sailplanes & power models equipped with plain flaps or spoilers actuated by a single servo.
/5	QUADRO-FLAP For sailplanes & power models equipped with separate servos for each aileron and each flap (4 wing mounted servos).



Universal Profi-Programs
For competition pilots in classes F3A, F3B, F3E & large soarers.

58/6 F3B (3 wing-sv)
Universal program for contest models equipped with 3 wing mounted servos.
(1 servo for flaps); undesired functions to be left unoccupied at the RX.

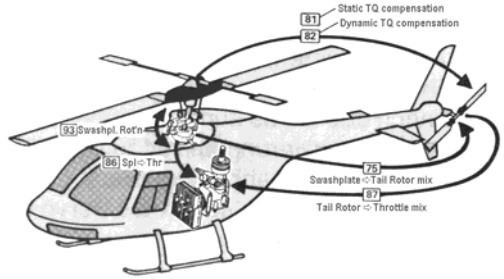
/7 F3B (4 wing-sv)
Universal program for contest models equipped with 4 wing mounted servos.
(2 servos for flaps); undesired functions to be left unoccupied at the RX.



Universal Helicopter Programs
For contest flyers in class F3C

58/8 HELI
Universal program for contest models including those equipped with rpm and gyro control.

/9 HELI (sp.ctl)
Special program for contest models equipped with gyro and rpm control.



Selection of Model Type

Type 1: NORMAL

The majority of model aircraft belong in this category. It comprises all power and sailplane models with elevator, rudder, ailerons and throttle (or in the case of gliders; the spoilers), which are actuated by one servo for each of the controls. The situation remains unchanged even if additional control channels are used to actuate supplementary functions, such as retracts, glider tug release couplings, mixture adjust or flaps (such as plain flaps) of sailplane models. Any options available, and sensible, in conjunction with this configuration are provided here. In the case of a model equipped with a V-Tail (replacing the conventional type of tailplane), a special mixer may be used, which combines the control functions of elevator and rudder in such a manner as to provide each of the control surfaces, each controlled by a separate servo, with elevator plus rudder functions. For more complex applications, such as automatic compensation of elevator trim on actuation of flaps, no less than nine freely programmable mixers are available, permitting such functions to be tailored to prevailing conditions.

Type 2: NORMAL/DIFF

This type of model differs from type 1 (NORMAL) only by the provision of two separate servos for the actuation of the ailerons instead of a common servo. In this manner differential control of ailerons is provided, permitting the downward deflection of an aileron to be adjusted independently of the upward displacement.. This is achieved using code 22. The independent operation of the two ailerons by one servo each provides additional options, such as deflection of these control surfaces in the same direction, using them as plain flaps or flaperons. This option, too, is available to suit the modeller's requirements, thanks to the availability of nine freely programmable mixers.

Type 3: DELTA/DIFF

Type 3 corresponds to type 2, differing from the latter in that in deltas and flying wing models the elevator and aileron functions are performed by common control surfaces located at the trailing edges of the right and left wing panels and moving either in the same direction or in the opposite one. Each control surface being controlled by an independent servo, and with the correct mixture of aileron and elevator control provided for already. All other options are available with restrictions, including the nine freely programmable mixers.

Type 4: UNIFLY/DIFF

This type of model is a variant of type 2. It is meant for power models and sailplanes, where the plain flaps are actuated by a single servo, or the full-span ailerons are to operate as a combination of flaps and ailerons (flaperons). For this application the freely programmable mixers 1…5 have already been occupied by certain special functions, just as if one had adjusted type 2 to perform the mixer allocations oneself via code 51. This mixer allocation, which functions the combi-mix aileron-rudder, flaperon mix, elevator compensation on actuation of spoilers, elevator compensation on actuation of flaps and throttle pre-selection are realised, is not a compulsory one; it may be modified to suit the modeller's intentions, expanded by the additional four freely programmable mixers or cancelled entirely (re-creating type 2 again).

Type 5: QUADRO-FLAP

Type 5 is also a variant of type 2, just like type 4. It is meant mainly for large sailplane models, each wing panel of which is equipped with one servo for each aileron and flap, giving a total of 4 servos. Here, too, the special functions are realised by pre-adjusting of freely programmable mixers 1…5 for combi-mix aileron-rudder, flaperon mix, elevator compensation on actuation of spoilers, elevator compensation on actuation of flaps and mixing aileron function into the flap function. Here again mixer allocation can be modified, expanded or cancelled at any time.

Type 6: F3B (3 wing servos)

Type 6 is for F3B contest sailplane models, each aileron of which is actuated by a separate servo, while the plain flaps are operated by one common servo. The universal Profi program can also be used for models have two wing mounted servos. In this case the functions not required are left unoccupied in the receiver.

Options specifically meant for power models are missing here. However, there are available all kinds of imaginable mixing and coupling functions between aileron, elevator, rudder, spoilers and plain flaps, which are realised by special mixers. For the different tasks, duration, distance, speed and start, pertinent elevator trim data and flap settings can be stored and called

later on. For other applications seven freely programmable mixers are available.

Type 7: F3B (4 wing servos)

Type 7 corresponds to type 6, with the exception that in the case of type 7 the flaps are actuated by a separate servo each, thus providing additional mix options (ailerons-flaps) which are also realised by a special mixer. Here, too, seven freely programmable mixers are available.

The universal Profi program can also be used for models have two wing mounted servos. In this case the functions not required are left unoccupied in the receiver.

Type 8: HELI

Type 8 is a universal helicopter program for practically all helicopters, unless they are not to be operated exclusively with an RPM regulator which can not be turned off or overridden by the throttle channel. Here one finds all currently imaginable options for helicopters of all types and sizes, both for normal operation and for demanding competition work.

Type 9: HELI (with speed control)

Type 9 is suitable for model helicopters which are exclusively operated with a speed control operated via an auxiliary channel. In this case the compensating functions acting on engine control are missing. Other control functions effect the auxiliary channel, which in turn correspondingly controls the regulator. If a speed control is used, which can be turned off or overridden by normal throttle control, type 8 should be used.

Mode of Operation

The mode of operation permits skimming through the program of a model by pressing key LIST-DM, then pressing INC to go forwards and DEC to go backwards. Aster the desired code number has been found, the program in question can be selected using the ENTER key. The value can then be set using the INC and DEC keys as well as CLEAR and 1 …9, respectively.

The survey of contents is vacated by pressing the CLEAR key while a new code number and title of the code appears in the lower line of the display.

Analogue Adjustment of Values

The functions of the INC and DEC keys can be taken over by a proportional rotary module (order number 4111) wire to plug station AUX or a proportional module (order number 4152).

Calling the function is performed as before, but at that station where adjustments are to be made, normally by the INC and DEC keys, the rotary control is activated by key 9. Adjustments are then made performed using the rotary control. In the case where the adjustment range of the rotary control should prove inadequate to obtain the desired value, the rotary control has to be turned off on reaching the end position, via the DEC key, and then reset to suit, turned on again via key 9. This step can be repeated as often as required.

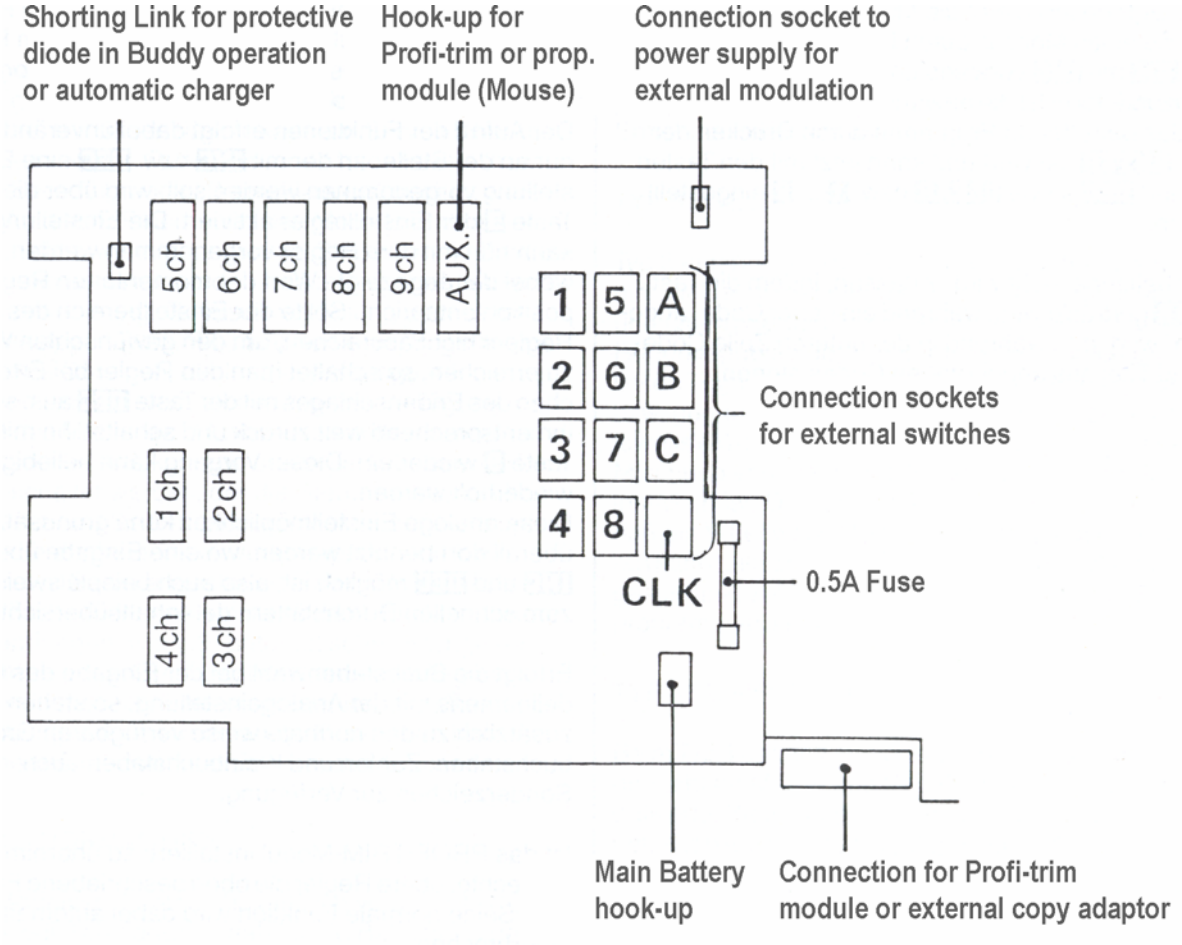
This analogue adjustment option can, in principal, be used at all stations where inputs are possible via INC and DEC keys, including for example for skimming the list of codes.

If, on imputing the name of the model, the selection of letter is performed using analogue setting, numbers, lowercase letters and special symbols will be available in addition to the normally available capital letters.

After the PROFITRIM-module has been installed, the right upper control will take over the functions described above. Its normal function will be interrupted automatically at the same time.

Fixed-Wing Aircraft Programming

Hook-up of External Operating Elements at the Transmitter Board



The operating elements wired to connections 5ch…9ch can be allocated differently, if so desired using code 37.

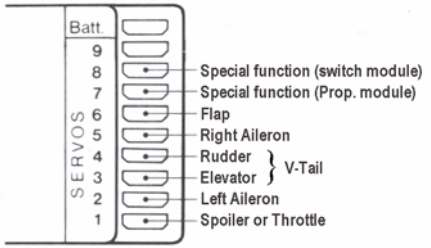
If a three position switch (diff. Switch, order no 4160/22) is connected, for example to switch aileron differential (code 22), the two plugs must be plugged into horizontally adjacent stations only (e.g. 4 and 8), never one above the other (e.g. 3 and 4).

The external plug stations 1…8 are allocated to the desired functions using codes 23, 33 and 34. A switch (e.g. 4160/11) connected to the CLK connection is used to start/stop the countdown timer.

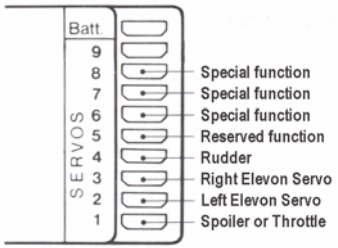
The connections A…C may only be used for the automatic aerobatic manoeuvre (code 66).

Allocation of Receiver Outputs

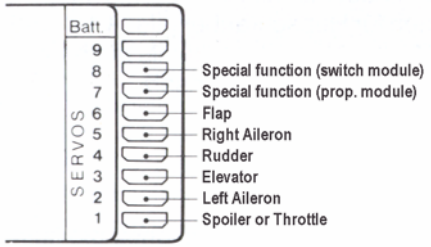
Types 1 & 2 - Normal / Differential



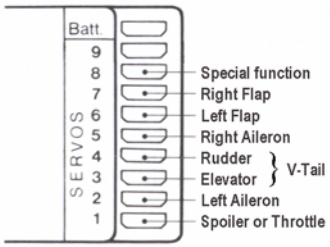
Type 3 - Delta



Types 4 & 6 - Universal / Diff. (3 wg servo)

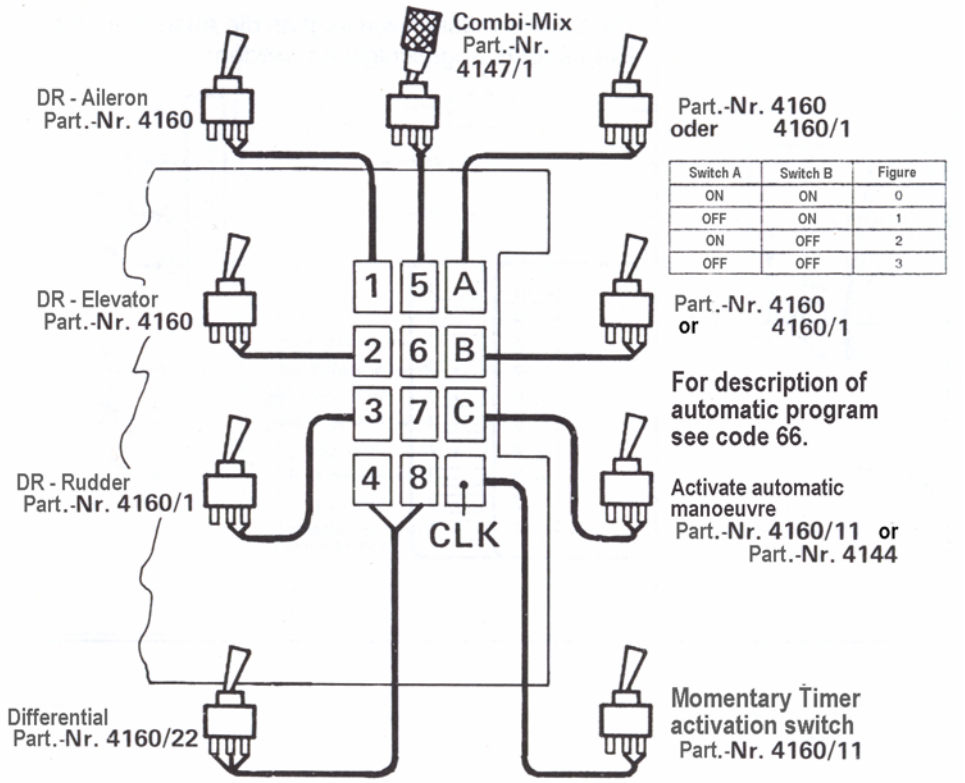


Types 5 & 7 - Quattro-Flap (4 wing servos)

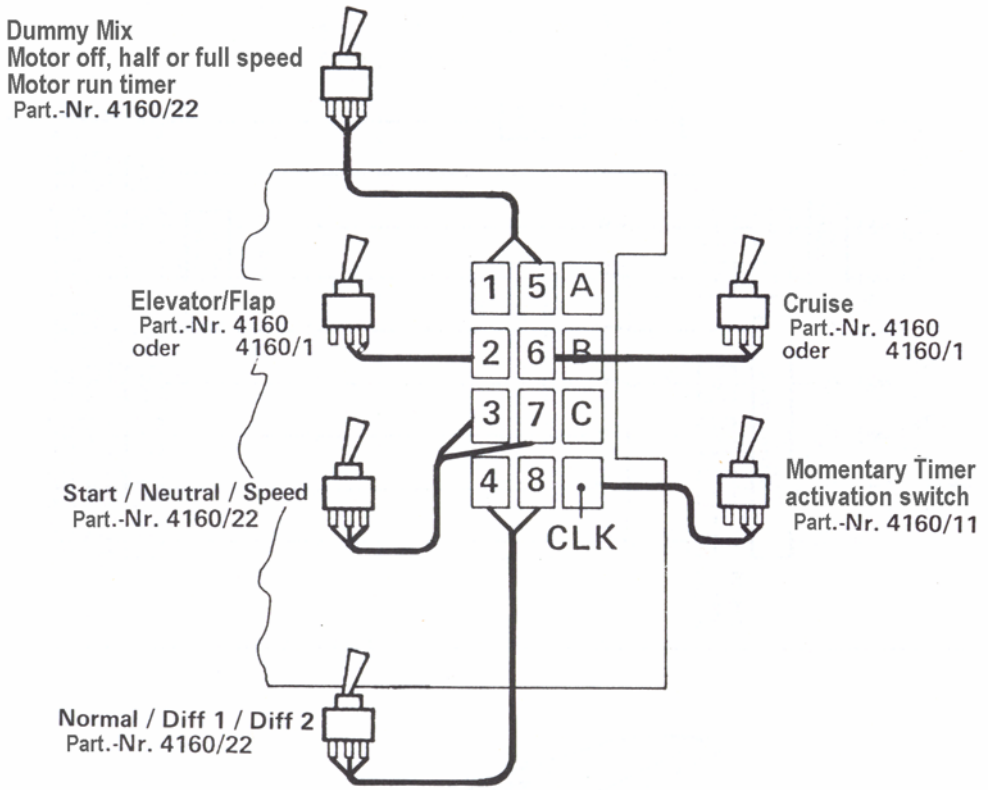


Recommended Allocation For Switches

Example allocation of Switches for F3A models



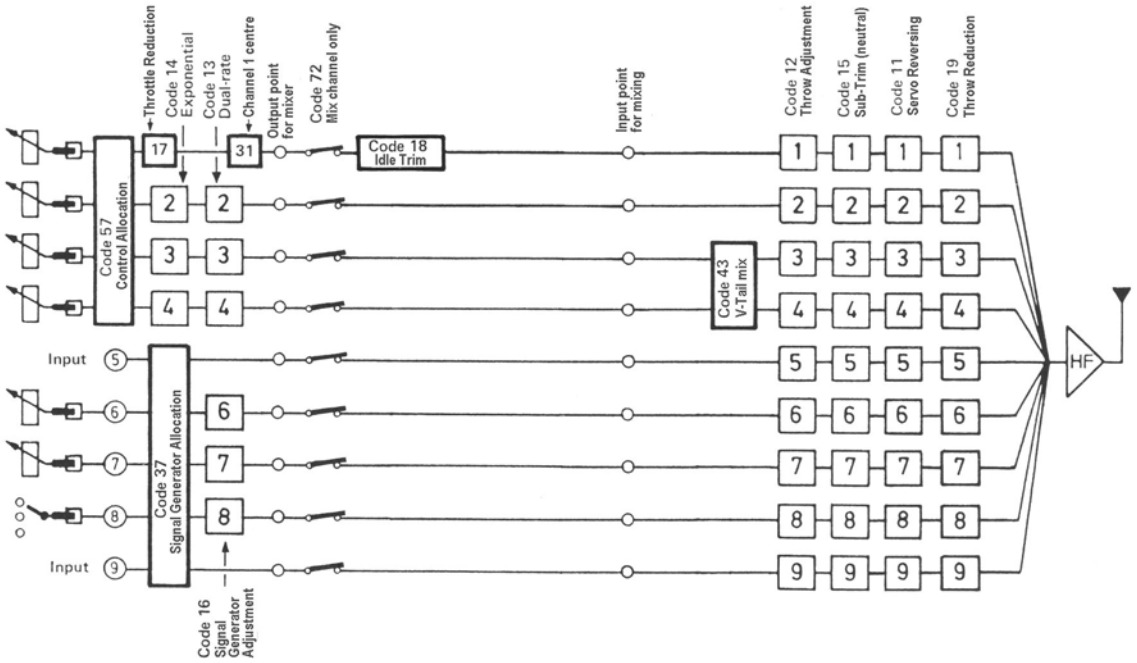
Example allocation of Switches for F3B and F3E models



The switch allocation is freely programmable, that is: any switch can be programmed for any desired function.

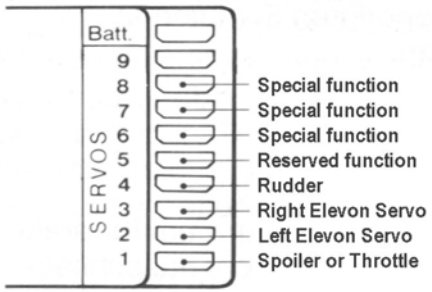
These practical examples of switch allocations are meant to simplify programming for the inexperienced.

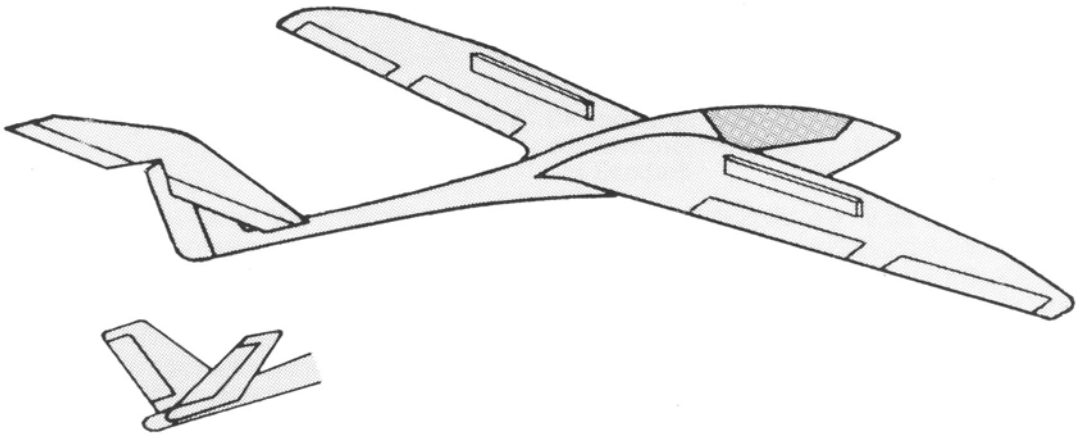
Block Diagram - NORMAL

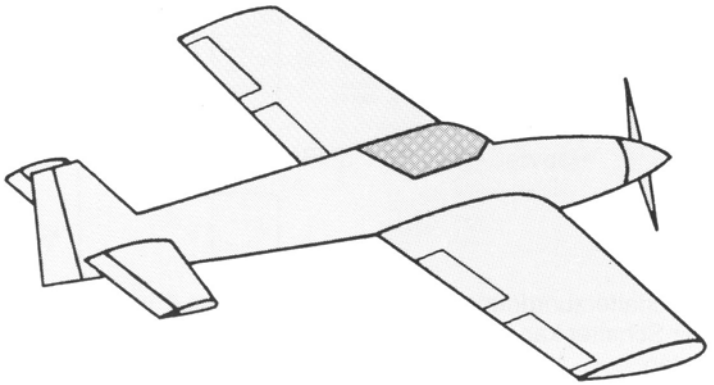


Allocation of Receiver Outlets

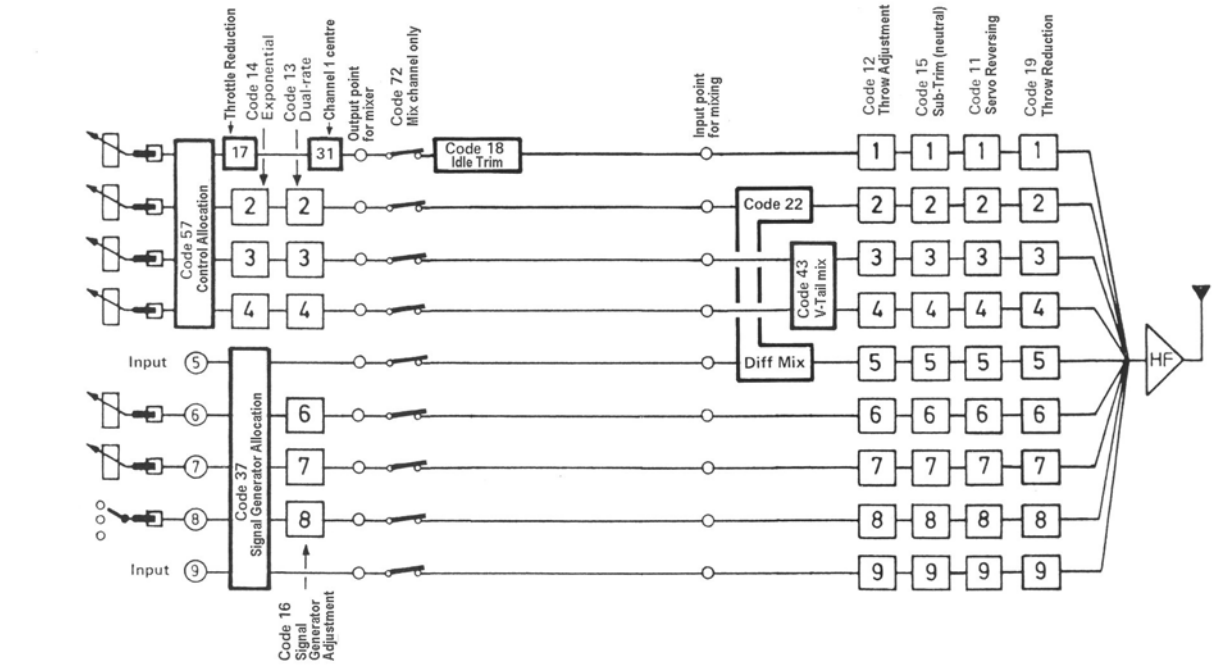
The servos must be connected to the receiver outlets as shown below.







Block Diagram – NORMAL/DIFF



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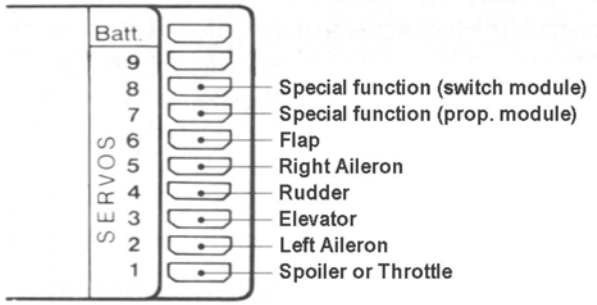
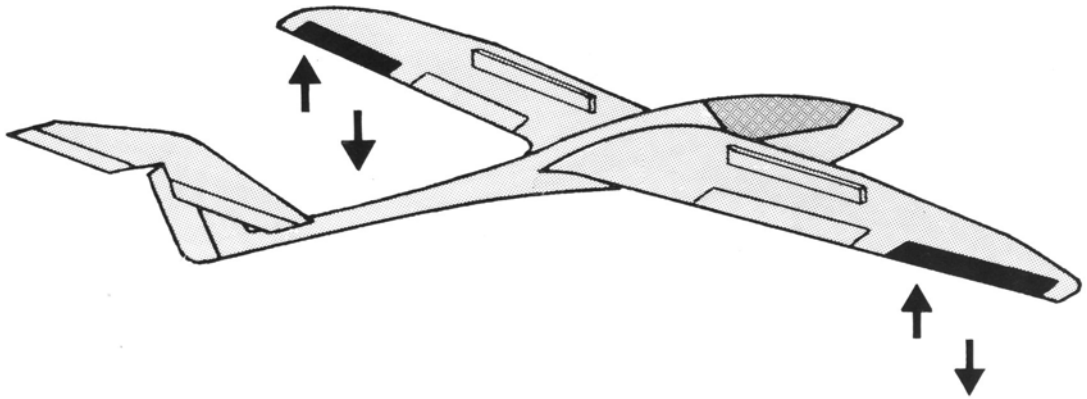
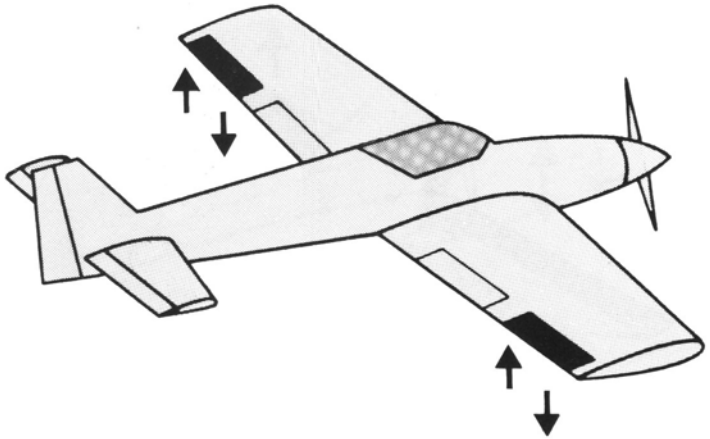
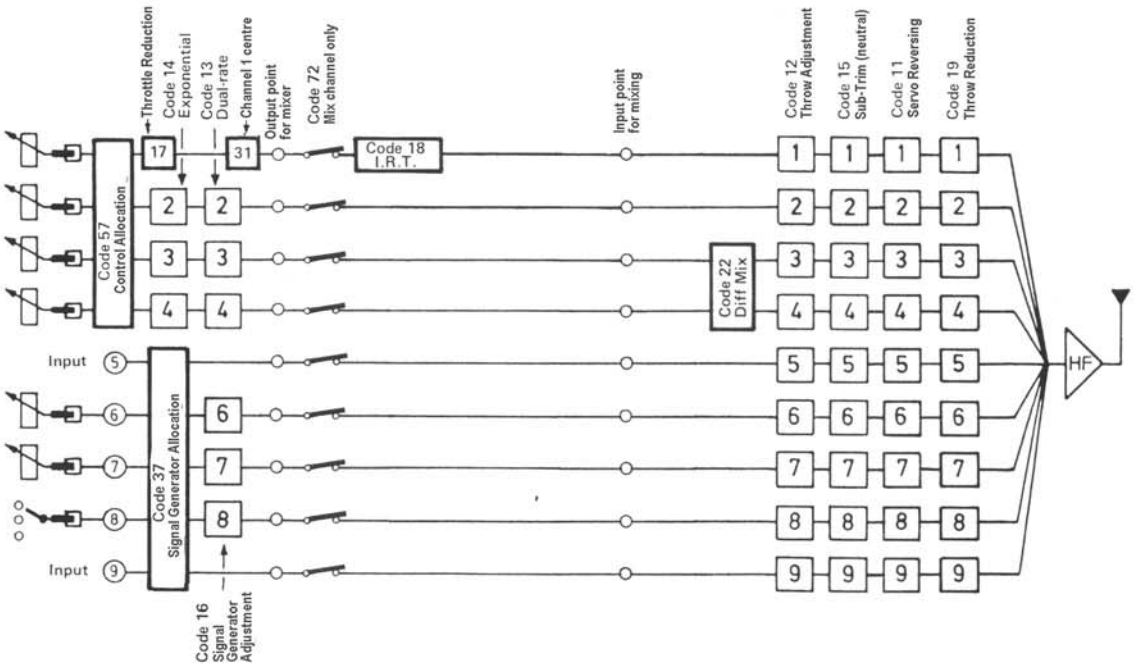






Block Diagram – DELTA/DIFF



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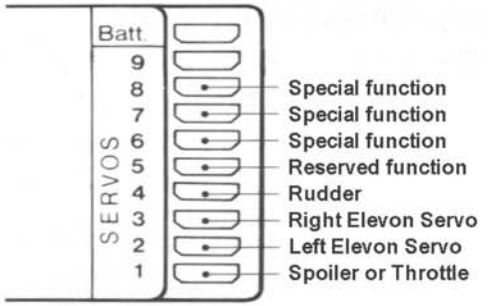
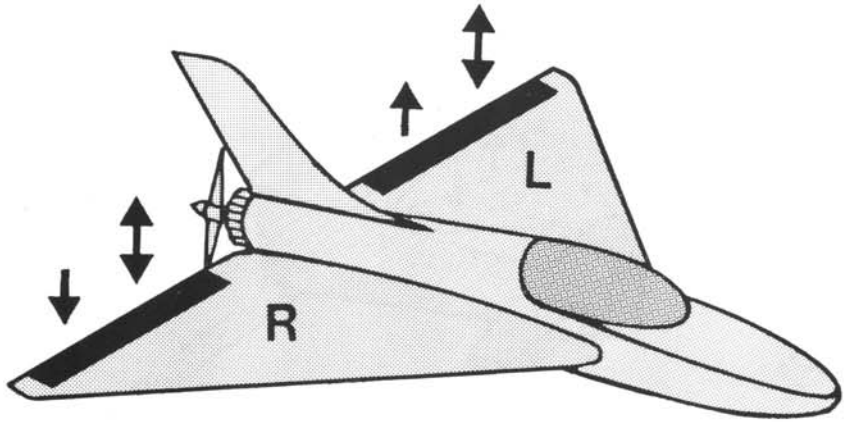
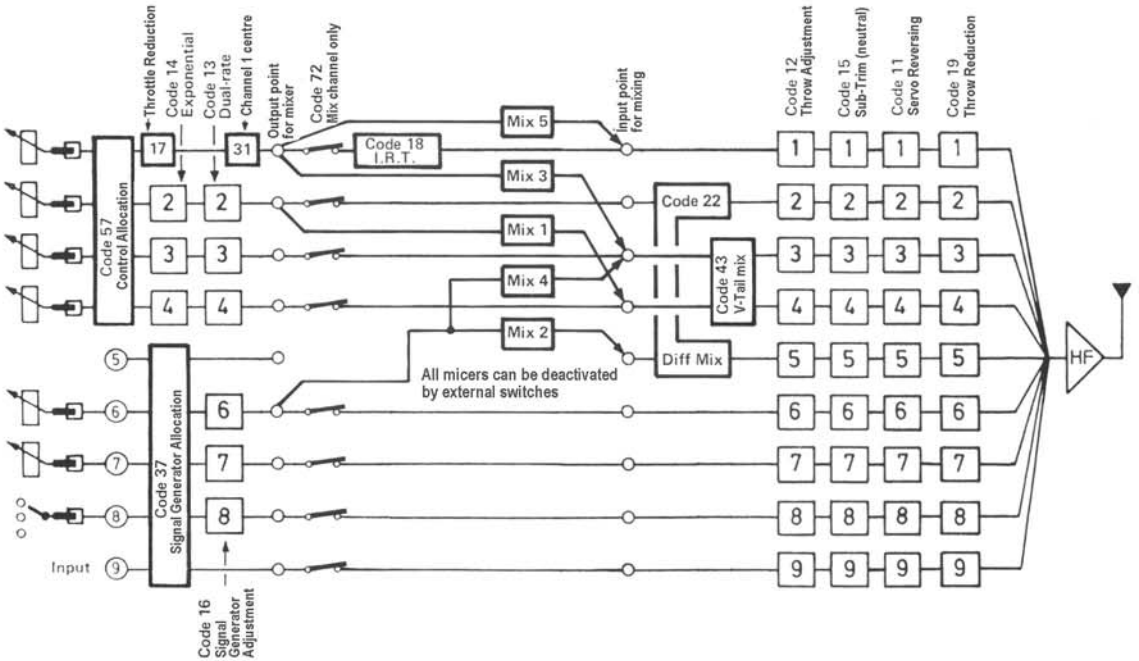


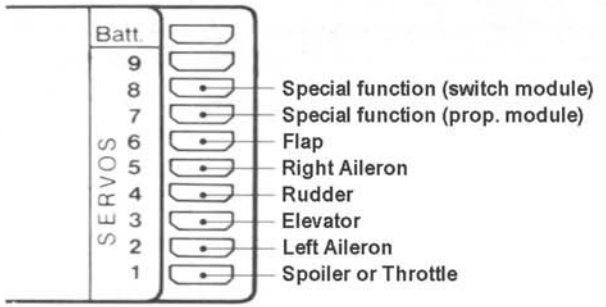


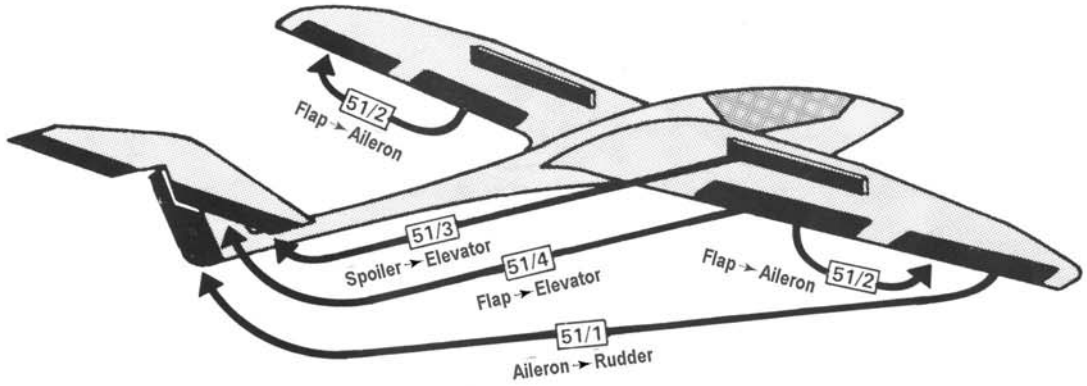
Block Diagram – UNIFLY/DIFF

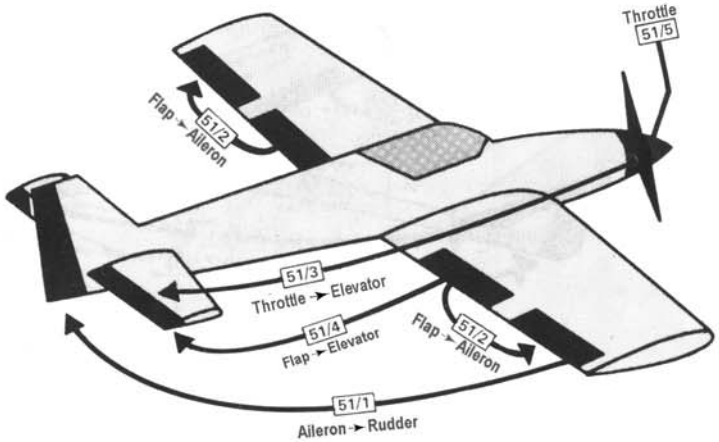


Allocation of Receiver Outlets

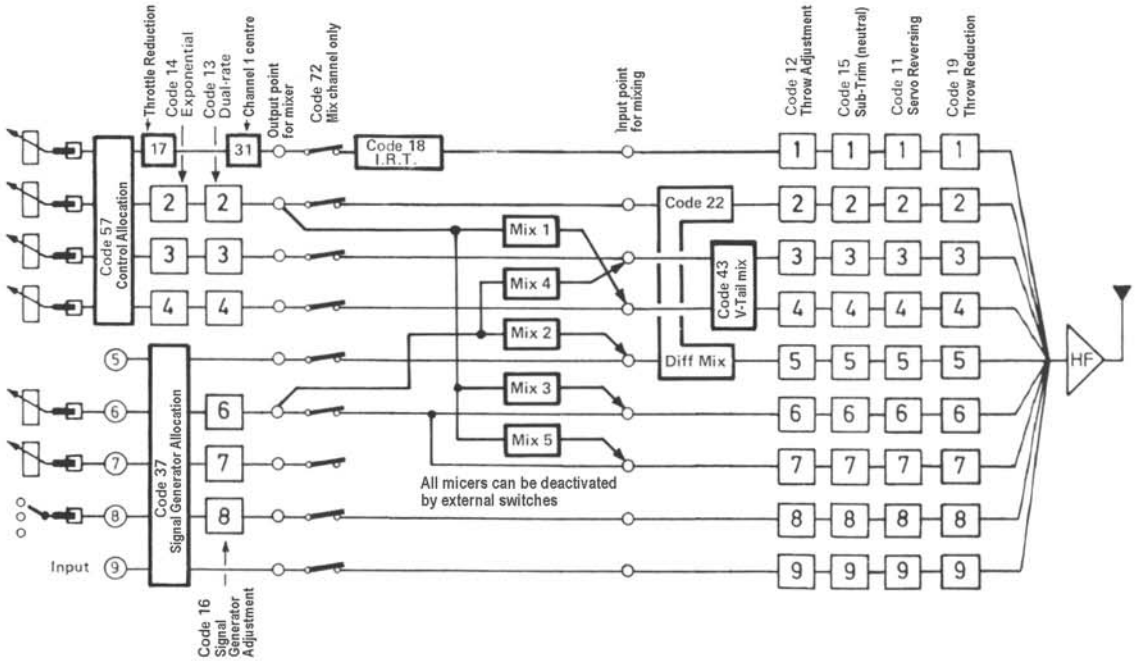
The servos must be connected to the receiver outlets as shown below.







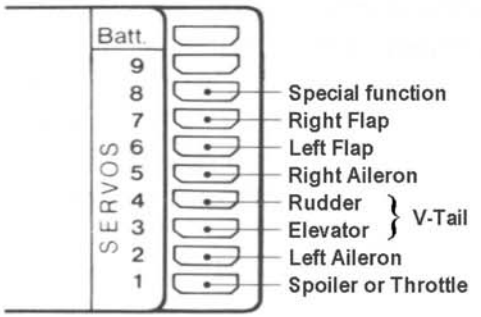
Block Diagram – Quadro-Flap

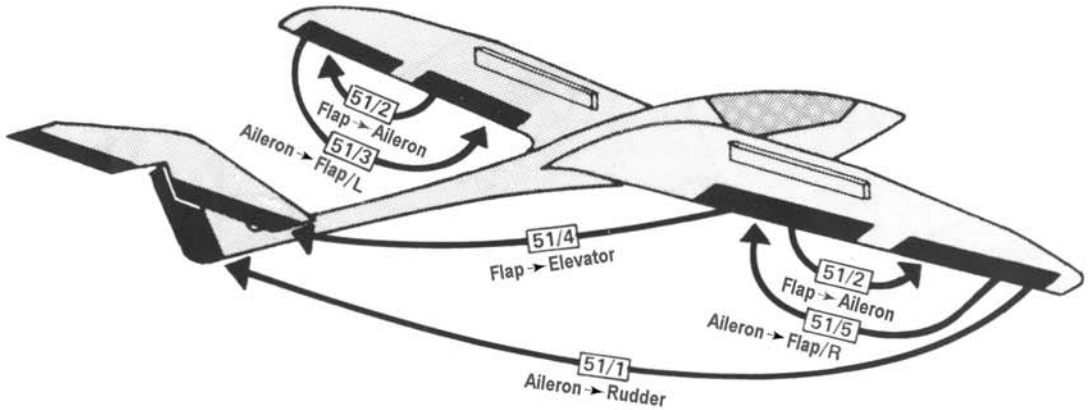


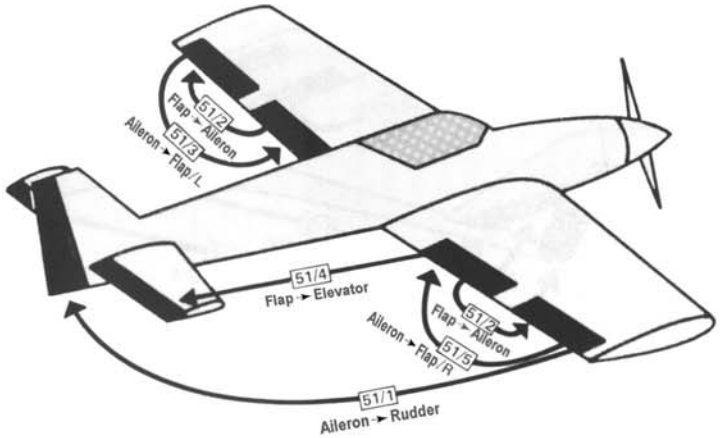
Allocation of Receiver Outlets

The servos must be connected to the receiver outlets as shown below.

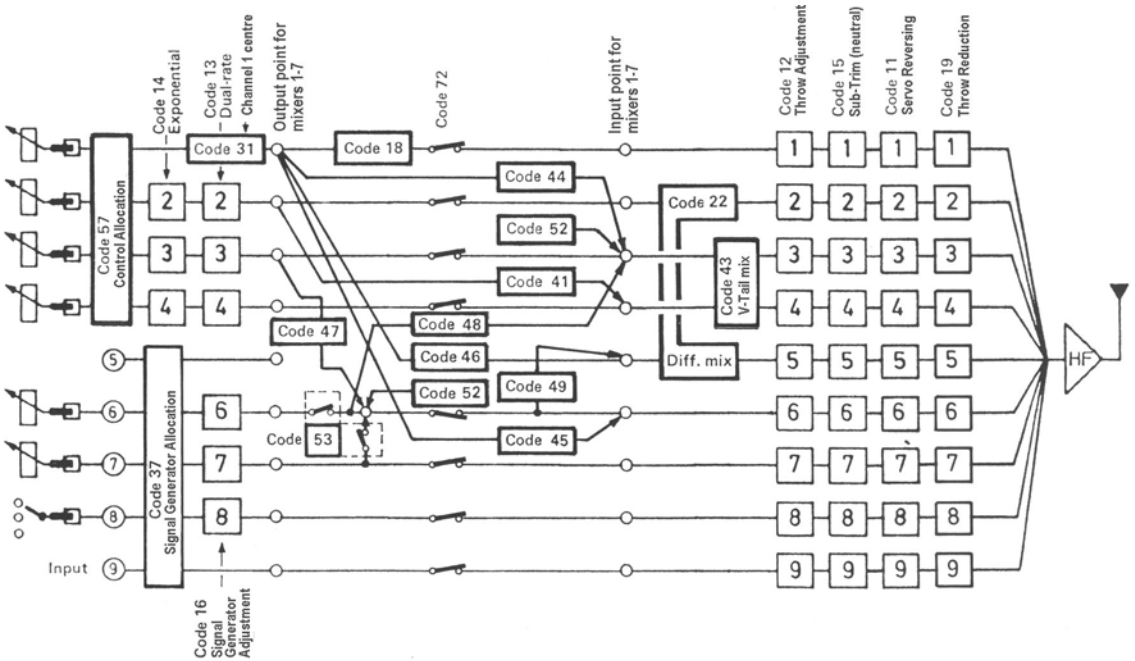
Unused functions should be left unconnected at the receiver.







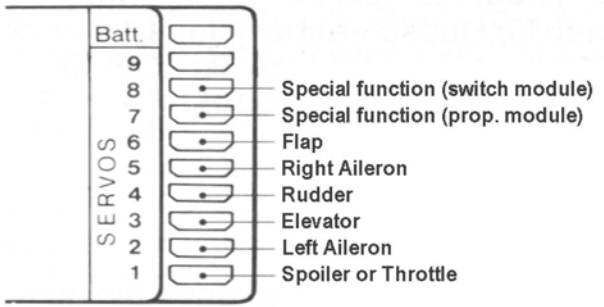
Block Diagram – F3B (3 wing-servos)



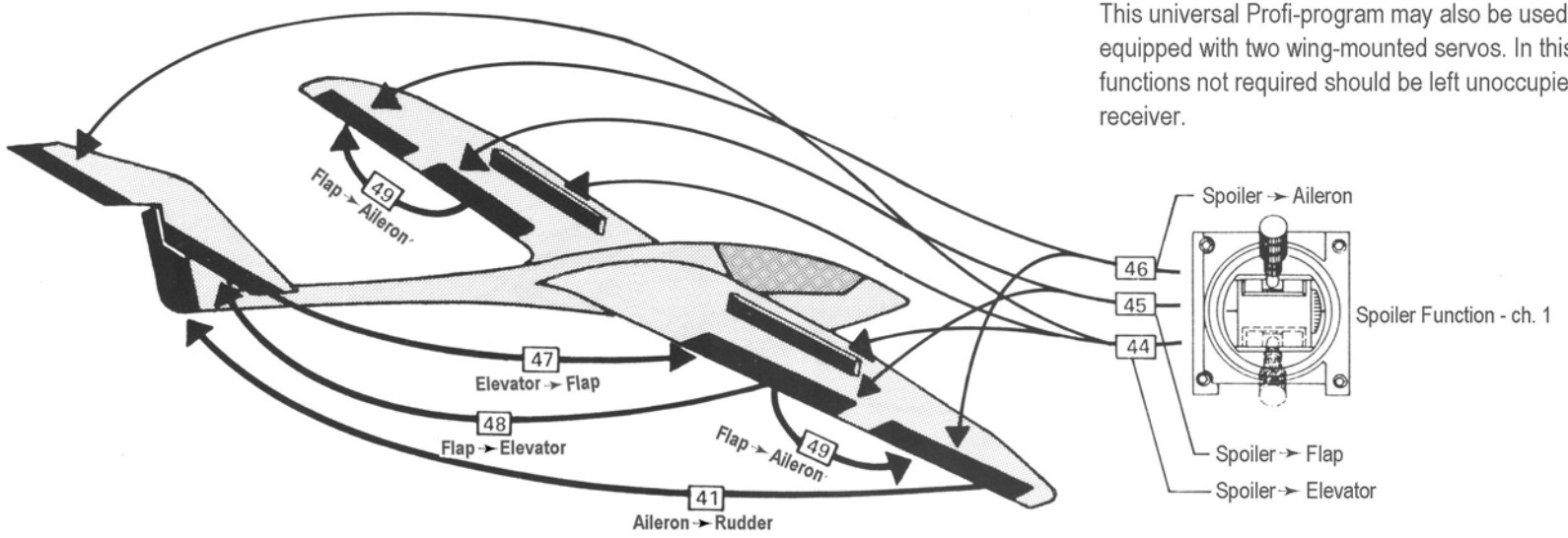
Allocation of Receiver Outlets

The servos must be connected to the receiver outlets as shown below.

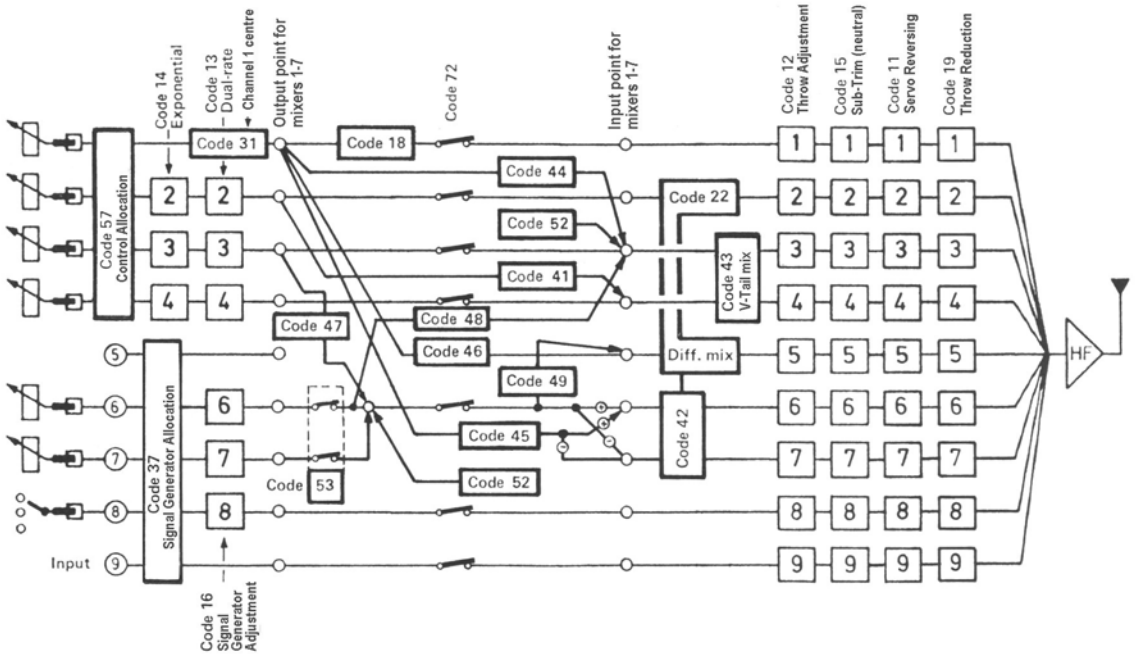
Unused functions should be left unconnected at the receiver.



This universal Profi-program may also be used for models equipped with two wing-mounted servos. In this case, the functions not required should be left unoccupied at the receiver.



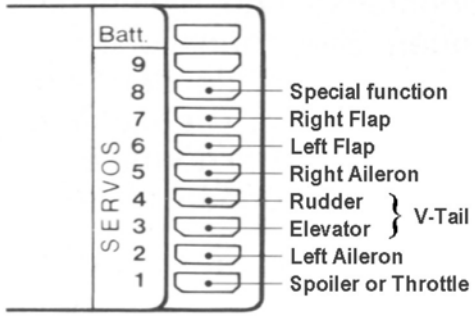
Block Diagram – F3B (4 wing-servos)



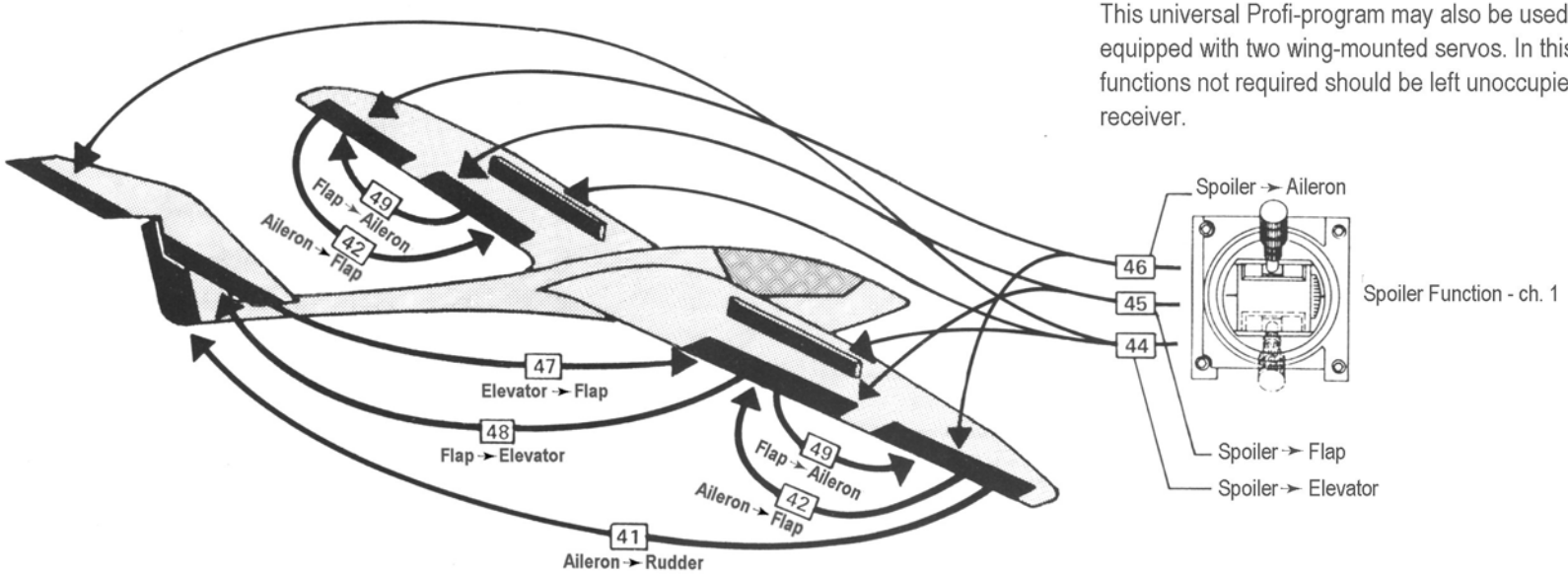
Allocation of Receiver Outlets

The servos must be connected to the receiver outlets as shown below.

Unused functions should be left unconnected at the receiver.



This universal Profi-program may also be used for models equipped with two wing-mounted servos. In this case, the functions not required should be left unoccupied at the receiver.



Programming

Code List (Types 1…5)

The codes for the various options were chosen as a result of in-house deliberations. The following programming instructions, are arranged in the sequential order of the individual programming steps. These are arranged to suit practical requirements, the code numbers are not arranged in numerical order.

When a new model is being programmed, be sure to follow the sequences detailed in the following pages. If you don't follow it, you may forget something or unintentionally change other, earlier made adjustments.

In subsequent descriptions functionally related options have been grouped together, so they will be comparatively easy to fund.

Code 56
Model Selection

Selection and Deletion of Models

s	e	l	e	c	t		M	O	D	E	L		
K	E	Y		1	-	7		O	R		+	/	-

The MC-18 transmitter permits the storing the data of seven models and 30 models[2], including all trim data. To this end, actual trim data have to be stored into the trim memory via code 59, so the trim sliders of control functions ailerons, elevator and rudder can be moved to the centre position. In this manner finding trim data required for a newly selected model (after a change of model) will be very much simplified, as all you've got to remember is that all trim levers will occupy the centre position.

After calling code 56, model selection is performed either directly by entering the model number under which the desired model has been stored, or by skimming through the index of stored models to and fro via keys INC and DEC. In either case the name of the currently selected model will appear in the lower line of the display. You still have the possibility to correct your selection by entering another model or by skimming the index once again.

The selected model will be activated by ENTER. If the CLEAR key is pressed instead of ENTER, complete deletion of the selected model data can be initiated. This process is be performed by the ENTER key, and aborted by any other key.

In case the model selected has been programmed for another kind of modulation than the preceding one, the display message "POWER OFF" indicates that you've got to turn the transmitter off and then on again so that the switch from PCM to PPM (or vice versa) can be made.

[2] Transmitters are configured for 30 models, starting with series '89

Code 95
Modulation

Selection of PPM or PCM Modulation

m	c	-	1	8	E		M	O	D	E	L		1
M	O	D	U	L	A	T	I	O	N		P	P	M

The MC-18 transmitter permits operation on PPM (Pulse Position Modulation) or PCM (Pulse Code Modulation).

Switch over is provided by code 95, using the INC and DEC keys.

After a change of the modulation mode, the display text will indicate that the transmitter has to be turned off momentarily, so that it can swap over to the changed modulation.

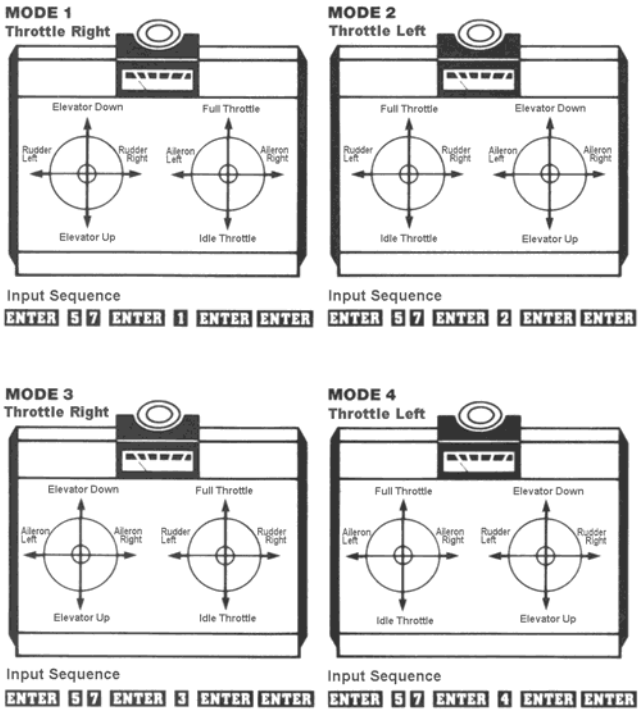
Code 57
Control Allocation

Allocation of Control Functions 1 – 4

m	c	-	1	8	E		M	O	D	E	L		1
M	O	D	E		2								

Fundamentally there are four different modes for allocating the control functions ailerons, elevator, rudder and throttle to the two control sticks. Which of them is used depends on the individual preferences of the modeller.

The selection of the desired mode of operation is performed by selection of code 57 via keys 1...4. Changeover of the internal mechanical spring centring will be required when changing between even and odd mode numbers.



Code 58
Model Type
Selection of Model Type

m	c	-	1	8	E		M	O	D	E	L			1	
N	O	R	M	A	L	/	D	I	F	F					

The PROFI-ULTRASOFT-Module recognises a total of 9 different model types. The selection has to be performed when beginning to program a model, as it determines which codes may be called. A code number which is incompatible with the model type concerned, will be rejected by a message “INH (WRONG TYPE)”.

The following model types can be selected via buttons 1...9 on activation of code 58, with the selected type indicated in the lower line of the display.

Key	Display	Meaning
1	NORMAL	Conventional model
2	NORMAL/DIFF	Same as 1, but with 2 aileron servos and differential
3	DELTA/DIFF	Deltas and flying wings with aileron/elevator mix
4	UNIFLY/DIFF	Models with plain flaps operated by a single channel
5	QUADRO-FLAP	Same as 4, but flaps operated by 2 channels
6	F3B (3 wing sv)	F3B model with 3 wing-mounted servos (1 channel for flaps)
7	F3B (4 wing sv)	F3B model with 4 wing-mounted servos (2 channels for flaps)
8	Heli	Universal helicopter program including models with RPM control
9	Heli (sp.ctl)	Helicopter with RPM control only

When changing model type via code 58, you must be aware of the fact that some of the already programmed adjustments will be deleted and reset to their basic values, even if immediately switched back to the initial model type.

Code 32
Model Name
Entering Model Names

N	A	M	E	:										
D	I	S	C	U	S		3	3	0					

Due to the variety of model programs which can be stored in the transmitter at the same time, it will not be easy to remember the number of a model, the data of which have been stored in memory. For this reason the name of a model can be additionally stored. The relevant test, which must not exceed 11 symbols, is indicated in the multi-data terminals display.

On selecting code 32 the earlier input text will appear or, when programming for the first time, an empty line. Using the INC and DEC keys the letters of the alphabet and numbers 0 through 9 may be selected. Use of the TURN key permits switching from capital letters to lowercase. When the desired character appears it is accepted by pressing STORE and the next character can be selected. When finished, press the ENTER key.

Deletion of data input is performed by pressing the CLEAR key.

If analogue input is used, via a proportional rotary module connected to the AUX socket, for selection of the characters, special symbols will be available in additional to capital letters and numbers, for dressing up a names.

Code 18
Engine Idle Trim
Idle Trim Direction Forward/Backward/Off

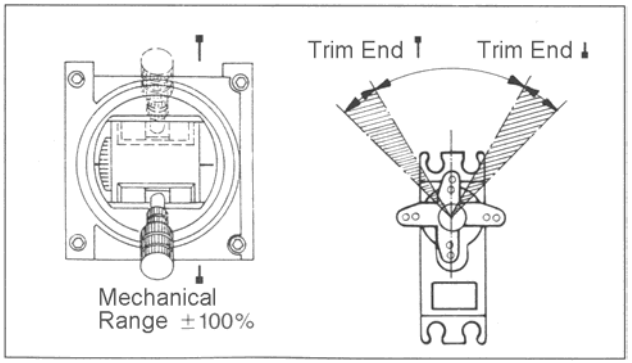
m	c	-	1	8	E		M	O	D	E	L			1	
I	D	L	E		R	.		T	R	I	M		⊥		

Idle trim is permanently allocated to control function 1 (throttle) and permits precision adjustments of idle RPM to be performed without affecting full throttle adjustments.

Code 18 enables the pilot to adapt idle trim to the direction of operation of the throttle stick he uses.

After calling the code, the direction of operation (push or pull) can be reversed by pressing the INC and DEC keys. The currently active adjustment is shown on the display in a stylised control stick which indicates idle stick position.

Idle trim can be switched to normal trim – bi-directional effect – by pressing the CLEAR key.



Code 23
Switch Function

Allocation of External Switches to Model Types 1 – 5

→	C	L	K		D	I	1		D	I	2		P	R	G
		N				9				9				N	

External switches installed and connected to plug stations 1 – 8 are allocated to specific functions via code 23. Some of these functions can be activated and de-activated in the process. Allocation can be performed either as per the mechanical mode of operation of the switch (open = OFF, closed = ON) or by pole reversal (open = ON, closed = OFF).

In addition to physically existing switches a logical “phantom switch” is available, designated numeral 9. By allocation of this switch one of the functions can be permanently switched on or off, respectively.

As any number of functions can be allocated to any of the switches, linkages can be realised. Without this mixers would have to be used, which remain available for other purposes.

Allocation and pole reversal of external switches

After calling code 23, the functions available for the active model will appear on the upper line of the display, with the allocated switches appearing on the line below. Numerals indicate the switches wired to the corresponding plug stations.

N means that the function in question is de-activated. Flashing numerals indicate that the switch concerned has been allocated with reverse polarity. The small arrow (upper line) indicates the function to which the switch can be allocated at the present time. It can be moved to the right or left by pressing the INC and DEC key, respectively.

As not all of the available functions can be shown at the same time on the display, the latter can be moved – window style – over the two lines, showing the allocations. When the arrow points to the outermost right function, the next function will appear in the display when the INC key is pressed. They can be scrolled left by pressing the DEC key. In this manner any of the functions can be displayed.

To allocate the selected functions press the CLEAR key. As a result a question mark symbol will appear on the lower line. To switch be may allocated by pressing keys 1…9. If the switch is to be reversed, the DEC key has to pressed first.

If a de-activatable, currently active function is selected, pressing the CLEAR key will first de-activate the function, pressing the CLEAR key a second time will display the question mark symbol.

The type and number of functions, to which switches can be allocated via code 23, depends on the activated model type (code 58).

Available functions for model types 1…5

CLK Stopwatch in standard mode, runs as long as switch is closed.

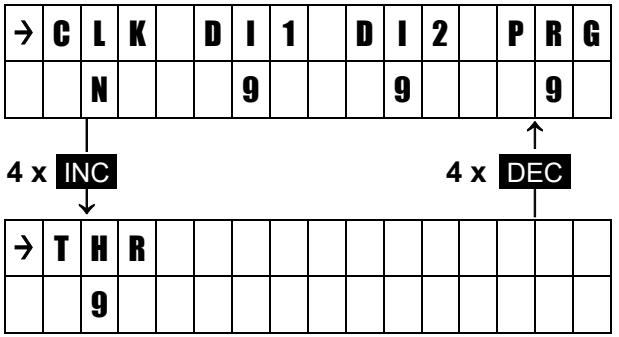
DI1 Differentiation switch 1 (see code 22)

DI2 Differentiation switch 2 (see code 22)

PRG Activation of automatic program (code 66)

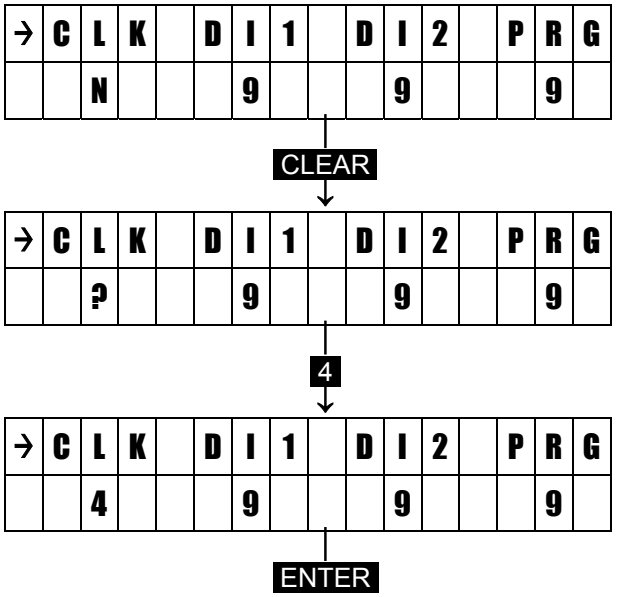
THR Throttle reduction (code 17)

Using code 73 the switch position, number and direction of operation of the desired switch can be found quickly and reliably.



Selection of individual functions - Stopwatch

ENTER 2 3 ENTER



Code 37
Signal Generator Allocation

Allocation of Operating Elements Channels 5 – 9

P	O	R	T					5	6	7	8	9		
I	N	P	U	T				5	6	7	8	9		

In some cases, for individual models, it may be desirable to have certain operating elements, such as slider-type potentiometers or channel switches affect other function outputs than those to which they have been allocated by the internal connection.
Code 37 permits free choice of allocation of the operating elements to the function outlets without changing the internal connections. In addition it is possible to have one operating element affect several function outputs.

After selecting, the function inputs (operating elements) appear in the upper line of the display identified by the socket 5…9, and the output to which they have been allocated appears in the lower line. Signal generator 7 is, for example, the slider-type potentiometer is connected to plug station 7.

To allocate one of the function inputs to another operating element, select the function concerned by one of the keys … 9, whereupon a question mark symbol appears in the lower line below the selected function. Pressing key 5 … 9 allocates this function to the desired operating element, which may have also been allocated to another function, affecting both functions in that case.
Normal allocation will be restored by pressing the CLEAR key.

In the case that a signal generator action should be undesirable, in special case such as a dummy mixer, the signal generator concerned can be turned off via code 72.

Code 43
V-Tail

V-Tail Mixer

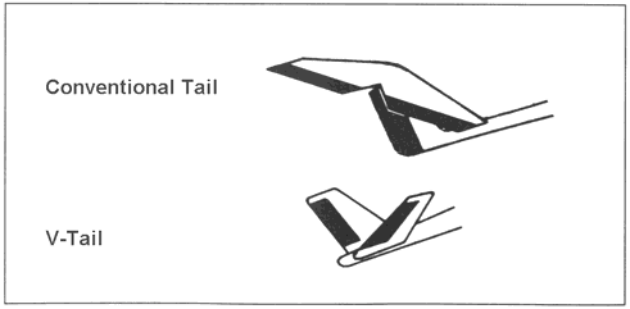
m	c	-	1	8	E		M	O	D	E	L			1	
V	-	T	A	I	L		O	F	F						

With models fitted with a V-tail the functions of elevator and rudder are mixed in a such a manner that in the case of the elevator both control surfaces are moved up and down (in the same direction), but in opposite directions (one up, one down) the case of rudder. Unlike mechanical solutions where the elevator servo and the rudder servo actuate both surfaces via a suitable mechanical mixer, each control surface is operated by a separate servo. This solution provides the advantage that control of the V-tail is slop-free and accurate, and that in addition, higher control forces are available.

The V-tail mixer can be used for all types of models, naturally with the exception of helicopters (types 8 and 9) and Deltas and flying wing models (type 3) as in these case elevator function and aileron function are mixed anyway.

After calling code 43, the V-tail mixer can be turned on via the INC and DEC keys, and turned off by pressing CLEAR.

The elevator/rudder mix ration can be modified via the dual-rate adjustment, code 13.



Code 11
Servo Reverse

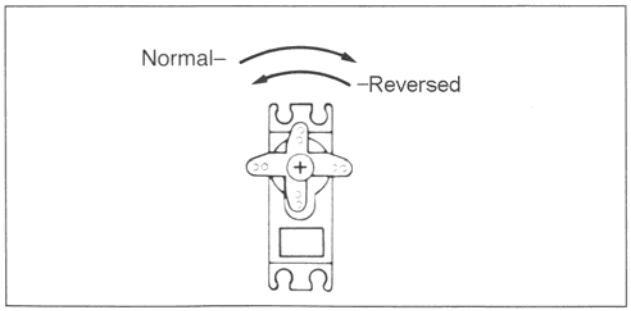
Reversing Direction of Servo Rotation

R	E	V	.	S	W			2	3		5			8	
		N	O	R	M		1			4		6	7		9

Code 11 permits changing the direction of rotation of servo to those required in a model, so the linkages etc., can be installed without paying attention to the initial direction of rotation of the servos in question.

After calling code 11, the direction of rotation of all servos will be simultaneously indicated on the display by their numbers 1…9 with the numbers appearing in the bottom line indicating normal rotation, and those appearing in the upper line indicating reversed rotation.

Important:
The numerals of the servo designation always refer to the receiver outlet to which the servo is connected. Any conformity with the numbering of the control function inputs of the transmitter would be purely coincidental. They won't occur normally because of the complex special programs of these hi-tech models. For that reason a change of allocation of control functions (code 57) won't affect the numbering and direction of rotation of the servos.



Code 15
Neutral Adjust

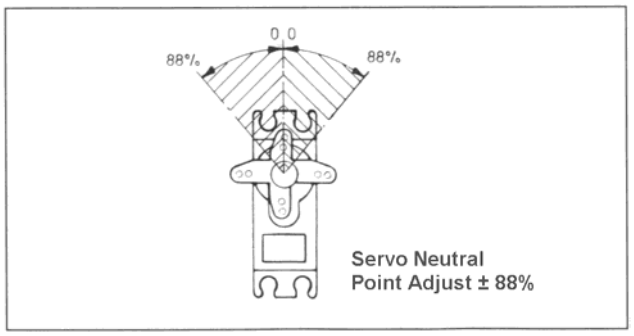
Adjusting the Servo Neutral Position

SUB	TRIM										
push	ch		key			1	-	9			

For adjusting servos which do not comply to normal standards (servo neutral 1.5ms) and for extreme requirements, the neutral position can be adjusted within a range of ±88% of normal servo travel.

After calling the servo concerned via keys 1 …9, the servo neutral position can be adjusted with the INC and DEC keys; pressing CLEAR restores the initial normal neutral position.

This adjustment refers directly to the servo concerned and is independent of all other trim options.



Code 12
Servo Travel Adjust

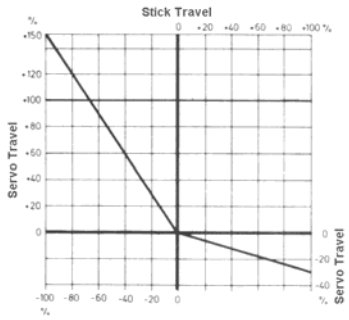
Adjusting Servo Travel

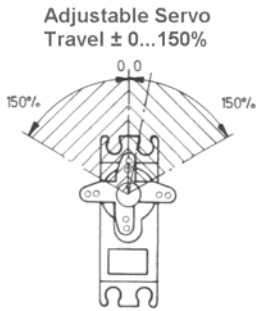
THROW	ADJUST										
push	ch		key			1	-	9			

Code 12 permits adjustment of servo travel for either side of motion independently. The range of adjustment is 0 – 150% of normal servo travel.

Important:
Unlike code 16, changing the signal generator, these adjustments refer directly to the servo concerned, independent of the source of the signal for the servo – be it control stick or any of the mixer functions.

After calling code 12 and input of the servo concerned using keys 1 …9, the travel of the selected servo will be indicated, with a prefix + or – indicating the side. For adjustment and display, the operating element (control stick, slider, rotary control or switch) has to be moved to the end station in question. The desired servo travel can then be adjusted with the INC and DEC keys, and may be reset to default travel (100%) by pressing CLEAR.





Code 19
Servo Travel Restrict

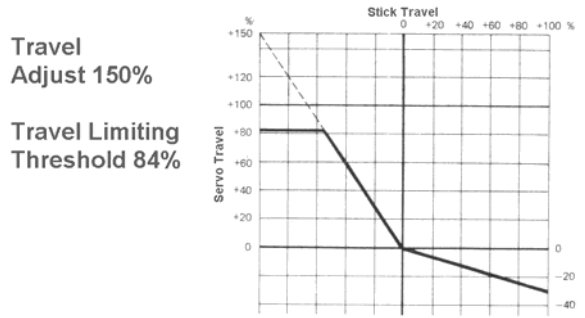
Limiting Servo Travel

THROW	LIMIT										
push	ch		key			1	-	9			

As a result of the cumulative action of mixers, the resulting deflection of servos may exceed the normal travel range. All Graupner servos feature a reserve of an additional 50% of the normal range. The transmitter restricts motion to 150% to prevent stalling the servos by mechanical constraints.

In certain cases it may prove advantageous to have servo travel limiting to become operative at a lesser servo travel, if for example, deflection is limited mechanically and the servo range normally used in flight must not be restricted unnecessarily, but unacceptably large travel might result from extreme combinations.

Code 19 permits adjusting the travel limiter threshold in 16 steps between 9 – 150% of normal control range, individually for each channel and each side of neutral. To this end, the desired channel has to be called first, by using keys 1 …9, followed by shifting the stick, slider, etc., to the desired end point. The travel limit can then be adjusted via the INC and DEC keys.



Code 79
Servo Slow Down
Slowing-Down Transit Time

S	L	O	W		D	O	W	N		O	F	F			
E	N	T	E	R		C	H		T	O		A	C	T	.

In some special cases, such as retracts, the normally fast transit time of a servo does not look right.

With code 79, the transit time of a servo connected to any of the channels may be slowed-down from 0.5s to 30s when moving from one end point to the opposite end point.

After activation of code 79, the desired channel has to be selected using keys 1 …9.

Transit time is slowed down by the INC key, with steps being very small for short transit times and larger with longer ones. Below 1.5s the steps are so small that the display only changes after several steps. In all some 50 intermediate values are provided. Pressing the DEC key reduces the transit time and the CLEAR key cancels the deceleration completely.

This function is not compatible with retract servos such as G503 (order N° 3977) and C2003 (order N° 3890).

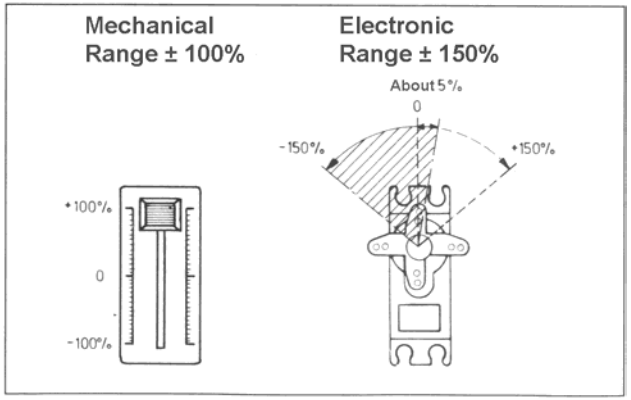
Code 16
Signal Generator Setting
Changing Control Travel

T	R	A	C	E		R	A	T	E						
p	u	s	h		c	h		k	e	y			6	-	8

Control travel resulting from actuating an operating element on function inputs 6 – 8 is adjusted by code 16.

The range of adjustments amounts to 0 – 150% of the normal range. Unlike code 12 (servo travel adjust), these adjustments refer to the operating element (slider, rotary control or switch) independent of the latter acting directly on a single servo or via a complex mixing and coupling function on several servos.

After calling code 16 and input of the function concerned via keys 6 …8, the adjusted control range will be indicated with a prefix + or – indicating the side. For adjustment and display the operating element concerned has to be moved to the end point in question. The control range is then adjusted using the INC and DEC keys, or set to the normal (100%) via the CLEAR key.



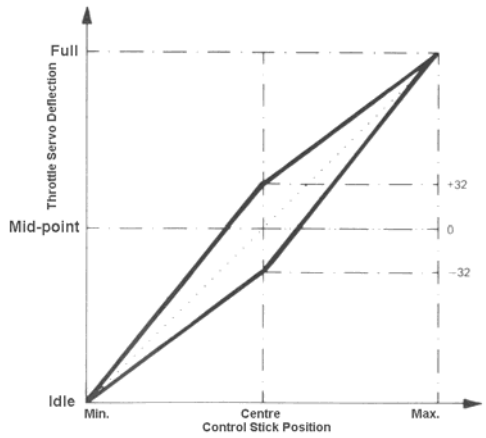
Code 31
Channel 1 Centre
Throttle/Spoiler Actuating Curve

T	H	R	/	B	R	K		M	I	D	P	N	T		
+		1	6	%											

Code 31 permits changing the characteristics of the servo connected to channel 1 (throttle/spoiler) at neutral position of the stick without affecting the end position.

This setting can be used to compensate for non-linear throttle response, or to intentionally obtain a non-linear function of the spoilers, for example.

After calling code 31 adjustment of servo travel is performed using the INC and DEC keys, while directional changes can be made via the TURN key.



Code 34
DR/EX Switch

Dual Rate / Exponential Switch Allocation

→	D	R		2	3	4			E	X		2	3	4	
S	W	I		9	9	9						9	9	9	

The switches for the dual-rate and exponential functions are allocated using code 34. In doing so it is possible to trigger several control functions simultaneously without using multi-function switches.

Due to the possibility of reversing switch functions via the DEC key, dual-rate and exponential can be coupled with ant other function switch.

Allocation and reversing of external switches

After calling the designations of the control functions will appear in the upper line of the display for dual-rate and exponential, with the allocated switches concerned in the lower line. The small arrow in the upper line indicates whether the allocation for dual-rate or exponential is being performed, and it's position can be changed using the INC and DEC keys.

Allocation of the switches is performed by pressing the key for the input function (2…4) followed by the switch number, if necessary pressing DEC first to reverse the switch polarity.

After all allocations have been made, press ENTER to store the settings.

Using code 73, switch position, the number and orientation of the switches can be found quickly and reliably.

Code 13
DUAL RATE

Adjustable Servo Throw Reduction

D	U	A	L		R	A	T	E						
p	u	s	h		c	h		k	e	y		2	-	4

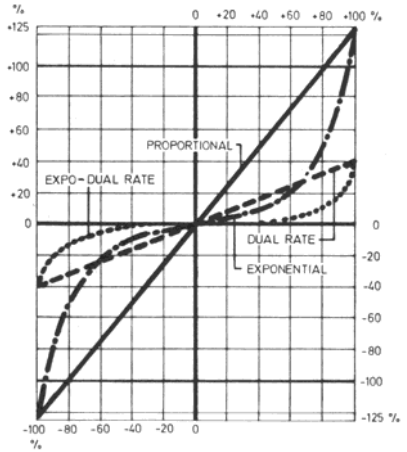
The dual-rate function permits in-flight switching of control characteristics, with the range of adjustment being variable between 0 – 125% of the normal range for each of the two switch positions. The switched must have been allocated beforehand using code 34.

Dual rate refers directly to the corresponding stick function, independent of whether it affects a single servo or, optionally via complex mixing and coupling functions, several ones.

After calling code 13 the desired control functions can be selected via keys 2…4:

- 2 = Ailerons
- 3 = Elevator
- 4 = Rudder

Adjustments of the control curve are performed using the INC and DEC keys after the switch has been moved to the appropriate position (P0/P1).



Code 14
EXPONENTIAL

Progressive Control Characteristics

E	X	P	O	N	E	N	T	I	A	L				
p	u	s	h		c	h		k	e	y		2	-	4

Exponential control permits obtaining sensitive control of a model near the neutral position of the function concerned, whilst maximum travel remains unaffected. The degree of progression can be adjusted from 0 to 100%, with 0 corresponding to normal linear travel.

The three control functions ailerons, elevator and rudder can be switched from linear to progressive control using switches, which have been allocated by code 34 beforehand, or from one progressive adjustment to another progressive one.

These adjustments refer directly to the corresponding stick function, no matter whether it affects a single servo or, optionally via complex mixing and coupling functions, several ones.

After calling code 14 the desired control functions can be selected via keys 2…4:

- 2 = Ailerons
- 3 = Elevator
- 4 = Rudder

Adjustments of the control curve are performed using the INC and DEC keys after the switch has been moved to the appropriate position. (P0/P1)

In some cases linking the two functions of dual-rate and exponential may make sense. This is achieved by using the same switch when allocating the dual-rate and exponential switches using code 34.

Code 35
Trim Reduction

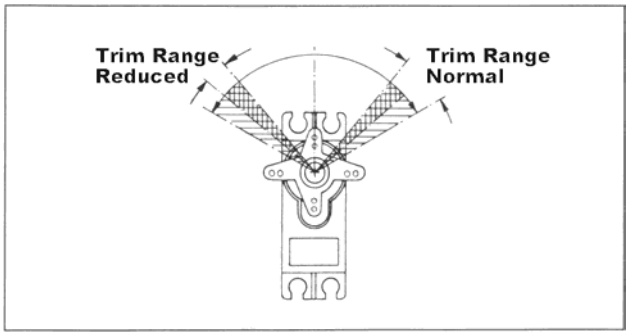
Reducing Trim Range

T	R	I	M		N	O	R	M	.		1			4
T	R	I	M		R	E	D	.				2	3	

When using dual-ate and/or exponential, trim may in some cases, not appear sensitive enough because of the ratchet steps. Code 35 permits reducing the trim action tom 50% independently for each control function.

After calling code 35, the display will indicate the control functions using normal trim in the upper line, and reduced trim in the lower line. Using keys 1…4 permits switching the functions between the two options.

- 1 = Throttle
- 2 = Ailerons
- 3 = Elevator
- 4 = Rudder



Code 59
Trim Data Memory

Storing Trim Data

T	R	I	M		O	F	F	S	E	T				
S	T	O	R	E		o	r		C	L	E	A	R	

Code 59 is used for storing actual trim data. It can be used in addition to display trim data stored in the memory. After calling the display will show the following message.

T	R	I	M		O	F	F	S	E	T				
S	T	O	R	E		o	r		C	L	E	A	R	

From here, branching occurs to the functions of “Trim Storage” or “Display of Stored Trim Data”.

a) Trim Storage

To store actual trim data, press the STORE key. As a result, the display will show

S	E	T		T	R	I	M		&		E	N	T	E	R
+	1	6		-	0	7		+	0	9		-	1	3	

↑ Throttle ↑ Aileron ↑ Elevator ↑ Rudder

with the lower line indicating the positions of the trim levers as a deviation from the neutral position. With the aid of the display the trim levers are then shifted to the neutral position, a step which does not change the trim positions of the model. By pressing the ENTER trim data storage process is terminated and the previous in-flight established tri data now corresponds to the mechanical neutral setting of the trim levers.

Important:
In normal cases the trim lever for idle trim should not be changed, as the indicated value does not represent a value which has been established in flight, but a random value for the idle trim position. If a larger deviation from normal value has been stored for function 1 (throttle), this will lead to malfunction of the idle trim. When in doubt the stored trim data for function 1 should be displayed and, if necessary, deleted as described below.

b) Display of trim data memory

If the CLEAR key is pressed instead of the ENTER key the stored trim data of each function can be displayed now using keys 1…4 and if necessary deleted (returned to 0) by pressing the CLEAR key. The trim values are:

- 1 = Throttle
- 2 = Ailerons
- 3 = Elevator
- 4 = Rudder

The deletion of trim memories should preferably be performed for all of the functions prior to entering the data for a new model, so the same range will be available for storing trim data in any direction when test-flying that model.

Code 94
Copying

Model Copying Functions

C	O	P	Y		:	F	R	O	M		M	O	D	E	L
K	E	Y		1	-	7		O	R		+	/	-		

Code 94 permits copying model data form one model to another one, and also via an external interface of a transmitter to another mc-18 transmitter.

With the aid of a separately available PC adapter, order N° 8181, it is also possible to transfer either individual model adjustments data or the complete contents of the memory of the transmitter (all models) into a personal computer compatible with industrial standards via the serial interface of the latter, saving it there on a disk for possible re-transfer to the transmitter (or some other transmitter).

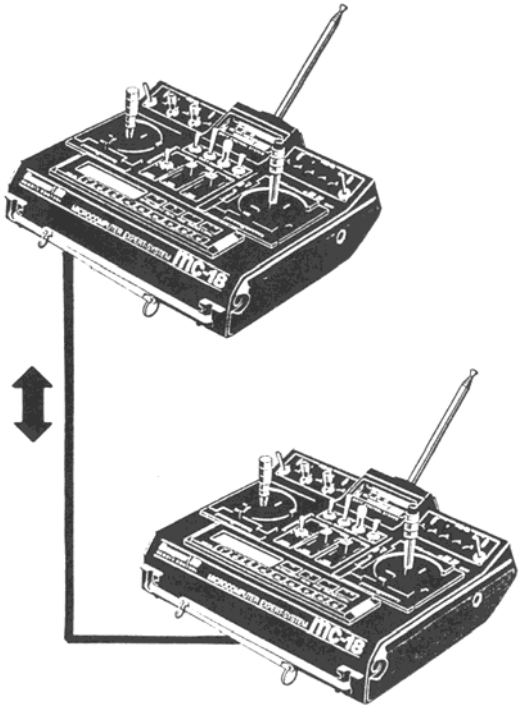
A special cable, order N° 4180, will be required for the transfer to another mc-18 transmitter, which has to be plugged into the connection socket for the PROFITRIM module of both transmitters.

After activation of code 94, the transmitter expects the input of the model memory of which a copy is to be produced. This is achieved either by input of the model number or by skimming through the list of models using the INC and DEC keys. The selection is then made by pressing the ENTER key. Then the model memory, into which the copy is to be produced, is selected in the same manner. The copying process is triggered by pressing the ENTER key, with all previously stored data being transferred to the model memory, into which the data is copied. If the name of the model the data of which is being copied has been entered, this name will also be transferred to the copy, but with a + symbol added to the last letter of the name to distinguish it from the original.

For safety's sake, model memories that are active at the moment must not be copied!

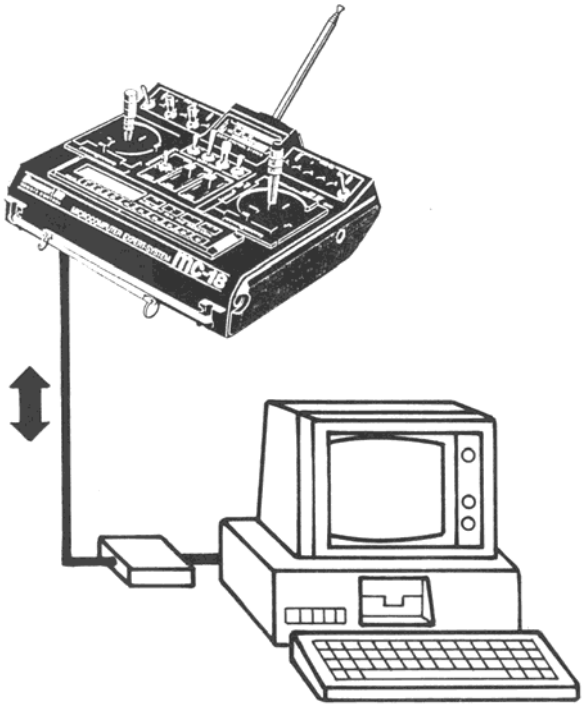
When copying from one transmitter to another, or to a personal computer, selection is performed by keys INC and DEC, with "external interface" for source at the receiving transmitter, and as target for the sending transmitter. In addition, the "all-models memory" option is available, which permits transferring all model memories simultaneously. In that case, the options of both units have to be set accordingly. The transfer process should be initiated by the receiving unit via the ENTER key, followed by the sending one.

<u>Copying between two mc-18 transmitters</u>
Using the programming interface mc-18/mc-18 (order N° 4180) single model and all models memories can be copied between two mc-18 transmitters. For example, please refer to pages 54/55.



In the case of transmitters with the extended memory (for 30 models), on deletion (code 56) and when copying (code 94) a back-up copy of that memory will be made onto which the copy is transferred or which is being deleted. This permits reversing accidental deletion or overwriting of model adjustments, this back-up copy being copied onto a normal memory station. Just call code 94 as usual and input "from model" memory station 31. For copying examples between two mc-18 transmitters refer to pages 54/55.

<u>Data Exchange to and from Personal Computers</u>
Precise instructions are given in the disk included in the programming interface mc-18/PC (order N° 4181).



Code 22
Differential

Aileron Differential in Type 2 – 7 Models

m	c	-	1	8	E		M	O	D	E	L			1	
A	I	L	E		D	I	F		O			N	O	R	M

Differentiation of ailerons serves to correct an undesirable effect called “adverse yaw”. With equal throws on ailerons the drag of the lowered aileron is higher than the drag created by the raised one. The resulting moment about the vertical axis acts in opposite direction to the planned direction of flight. If a model tries to turn to starboard (right) under the action of the ailerons, higher drag is generated on the port (left) side, causing the model to bank to starboard, yet yawing left about the vertical axis at the same time. This effect which us much more apparent with sailplanes, with their high aspect ratio wings and resulting longer lever arms as compare to power models, normally has to be compensated for by simultaneous deflection of rudder, which increases drag still more and impairs flight performance.

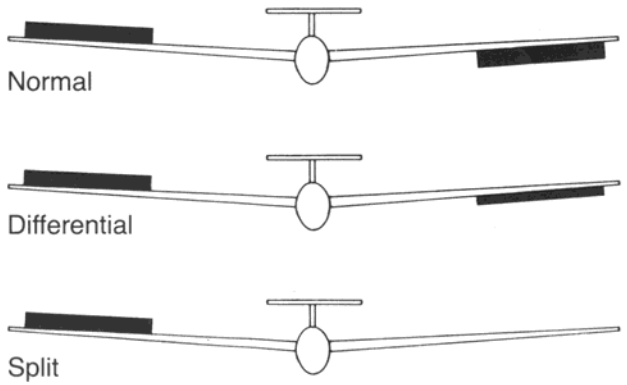
In the case of differential ailerons the downward movement of an aileron is less than the upward movement of the opposing aileron. This results in the drag being equal on both sides and in the cancellation of the negative jawing moment.

Mechanical solutions usually require permanent adjustments to be made during the assembly of the model, and in the case of high differential ratios may well introduce slop into the control system.. Electronic differential offers great advantages; each of the ailerons is operated by a separate servo, permitting the ailerons servo to be installed in the wing, ensuring slop free and reproducible adjustments even with 2 piece wings.

The ratio of differential can be adjusted as required via the downward deflection without affecting upward deflection permitting complete suppression of downward motion (Split) in extreme cases. In this manner, one can not only cancel the negative yawing motion moment, but even generate a positive one. In this latter case, operation of the ailerons will make the model yaw towards the direction of turn, permitting even large sailplanes to perform smooth turns on ailerons alone, which would not be possible otherwise.

The PROFI-ULTRASOFT-Module permits storing three different differential ratios which can be called up via allocated switches via code 23. Use of a external differential switch, order N° 4160/22, with three positions is recommended. This permits switching between the three differential values, e.g. switch position 0 = 20% differential used for aerobatics to allow precision rolls, switch position 1 = 50% for assisting the model during thermalling, and finally switch position 2 = 100% (split) for performing turns on ailerons alone at the slope.

After input of code 22, the number of the differential memory (0 – 2) and the stored value in % will appear in the lower line of the display, with 0% representing the standard installation (no differential) and 100% the split function. After changing the switch position into the required position, the desired value can be set via the INC and DEC keys. Resetting to the normal setting (0%) is performed by pressing the CLEAR key.



Code 17
Throttle Reduction

Switchable, Single-Sided Throttle Throw Reduction

R	E	D	U	C	E	D		T	H	R	O	T	T	L	E
F	U	L	L	⊥		V	A	L	U	E		1	0	0	%

Code 17 permits programming a reduction of the carburettor control range, switchable by an external switch allocated by code 23. The effects corresponds to a dual rate function for channel 1, the neutral point of which is not located at the stick neutral, but at one of the end points. This options permits the avoidance of exceeding a critical carburettor opening when the throttle stick is in the full throttle position or falling below a set carburettor opening, although the stick is on the lower stop.

After calling code 17, the lower line of the display will either show the word OFF, indicating that the switch allocated by code 23 is in the OFF position, or if the switch is in the ON position, it will show the adjusted value. The stylised stick right of “FULL” indicates that position of the throttle stick, where throttle reduction is to become effective. It can be reversed by pressing the TURN key. Servo throw can be adjusted in that direction via the INC and DEC keys, in % of normal throw. The end position of the throttle servo at the opposite end remains unchanged.

Code 66
Automatic Program

Automatic Flight Manoeuvre for Type 1 – 5 Models

P	R	O	G	R	A	M		-		A	U	T	O	M	.
P	R	O	G	R	A	M		3		O	F	F			

Prior to programming a switch has to be allocated by code 23. After its activation, channel 1 – 4 data for four different aerobatic manoeuvres (frequently Barrel Rolls, Snap Rolls) can be programmed and called via button while the letter is pressed down and hold. Programmed mix functions, if any, having their inlets at one of channels 1 – 4 will react as if the stick concerned had been moved to the programmed position. Channel trim remains effective in the normal manner, even when activated programmed position.

Selection of stored manoeuvres is performed via two switches wired to connections A and B as follows:

Switch A	Switch B	Manoeuvre
ON	ON	0
OFF	ON	1
ON	OFF	2
OFF	OFF	3

Activation of a selected manoeuvre is performed by an intermediate switch (order No. 4160/11) wired to connection C, or via a momentary button.

As a precaution against accidental activation of a manoeuvre, a switch can be allocated by code 23, preferably a locking safety switch (order No. 4147/1). This safeguarding measure can be dispensed with though if this function remains permanently activated by the setting in code 23.

On calling code 66, “INH” will appear on the lower line of the display if no switch has been allocated by code 23, or the allocated switch has not been turned on.

If the button at position C has not been pressed, the display will read:

P	R	O	G	R	A	M		-		A	U	T	O	M	.
P	R	O	G	R	A	M		N		O	F	F			

Symbol ‘n’ indicates manoeuvre 0 – 3, which has been selected by switches A + B.

If button C is pressed, the display will read

→	1	:	+			0	%		2	:	+			0	%
	3	:	+			0	%		4	:	+			0	%

In each case the arrow indicates that control function the setting of which can be changed. The selection is performed with keys 1…4. Keys INC and DEC permit adjustment of the magnitude of control surface deflection, while key 7 reverses the direction of deflection. Using key 8 the selected control can be set to follow the relevant control stick, while the other servos occupy their programmed positions. In this case the display will read “VAR” instead of a percentage value.

Code 63
Channel 1 Switch

Automatic Channel 1 Dependent Switch (Throttle/Spoiler)

C	H	1	-	S	W	I	T	C	H	=	?			

For special functions it is desirable not to perform switching by an external switch, but automatically via the channel 1 stick (throttle and spoiler), whereby exceeding a critical stick position provides switch position ON, while falling below provides switch position 0, or vice versa.

The threshold point can be placed anywhere along the stick travel and the modeller can decide whether the upper or lower portion is to activate switch position to the ON state. The automatic switch is allocated to one of the external switch connectors (1…8) whereby it is unrestrictedly included into the free programmability of the external switches via codes 23, 33 and 34.

If a normal switch is also wired to this connection, the two switches (e.g. the external switch and the automatic one) will be wired in parallel. With reversal of polarity being possible with either type of switch, logical links between the two of them can be realised.

“AND“ Link
Both switches must be closed so the connected function(s) can be performed.

“OR” Link
The connected function(s) is (are) performed when either switch is closed.

As a result the external switch may be used to perform automatic switch over by the stick. By including the automatic switch into a free allocation of external switch any combination of functions can be switched in dependency of the control stick position. So, by turning on the correspondingly programmed misers, flaps can be lowered when throttling the engine and the elevator re-trimmed (Auto-Landing), or dual-rates may be switched to increase control surface throw in the landing approach at reduced speed. Pilots of electric flight models can turn the timer on and off via the automatic switch for checking motor run synchronously with the main drive motor.

Programming:

After calling, via code 63, the transmitter, as in the above display, indicates it is waiting for the input of the external switch connection (1…8), to which the automatic switch is to be allocated. After the connection number (e.g. “6”) has been input the display will read like:

C	H	1	-	S	W	I	T	C	H	=	6				
	=			C	H	1	S	=			P	6	=		

Here the interaction of the automatic switch and a possibly connected external switch is shown. The stylised control stick at the left of the lower line indicates the direction of deflection of the throttle/spoiler stick with the switch in the open position. Direction can be reversed by hitting the TURN key.

The switch state (open or closed) of the channel 1 switch is indicated in the centre of the lower line. By moving the stick the function can be checked and the threshold point be adjusted. To do this the stick is moved to the position at which switching is to occur, then press the STORE key.

The right end of the lower line displays the switch state of a switch wired to its allocated external switch connection.

The interaction of the external switch and automatic channel 1 switch is displayed at the right end of the upper line of the display.

The allocation of the channel 1 switch is cancelled by pressing the CLEAR key.

Code 51, 33, 61 and 71
Free Program Mixer

Programming Mixers and Dummy Mixers

In addition to the available mix and coupling functions, all model programs provide a number of freely programmable mixers. In the case of type 1 - 3 models nine mixers are at the disposal of the user, types 4 and 5 have four mixers available, for F3B types 6 and 7 a total of seven, and for the helicopter types 8 and 9 there are four mixers available.

The mixers link an input signal to an outlet signal, with allocation performed by code 51. As any optional control function can be fed as an inlet signal, the outlet signal affects any desired control channel, not a control function. Distinguishing between these two terms is of utmost importance. Control function refers to the outlet signal of an operating element, that is a stick with or without trim, slider, rotary control or a channel switch, which in the course of the ensuing action passes through all the mix and coupling functions of the model program. A control channel is the outlet signal for a specific receiver connection, which until it arrives at the servo can only be affected by throw adjust, neutral point adjust, throw reduction or control surface reversing.

Mixers may also be switched in series for special applications, which is say that in addition to the control function proper all other preceding mixers can also be used as inlet functions. All F3B mixers (see F3B programs) and all freely programmable mixers with a lower number are considered as preceding mixers.

To give you an idea, imagine that instead of a control function (see above) the outlet signal of a control channel is used as the input function of the mixer before it passes through throw adjust, neutral point adjust, throw reduction or servo reversing.

Each of the freely programmable mixers can be turned on and off by one of the switches allocated using code 33.

Vital parameters of the mixers are the mix quotas which determine how strongly the inlet signal affects the control channel wired to the outlet of the mixer. They also set the direction of the mixed signal and the neutral point of the mixer, that is the point on the control characteristic curve of the inlet signal where the mixer does not affect the control channel wired to the outlet (normally this will be the neutral point of the control stick).

In the case of freely programmable mixers, these parameters can be adjusted over a wide range. The neutral point can be shifted to any desired point of the control throw of the operating element wired to the inlet (the distance from neutral point is called the OFFSET). The mixing ratios can also be adjusted in both directions above and below the neutral point, either in symmetrical (code 61) or asymmetrical (code 71) fashion. The mix direction can also be set for both sides using codes 61 and 71 by setting the values as + or -.

As a single control function can serve as inlet for an optional number of mixers, and any number of mixers may affect a control channel, the freely programmable mixers permit achievement of special, highly complex, applications.

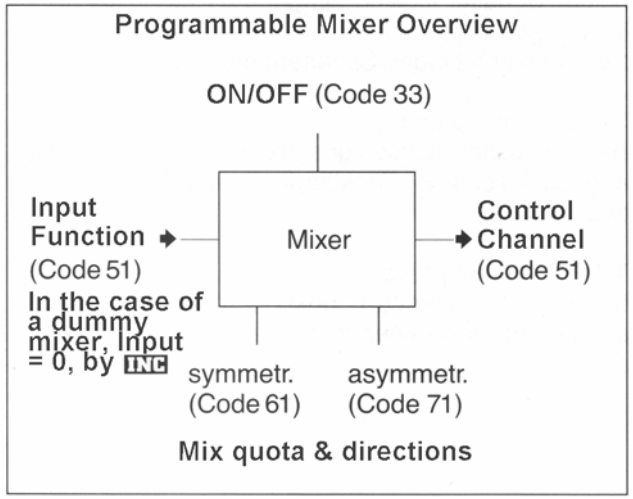
DUMMY Mixer:
A so called dummy function may also be allocated as an inlet signal, that is a control function that is not available as a true operating element, but provides a consistent control signal. In this manner it is possible to make use of a control channel as an operating element by allocating a dummy mixer and having the outlet of the mixer affect the channel concerned. Throw of the switch is then adjusted by the mix quota and mix direction of the dummy mixer. A dummy mixer also permits mixing an additional constant trim signal dependent on a switch allocated by code 33.

Practical Example of a Dummy Mixer

An external switch is wired to socket 1, switches a servo connected to receiver output 8,for example operating a glider tug release device.

Programming Sequence:

1. Reset mixer from 0 to 8 via code 51. Inlet function 0 is obtained by pressing the INC key.
2. Input mix quota and direction via codes 61 and 71.
3. Allocate external switch to socket 1 via code 33.



1. Channel Allocation (Code 51)
To program a mixer first call code 51, via which the channels to be linked are determined.

On the display then appears “MIX ?”, asking the operator to input the number of the mixer to be used. After the number has been input, the display changes to:

M	I	X		1										
I	N	H												

With INH meaning Inhibited.

This indicates that the mixer is not yet active, otherwise the numbers of the already allocated control channels will be displayed instead of INH.

Start by entering the control functions by keys 1…9, which are to act is input signal of the mixer. If the dummy mixer indicated by “0” is to be used press INC, or if the preceding mixer is to be used as the input press the DEC key before the input function number, which will be indicated by an arrow in front of the input channel. Then input the control channel (=servo output) into which the signal will be mixed.

M	I	X		1										
	4	→	8		T	R	I	M		O	F	F		

If, as in the example above, the input is one of the control functions 1 – 4, it can be decided whether trim is also to affect the mixer input or not. Pressing the INC or DEC key will enable the trim, whilst pressing the CLEAR key will disable it.

M	I	X		1										
	4	→	8		T	R	I	M		O	N			

Channel allocation of the mixers is confirmed by the ENTER key. Programming can be continued by entering the next mixer number, or terminated by pressing the ENTER key again.

2. Allocation and Polarity Reversal of External Switches (Code 33)
A switch which allows the mixer to be turned on and off is allocated to the mixer by code 33.

M	I	X	E	R			1	2	3	4	5	6	7	8	9
S	W	I	T	C	H		9	9	9	9	9	9	9	9	9

The upper line indicates the mixer numbers, with the allocated switches shown on the bottom line. Switches are allocated by entering the number of the mixer, whereupon a “?” appears in the lower line, and then entering the desired switch number, the polarity of which can be reversed by pressing the DEC key first. The phantom switch “9” can be used, in which case the mixer remains permanently on (basic setting of all mixers). When in doubt, switch number and switch position can be established quickly and reliably using code 73.

3. Adjusting the Symmetrical Mix Quota (Code 61)
If a symmetrical (common) mixer (in relation to the neutral point) is required, the mix quota and direction is set using code 61.

M	I	X	1		C	O	M			4	→	8		w	/
o	f	s				0		-	S		+		5	0	%

Mix quota is adjusted using the INC and DEC keys, the process can be speeded up by pressing the 6 or 8 key, which increases or decreases the value in steps of 10 respectively. The direction of mixing is determined by the + or – prefix to the mix quota, and can be changed by pressing the TURN key.

To alter the neutral point of the mixer, shift the corresponding operating element (stick, etc.) into the required position and press the STORE key. The offset from the normal neutral point captured in this way is transferred to the display.

Adjustment is confirmed by pressing the ENTER key. Afterwards, further mixes can be adjusted by entering their number, or the adjustment process terminated by pressing the ENTER key again.

4. Adjusting the Symmetrical Mix Quota (Code 71)

Code 71 permits adjusting separate mix quota and mix directions for the two sides of the control function at the mixer inlet.

M	I	X	1		S	E	P			4	→	8		w	/
o	f	s				0		-	S		+		2	8	%

The setting of the mix quota is performed in the same way as for code 61 using the 6, 8, INC and DEC keys. In this case the operating element has to be set to the side requiring adjustment (displayed with the prefix + or – ahead of “s”). The direction of mixing can be adjusted separately for either side using the TURN key. Neutral point offset is achieved by moving the operating element of the control function to the required position and capturing the value using the STORE key.

Code 72
MIX-only Channel

Mix-only Channel Set-up

M	I	X		O	N	L	Y		C	H				
			n	o										

Code 72 permits interrupting the normal direct signal flow between the control function inlets and the associated control channels at the outlet side. The signal generators connected to the control function inlets concerned will then affect the mixer inputs of the channel in question, but not the allocated servo. The latter can then be reached by mixers programmed for their specific control channels. Using this arrangement, it is possible to utilise the signal generator and servo of one or more channels independently of each other for optional special functions.

It permits, for example in F3B model types to use channel 1 via the dummy function of a special functions mixer to operate “butterfly mode”, controlled by the throttle/spoiler stick, provided spoilers have not been installed.

In the case where spoilers have been installed and “butterfly mode” with or without spoilers is to be provided for experimentation purposes, a mixer can be operated in normal mode. With the aid of code 33, this connection can be turned on and off. The same applies to other applications.

Any channel can be switched between normal and mix-only mode by keys 1…9. All channels can be switch back to normal by pressing the CLEAR key.

ALARM TIMER and Stopwatch

The PROFI-ULTRASOFT-Module offers two stopwatch functions.

1. Stopwatch with normal display (hours, minutes and seconds).
2. Timer alert, with seconds display.

One of these options can be selected for each model program.

A stopwatch, once programmed, will appear on the lower line of the display each time the transmitter is turned on, it does not need to be called over and over again. Once triggered the stopwatch will continue to run even when inputs are made during its operation via the keyboard.

Stopwatch with normal display.

The stopwatch with normal display may be programmed by allocating a switch to function “CLK” using code 23. A prerequisite is that the alarm timer (code 97) is not activated. The clock will then run as long as the allocated switch is closed. Using the CLEAR key it can be reset to 0.00.00 when not running (if running the transmitter switches to list of codes mode of operation). By this programmable switch allocation, the stopwatch function may be coupled with the tow hook, permitting the exact duration of flight (starting from release of the tow-line) to be recorded.

Code 97
Stopwatch

Stopwatch

T	I	M	E	R		6	0	0	s	e	c		←	
A	L	A	R	M			3	0	s	e	c			

After calling code 97, the message “TIMER OFF” will appear on the display. The timer is activated by the INC or DEC key, whereby the stopwatch, possibly programmed by code 23, will be turned off. The alarm timer can be deactivated by the CLEAR key. Timer run can be adjusted on the upper line of the display in 10 second increments using the INC and DEC keys. In the lower line a point of time can be set when, prior to the expiration of the return time, an acoustic signal alerts the flyer. The arrow at the right hand end of the display indicates which time can currently be adjusted, and is moved by pressing the TURN key.

After the set time has run down to 0, it is indicated by a longer acoustic signal. The timer continues to run, so that the time beyond 0 can be read.

Start/Stop instructions can be given by keys 2 and 3 respectively, or via an intermediate switch (order No. 4160/11) connected to plug station CLK, or a kick button (order No. 4144).

If a switch for the timer has been allocated by code 23, operation of the alarm timer will be performed exclusively by that switch.

Acoustic Signal Sequence:

100s before zero: every 5 seconds
20s before zero: every 2 seconds
10s before zero: every second
0s Extended Signal

A + symbol on the display indicates that the time shown is that beyond zero. The maximum timer capacity is 900 seconds beyond zero.

Code 98
Operating Timer

Transmitter Operating Timer

m	c	-	1	8	E		M	O	D	E	L			1	
I	N	T	E	G	.	T		4	:	2	7	:	5	4	

The operating timer displays the time the transmitter has been switched on and monitors the transmitter power supply.

After the batteries have been charged, could 98 should therefore be called and indicated time reset to 0 by pressing the CLEAR key.

The operating time is then measured whilst the transmitter power switch is on. This permits the cumulative operating time to be displayed at any moment by calling code 98.

Code 77
FAIL SAFE

Programming the Fail Safe

m	c	-	1	8	E		M	O	D	E	L			1	
F	A	I	L		S	A	F	E		H	O	L	D		

This is possible only in PCM mode with mc-18 receivers.

The inherently higher operational reliability of Pulse Code Modulation (PCM) as compared to the simpler Pulse Position Modulation (PPM) results from the ability of the micro-processor installed in the receiver to recognise when a received signal has been corrupted or stopped by outside interference.

In such cases, the receiver automatically replaces the false signal with the last correctly received one stored in the receiver. In this manner interference of short duration will be eliminated.

In the case of longer lasting disturbance of the transmissions, the operator may choose between two options:

1. HOLD

The servos hold that position which corresponds to the last correctly received signal, until the receiver manages to receive a new intact signal again.

2. FAILSAFE

The servos move a pre-set position until an acceptable signal is again received by the receiver. The delay, determining the time from loss of signal to the triggering of the fail-safe program, can be adjusted in three steps (1.0s, 0.5s and 0.25s), to allow for different model speeds.

After calling code 77, switching can be performed by the INC key between HOLD, FS 1.0s, FS 0.5s and FS 0.25s. To record the positions for the servos the control functions have to be moved to the required positions at the transmitter, then press the STORE key. This step stores the current adjustments as the fail-safe settings, which are transferred at regular intervals to the receiver. The receiver stores these fail-safe values for use in the case of signal loss.

Fail-safe adjustments can be overwritten at any time, even in flight, by calling code 77 and changing the current transmitter fail-safe data by pressing the STORE key.

Code 78
FAIL SAFE BAT

Activating Battery Fail-Safe

m	c	-	1	8	E		M	O	D	E	L			1	
B	A	T	T		F	.	S	.		O	F	F			

The automatic battery fail-safe serves to warn the pilot of dropping receiver battery voltage and to give him a chance to avoid an impending crash caused by depleted receiver batteries.

As soon as the voltage at the receiver battery drops below a predetermined value, a servo permanently allocated to the battery fail-safe function and acting as an indicator of the imminent depletion of the receiver power supply will be actuated. In the case of a fixed-wing model program, this will be the servo wired to channel 1 (throttle). For helicopter programs it will be channel 8, which could for example be used for switching on the lights, etc.

For the position, to which the servo will be shifted, three different values may be programmed:

+75%	Three-quarter deflection in one direction
0%	Servo neutral position
-75%	Three-quarter deflection in the opposite direction

When checking adjustments, the servo position display (code 74) will prove helpful.

The fail-safe display can be cleared again by actuating the operating element concerned for a moment (e.g. throttle stick for fixed-wing) and the servo can then be controlled in the normal manner. A model should be landed straight away after the battery fail-safe has been indicated. After code 78 has been called the display will read “BATT F.S. OFF”. Pressing the INC key activates the battery fail-safe and permits selecting the display position of the servo in sequential order –75%, 0%, +75%, OFF. Pressing clear will switch off the battery fail-safe immediately.

Code 88
Input Lock

Code Lock for Keyboard Input

K	E	Y	B	O	A	R	D		L	O	C	K		
p	u	s	h		k	e	y		1	-	9			

The input lock prevents changes of transmitter settings by unauthorised persons or accidental pressing of the input keys. The lock does not prevent unimpaired use of the transmitter when flying models using the elements activated, but no inputs will be possible via the keyboard, hence a change of models is not possible.

Activation of the keyboard lock is performed using code 88 and entering an optional 3 figure combination using keys 1…9, followed by the ENTER key.

The lock becomes effective by turning the transmitter off and on again. After pressing the ENTER key, the request “push key word” appears. Only after entering the correct combination of numbers will the lock be released. The lock remains released until the transmitter is turned off, after which it will be active and it has to be unlocked again.

The combination of numbers can be changed at any time, after releasing the lock, by calling code 88 again and entering the new combination.

To clear the input lock completely, the CLEAR key has to be pressed instead of entering a combination. The input has to be terminated by pressing the ENTER key.

Please ensure you remember the combination you set, or you will have to return the transmitter to Graupner Service for decoding.

Code 99
Transmitter Lock

Numerical Transmitter Lock

A	L	L		C	L	O	S	E						
p	u	s	h		k	e	y		1	-	9			

As a precaution against theft an electronic transmitter lock can be enabled using code 99. It prevents the putting the transmitter into operation unless the correct combination of figures is input after turning the transmitter on.

Activation of the transmitter lock is achieved by calling code 99 and entering an optional 3 figure combination using keys 1…9, followed by the ENTER key.

The lock becomes effective after the transmitter has been turned off. On activation of the transmitter, the request “push key word” will be displayed and it is only after entering the correct combination of digits that the lock will be released, permitting the transmitter to be used. The keyboard, however, remains locked as in the case of code 88. After pressing the ENTER key, the request “push key word” appears again and the correct combination must be entered to obtain access to the settings.

The lock remains released until the transmitter is turned off, after which it will be active and it has to be unlocked again.

In the case where the combination entered for the input lock (code 88) differs from the combination of the transmitter lock (code 99), the combination of numbers for code 99 will also apply to the input lock and replace the figures previously entered into code 88.

When the lock has been released the combination of digits can be changed at any time by calling code 99 and entering a new combination. To remove the lock completely instead of entering a new combination, the CLEAR key has to be pressed instead of entering a combination. The input has to be terminated by pressing the ENTER key.

For safety's sake the lock has to be removed prior to starting with flight operations! To this end, proceed as follows:

Turn on the transmitter

Input the correct combination of digits

Press the ENTER key

Input the correct combination of digits again

Call code 99

Press keys ENTER CLEAR ENTER

Please ensure you remember the combination you set, or you will have to return the transmitter to Graupner Service for decoding.

Code 76
Servo Test

Testing Servos 1 – 9

m	c	-	1	8	E		M	O	D	E	L			1
E	N	T	E	R	=	S	E	R	V	O	T	E	S	T

To check all servos for proper function, check them one after another by executing full deflections in both directions, starting from the neutral position. After calling code 76, the test program will be executed in an endless loop until interrupted by pressing the ENTER key. In this way, the receiver can be checked over a longer period.

Code 74
Servo Position

Display of Servo Position

S	E	R	V	O		P	O	S	.					
p	u	s	h		c	h		k	e	y		1	-	10

The actual position of each servo can be shown exactly with the aid of code 74. In this manner, the interaction of different mixers on a specific servo can be determined with accuracy, and the operation of throw reduction can be controlled. Battery fail-safe (code 78) can also be checked.

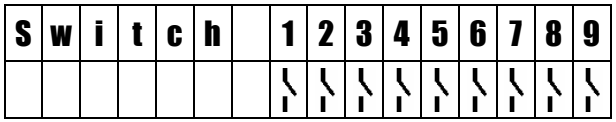
For the simulation of battery fail-safe position relying on the menu. The operating element for channel 1 or channel 8 is adjusted to the percentage value set using code 78, and the control surface throw checked at the servo after calling code 74.

After calling the request for the selection of the control channel to be checked will appear in the display. To select the channel, use keys 1…9 and INC (for channel 10). After entering the channel number, the lower line of the display will indicate after the channel number, the exact servo position within a range of ±150% of the servo throw in either direction, with 0% corresponding to the neutral position. Using keys 1…9 and INC, other control channels can be displayed. To terminate the display of servo position, press the ENTER key.

The sole exception is the adjustable servo speed of code 79 can not be displayed.

Code 73
Switch Position

Display of Switch Positions



For checking the installation of switches and their connections to plug stations 1…8, the switch positions of all external switched are indicated by code 73, with an automatic channel 1 switch, possibly programmed by code 63, being taken into account.

The display always refers to the actual mechanical switch position of the switch concerned, independent of its having possible been reversed by code 23, 33, or 34.

Please Note:
In the case of mixers a closed switch will normally turn off the mixer concerned, not on!

F3B Programs (Model Types 6 and 7)

Universal Profi-Programs for competition flyers, and also for other models such as large sailplanes featuring at least 2 wing-mounted servos

The F3B model programs (code 58, types 6 and 7) have been developed for F3B class contest models in close cooperation with renowned experts. The competition program requires a model with three different flight tasks, with only its ready to fly weight, being permitted to be changed by adding or removing ballast weights. Any other adjustments can only be performed by remote control.

To be able to comply with these requirements, the models of this contest normally feature plain flaps so they can be adapted to the flight tasks of duration, distance and speed, as well as the launch phase. In addition they also servo as a landing aid. As a rule, the flaps are lowered for take-off to generate as much lift as possible, with the resulting drag being of little importance as it is overcome by the towline winch anyway. For hi-speed flight a slightly negative deflection (meaning an upward one) may be advantageous depending on the airfoil section, while for distance flying the optimum angle of glide should be found somewhere about the neutral setting of the flaps.

For duration flying the lowest sinking rate will be achieved by setting the flaps to a slightly positive angle. That setting may have to reduced a bit for tight circling flight in thermals and increased when searching for thermals by flying wide circles to ensure the optimum glide. On landing, the flaps are fully deflected (positive) causing the airflow on the upper surface to separate and increase drag, without affecting the lift. This effect can be supplemented by spoilers, if installed (in some cases spoilers are dispensed with). Drag can be increased still more by deflecting both ailerons upward in addition to the extreme downward deflection of the flaps, this combination results in a most effective control of glide angle.

The latter set-up is also called “butterfly” or “crow” function. In some cases separate ailerons and plain flaps are replaced by one-piece full-span flaps, which are simultaneously operated as ailerons and plain flaps (called flaperons). Performance flying means flying at very low drag, in any flight situation and attitude, including turns and circling flight.

Lowest drag is achieved only when the airflow hits the model head-on, that is when side-slipping (with the flow having a component along the lateral axis) is avoided. This condition is simplified by differential ailerons used in conjunction with the aileron – rudder mix, whereby the negative yawing moment is compensated for. Additional mixers increase the effect of the control surfaces (plain flaps – ailerons), ensure uniform lift distribution (ailerons – plain flaps), increase manoeuvrability (plain flaps – elevator) and adjust elevator trim for deflection of the flaps.

In addition to the normal actuation of the plain flaps, via slider-type potentiometer or a step switch, the F3B programs offer storable pre-sets for plain flaps and elevator adjustments for any flight task and for take-off, all of which can be called via a switch. Which of the operating elements is to be used for in-flight fine tuning of the flaps settings can be determined separately for any of the presets.

The change of the flap and elevator settings when switching from one preset to another one is not made abruptly, but achieved using separately adjustable time constants. Other sensible options, such as reduction of aileron differential (for butterfly function), co-switchable PROFITRIM-module with optional storing of adjustment data, etc., simplify handling of a model for the demanding contest flyer and assist him in his endeavour to achieve optimum performance.

The two F3B programs differ only in that model type 6 is meant for flaps which are operated by a common servo, while each aileron is operated by a separate servo (in all 3 wing-mounted servos), while type 7 refers to a set-up where each flap and aileron is operated by its own servo (4 wing-mounted servos).

In the case of type 6, the flaps can be moved only in unison, so the aileron → flap mixer is omitted. All other options are alike for type 6 and type 7, so the two programs may be described together.

Model types 6 and 7 provide nearly all of the options of types 1…5, with the sole difference that those functions which are needed for power models only are omitted, such as throttle reduction (code 17) and automatic manoeuvre (code 66). As opposed to types 1…5, seven freely programmable mixers are available for type 6 and 7. Code 23 (switch allocation) takes the expansion of the F3B program into account when compared to normal types.

In addition types 6 and 7 provide the following functions (listed in sequential order of their descriptions:

Code	Display	Meaning	Page
23	SWITCH FUNCT.	External Switch Allocation	38
52	STRT-SPD-DIST	Flight Trim: Start, Speed, Distance	39
53	FLAP TRIM ASS	Flap Trim Assignment	39
92	SMOOTH SWITCH	Servo Transit Time Set-up	39
41	AILE→RUDD	Aileron to Rudder Mix	40
42	AILE→FLAP	Aileron to Flap Mix	40
49	FLAP→AILERON	Flap to Aileron Mix	40
91	AN. TRIM SW	Set-up for PROFITRIM	42
48	FLAP→ELEV	Flap to Elevator Mix	42
47	ELEV→FLAP	Elevator to Flap Mix	42
44	BRK→ELEV	Spoiler to Elevator Mix	43
45	BRK→FLAP	Spoiler to Flap Mix	43
46	BRK→AILERON	Spoiler to Aileron Mix	43
54	DIFF REDUCT	Reduction of Aileron Differential	43

Code 23
Switch Function

Allocation of External Switch in F3B Models

External switches installed and connected to the plug connections 1…8 are allocated to specific functions by code 23. Some of these functions can be activated and de-activated. The allocation can be performed to suit the mechanical mode of operation of the switch (open = ON, closed = OFF) or by reversing (open = OFF, closed = ON).

In addition to physically existing switches a logical “phantom switch” is also available, designated switch number 9. By allocating this switch to a function, it can be permanently switched on or off.

As any number of functions may be allocated to any of the switches, linkages can be achieved for which, otherwise, mixers would have to be used, which in this way remain available for other purposes.

Allocation and Pole Reversal of External Switches
After calling code 23, the functions available for the active model will appear on the upper line of the display, with the allocated switches appearing on the line below. Numerals indicate the switches wired to the corresponding plug stations.

N means that the function in question is de-activated. Flashing numerals indicate that the switch concerned has been allocated with reverse polarity. The small arrow (upper line) indicates the function to which the switch can be allocated at the present time. It can be moved to the right or left by pressing the INC and DEC key, respectively.

As not all of the available functions can be shown at the same time on the display, the latter can be moved – window style – over the two lines, showing the allocations. When the arrow points to the outermost right function, the next function will appear in the display when the INC key is pressed. They can be scrolled left by pressing the DEC key. In this manner any of the functions can be displayed.

To allocate the selected functions press the CLEAR key. As a result a question mark symbol will appear on the lower line. To switch be may allocated by pressing keys 1…9. If the switch is to be reversed, the DEC key has to pressed first.

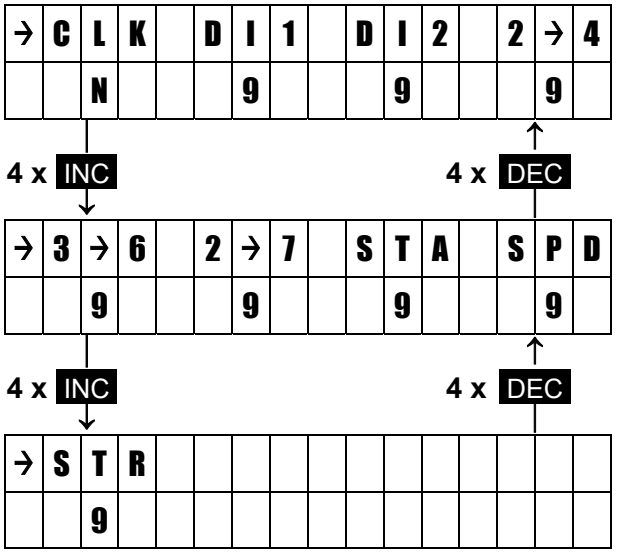
If a de-activatable, currently active function is selected, pressing the CLEAR key will first de-activate the function, pressing the CLEAR key a second time will display the question mark symbol.

The type and number of functions, to which switches can be allocated via code 23, depends on the activated model type (code 58).

Available functions for model types 6 and 7

CLK	Stopwatch in standard mode, runs as long as switch is closed.
DI1	Differentiation switch 1 (see code 22)
DI2	Differentiation switch 2 (see code 22)
2→4	Mixer Ailerons → Rudder
3→6	Mixer Elevator → Flaps
2→7	Mixer Ailerons → Flaps
STA	Pre-set for Start
SPD	Pre-set for Speed task
STR	Pre-set for Distance task

Selection of individual functions:



Using code 73 the switch position, number and direction of operation of the desired switch can be found quickly and reliably.

Code 52
TAKE-OFF, SPD, DIST

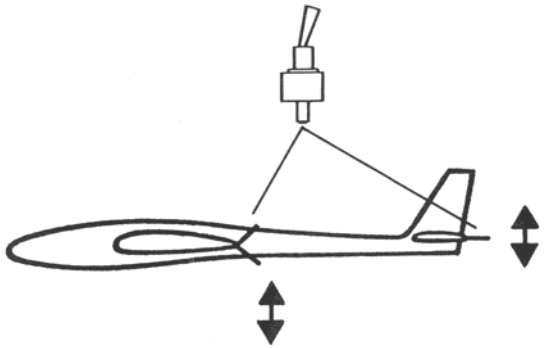
Pre-sets for the Flight Tasks

S	T	A	R	T		F	L	A	P		+		5	8	←
						E	L	E	V		+			7	

Code 52 permits storing the flap and elevator settings for Speed, Distance and for the Take-Off phases. However, the allocation of the corresponding external switches has to be performed first using code 23.

A possibly active aileron → rudder mixer (code 41) will automatically be switched off when the Speed flight task is selected on.

For these adjustments the corresponding external switch has to be actuated after calling code 52, whereupon the values for elevator and flaps will be displayed. Adjustments are made using the INC and DEC keys, by pressing the TURN key the elevator and flap adjustments can be changed and the value set directly to 0 by the CLEAR key.



Code 53
Flap Trim Arrangement

Signal Generator Selection for the Flap Function

N	O	R	M	A	L		I	N	P	6	=	O	N		←
							I	N	P	7	=	O	F	F	

The operating elements for actuating the flaps can be selected separately from the pre-set flight tasks duration (normal), distance, speed and the start phase. Operating elements can be slider-type, rotary potentiometers or step switches, which are wired to the plug stations for channel 6 and 7. Between the two inlets a fundamental difference exists.

While the signal generator wired to channel input 6 also affects mixer code 48 (flap → elevator), inlet 7 may be used for elevator independent flap trim. For any of these four phases of flight you can select whether the flaps function is to be performed by the signal generator of channel 6 or 7, or by neither of these. For example, you may actuate the flaps for the duration phase by slider-type control 6, for distance flight by a switch module providing three switch positions, and for the start and speed phases exclusively by the pre-set values without any further adjustment being possible.

Adjustment
After calling code 53, a selection menu appears on the display for the active flight phase concerned, selected by actuating the external switch in question. Using the INC and DEC keys you can switch the values between ON and OFF, or the CLEAR key for OFF. Using the TURN key permits swapping between adjustment of channel 6 or 7. For selection of another flight phase the corresponding switch has to be actuated, whereupon the display will change accordingly.

Code 92
Switch Slow-Down

Elevator / Flap Transit Time Slow-Down

S	m	o	o	t	h		E	L	E	=	O	F	F		←
							F	L	A	=	3	.	3	s	

In order to avoid abrupt elevator and flap deflection when switching between the pre-sets for the various flight phases, the transit time of the servos for elevator and flap can be adjusted separately, by code 92, within the range 0.5s to 30s for full servo throw. In the case of the elevator this slowing down is effective only when switching from one flight phase to another one, not in the course of normal control. In the case of flaps it is permanently effective, so the flaps can be operated smoothly with a 3 position switch without jerking.

After calling code 92, the transit time can be adjusted by the INC and DEC keys. For smaller delay values the steps are very small and not every change will show on the display. Steps increase in size as the delay value increases. By pressing the CLEAR key the slow-down is cancelled, while pressing the TURN key swaps between adjusting the elevator and flaps setting.

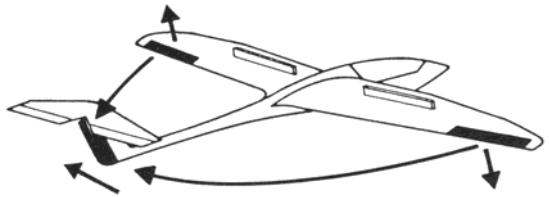
Code 41
Aileron → Rudder

Mixer Aileron → Rudder

A	I	L	E	→	R	U	D	D							
											+		3	3	%

Using code 41 the rudder can be affected, by an adjustable amount, by the ailerons (particularly in conjunction with aileron differential) to counteract the negative yawing moment to achieve smooth circling flight. The rudder remains fully controllable by the rudder stick. The mixer can be switched on and off by an external switch allocated via code 23. For speed flight (code 52) the mixer is, in principle, automatically turned off.

After calling code 41, the mix quota can be adjusted using the INC and DEC keys (in 1% steps) and the 6 or 8 key (in 10% steps), and set to 0 by pressing the CLEAR key, with direction of the mix being changed by pressing the TURN key.



Code 42
Aileron → Flap

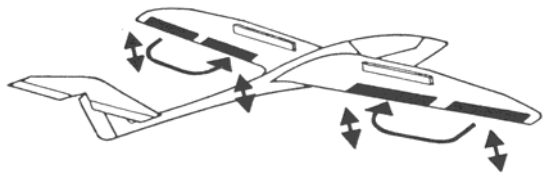
Mixer Aileron → Flap (for model type 7)

A	I	L	E	→	F	L	A	P							
											+		5	5	%

An adjustable amount of aileron control can be mixed into the flap channel, via code 42, so the flaps will be deflected in the manner of the ailerons on operation of the ailerons, though normally with lesser deflection. The advantage of this arrangement is increased rate of roll and reduced drag at the same rate of roll, as a result of the reduced aileron deflection required and a more uniform lift distribution along the span of the wing. The mixer can be switched on and off by an external switch set with code 23.

After calling code 42, the mix quota can be adjusted using the INC and DEC keys (in 1% steps) and the 6 or 8 key (in 10% steps), and set to 0 by pressing the CLEAR key, with direction of the mix being changed by pressing the TURN key.

The trim mixer can be switched on and off by pressing the 5 key.



Code 49
Flap → Aileron

Mixer Flap → Aileron

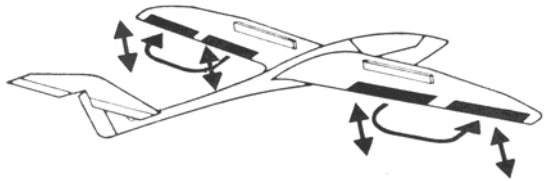
F	L	A	P	→	A	I	L	E							
o	f	s	-		7	3		+	s		+		4	5	%

An adjustable amount of flap control can be mixed into the aileron channel, via code 49, so the ailerons will be deflected in the manner of the flaps on operation of the flaps, though normally with reduced deflection. The advantage of this arrangement is reduced drag and a more uniform lift distribution along the span of the wing.

After calling code 49, the offset adjustments may be performed first, that is the mixer has to been informed which position to the operating element for the flaps (normally a slider-type potentiometer in channel 6) will occupy in normal flight (with the flaps in the neutral position). To this end the operating element is set accordingly and then the STORE key is pressed. The offset from the neutral position is shown on the lower line of the display).

The mix quota can be adjusted using the INC and DEC keys (in 1% steps) and the 6 or 8 key (in 10% steps), and set to 0 by pressing the CLEAR key, with direction of the mix being changed by pressing the TURN key.

Code 49 permits adjusting unequal mix quota and directions. In the course of programming the operating element for the flaps has to be set to the end required to be adjusted.



PROFITRIM-Module

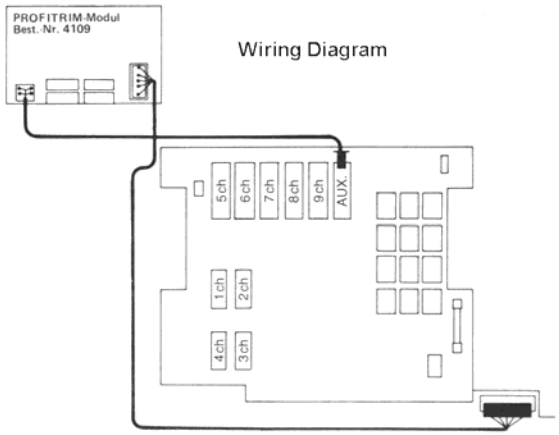
The PROFITRIM external module (order No. 4109) permits additional trimming of all flap and aileron functions by four rotary trimmers. The latter are allocated to the following functions:

1 = Aileron Trim (aileron function)
2 = Aileron Trim (flap function)
3 = Flap Trim (aileron function)
4 = Flap Trim (flap function)

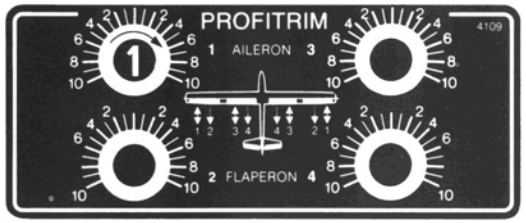
The trimmers can be turned on and off singly or in any desired combination, with their neutral positions corresponding to the programmed settings.

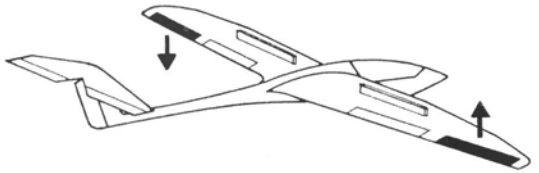
On deactivation of the trimmers, the adjusted value will be stored. It if thus possible to establish optimum settings in flight with the trimmers turned on, and to protect them against being accidentally changed when turned off. These data values will only be stored up to the next time the trimmer is turned on, whereupon the initial reference point, set in the course of programming will be re-established.

Trimmer 3 cannot be used in the case of type 6 models, since the flaps can only be driven in the same direction.

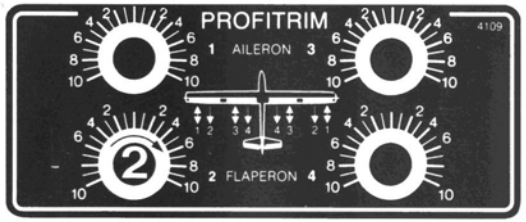


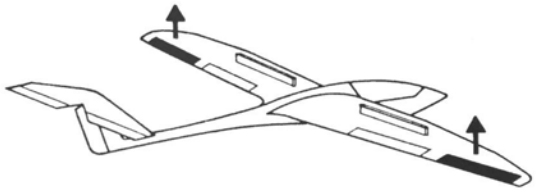
1 = **Trimming Ailerons (aileron function)**



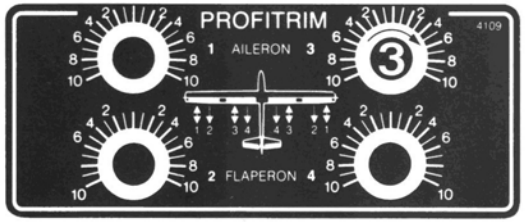


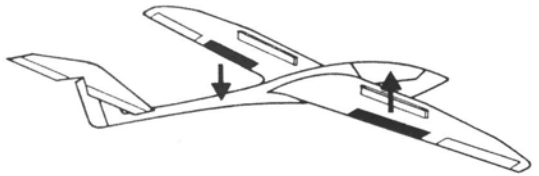
2 = **Trimming Ailerons (flap function)**



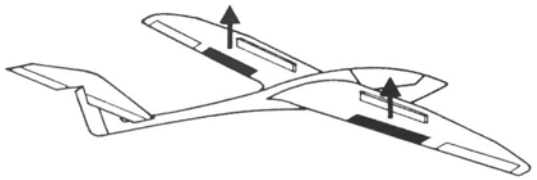


3 = **Trimming Flaps (aileron function)**





4 = **Trimming Flaps (flap function)**



Code 91
Activating PROFITRIM

Activating PROFITRIM

A	N	.	T	R	I	M				3	4		
			A	C	T			1	2				

Works only with (code 58) model types 6 and 9.

The adjustment controls of the PROFITRIM are turned on and off using code 91.

The upper line of the display shows the inactive controls, the lower line showing the active ones. The regulators are switched between on and off by entering the control number (1…4), whereupon the display will update accordingly.

In the case of type 6 models, control 3 (aileron trim of flaps) can not be used, since they are moved by a common servo and in the same direction only.

Actual setting can be stored by turning the control off, but only until the next trim the regulator is turned on again, whereupon the initial reference point, set in the course of programming, will be re-established.

Code 48
Flap → Elevator

Trim Correction on activation of Flap

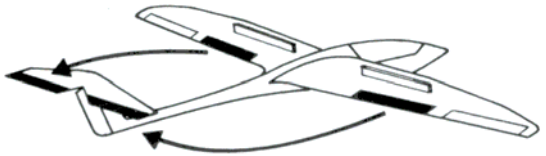
F	L	A	P	→	E	L	E	V					
o	f	s	-		7	3		+	s		+	3	3	%

Code 48 permits programming automatic correction of elevator trim on response to actuation of the flaps, so the attitude of the model won't be affected by the position of the flaps.

After calling code 48, only the offset value can initially be performed, which is to say that the mixer has to be told which position the operating element for the flaps (normally a slider-type control) will occupy in the normal flight (with flaps at neutral position). To this end the operating element concerned is set accordingly and then the STORE key is pressed. The offset from the neutral position is shown on the lower line of the display).

The mix quota can be adjusted using the INC and DEC keys (in 1% steps) and the 6 or 8 key (in 10% steps), and set to 0 by pressing the CLEAR key, with direction of the mix being changed by pressing the TURN key.

Code 48 permits adjusting unequal mix quota and directions. In the course of programming the operating element for the flaps has to be set to the end required to be adjusted.



Code 47
Elevator → Flap

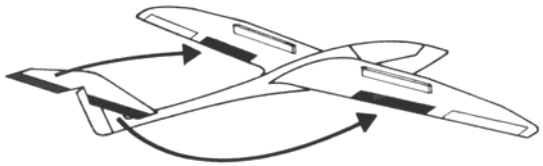
Mixer Elevator → Flap

E	L	E	V	→	F	L	A	P					
								-	s		+	2	0	%

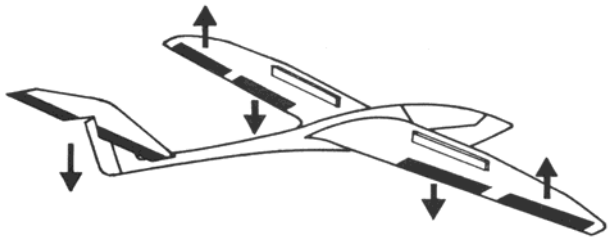
To assist the elevator when the model is circling tightly or when performing aerobatics, the flap function can be slaved to the elevator control using mixer code 47. The flaps being deflected downwards when up elevator is applied, and deflected upwards with down elevator. Thanks to this arrangement it is possible to have the flaps drop when circling and up elevator is applied, yet leave them inactive in the case of down elevator.

The mixer can be turned on and off by an external switch allocated by code 23.

After calling code 47, the mix quota for up and down elevator can be adjusted separately using the INC and DEC keys (in 1% steps) and the 6 or 8 key (in 10% steps). To achieve this, the elevator control has to be moved into the corresponding position indicated by the prefix + or – on lower line of the display. Using the CLEAR key the value can be set to 0, and the direction of the mix can be changed by pressing the TURN key.



Codes 44, 45, 46 and 54
Butterfly Function as Landing Aid



The “butterfly” function serves as a landing aid by controlling the glide slope. It may be used alone or in conjunction with spoilers which are possibly in use already.

On operation of the spoiler channel control, the flaps will be deflected downward, while the ailerons are moved upwards. The elevator is also re-trimmed by the mixers so as to maintain the longitudinal attitude of the model in normal flight. All of the three mixers can be adjusted individually and, of course, they can be used alone. For example, code 44 (spoiler → elevator) can be used in conjunction with normal spoilers to retain the glide path angle on extension of the spoilers, while the two other mixers have been set inoperative. In the case of full span ailerons, which are also used as flaps (flaperons), mixers 45 (spoiler → ailerons) and 44 (spoilers → elevator) may be used in unison to deflect the flaperons to the upper limit and to re-trim the elevator to suit.

When using aileron differential (code 22), aileron effectiveness will be considerably impaired by the extreme deflection of the ailerons via the butterfly function, aileron downward deflection being reduced or even suppressed entirely as a result of the differential. Deflections in the upward direction cannot be increased any more as the ailerons are already at their limits.

A remedy is provided by code 54 (reduction of differential), whereby the degree of differential is continuously, and adjustably, reduced or entirely cancelled on actuation of the butterfly function.

Adjustments:
Mixers 44, 45 and 46 are already allocated as per their functions, with mix quota having been set to 0, they are effectively inactive.

Code 44	Spoilers → Elevator
Code 45	Spoilers → Flaps
Code 46	Spoilers → Ailerons

To activate them, input the corresponding code number, whereupon the associated adjustment menu will be shown on the display. The first adjustment to be made is the offset, which is to say the mixer has to be told which position the operating element for the spoilers (throttle/spoiler control stick) normally occupies (spoilers retracted, and the no butterfly position of ailerons and flaps). To this end the operating element concerned is set accordingly and then the STORE key is pressed. The offset from the neutral position is shown on the lower line of the display). The mix quota can be adjusted using the INC and DEC keys (in 1% steps) and the 6 or 8 key (in 10% steps), and set to 0 by pressing the CLEAR key, with direction of the mix being changed by pressing the TURN key.

To deactivate the butterfly function, the mix quota of mixers 44, 45 and 46 have to be set to 0.

If spoilers are not provided, control channel 1 in code 72 (mix-only channel) can be de-coupled from the stick and, with the aid of a mixer, used for other purposes.

B	R	K	→	E	L	E	V							
o	f	s	-		7	3					-		2	5	%

B	R	K	→	F	L	A	P							
o	f	s	-		7	3					+	1	0	0	%

B	R	K	→	A	I	L	E	R	O	N				
o	f	s	-		7	3					-		9	0	%

Code 54
Adjusting the Reduction of Differential

After calling code 54, the magnitude of the reduction of differential can be adjusted using the INC and DEC keys, with 0% meaning that the differential remains unchanged on activation of the spoiler/ butterfly control, while a value of 100% indicates that differential is completely removed in the case of maximum butterfly function. The transition from normal to reduced differential is linear to spoiler actuation. The CLEAR key permits resetting the reduction to 0% and completely cancelling differential reduction.

D	I	F	F		R	E	D	U	C	T	I	O	N		
			8	5	%										

Programming Examples for Fixed-Wing Models

In case you have become slightly confused by the unusually large number of functions offered in the preceding chapters of these instructions, the following pages show you by way of example, how a practical adjustment of a model can be programmed in a minimum of time. In doing so, the essential functions will be activated, while the “deluxe” options meant for the competition pilot will not, initially, be taken into consideration. In the following chapters this basic program will the be expanded by additional options, followed by a few examples for the Profi’s bag of tricks. Here the basic principles of computer R/C will become clear.

From the extensive range of functions you select only those which are actually required and forget the rest of them. If, in the course of time, you need more all you have to do is activate additional functions.

Be sure to duplicate the following examples step by step, so you won’t forget or overlook anything. In this manner you’ll actually get automatically familiar with your R/C equipment and won’t consider it nearly as complicated as it may have appeared at first glance.

1.) Preparations

You have installed the module into the transmitter as per the instructions. Close the case of the transmitter again and turned the transmitter on. The display will read:

m	c	-	1	8	E		M	O	D	E	L			1	
	9	.	6	V			P	C	M						

Depending on what kind of module had been installed previously in your transmitter the display may show another model number or another modulation mode.

2.) Executing RESET (Important)

Call model memory 1 and clear it completely. To do this input:

ENTER 5 6 ENTER 1 CLEAR ENTER

If the transmitter had previously been switched to PCM you now have the basic position of the display again. If not, the request will appear to turn the transmitter off. This is because it has been switched to the default position of PCM modulation. Comply with the request and then turn it on again a moment later, thereafter you will be in the basic position.

For safety’s sake, so you won’t forget it later, execute a reset (right now) on all the remainder of the model memories. To do this, input:

ENTER 5 6 ENTER 2 CLEAR ENTER

ENTER 5 6 ENTER 3 CLEAR ENTER

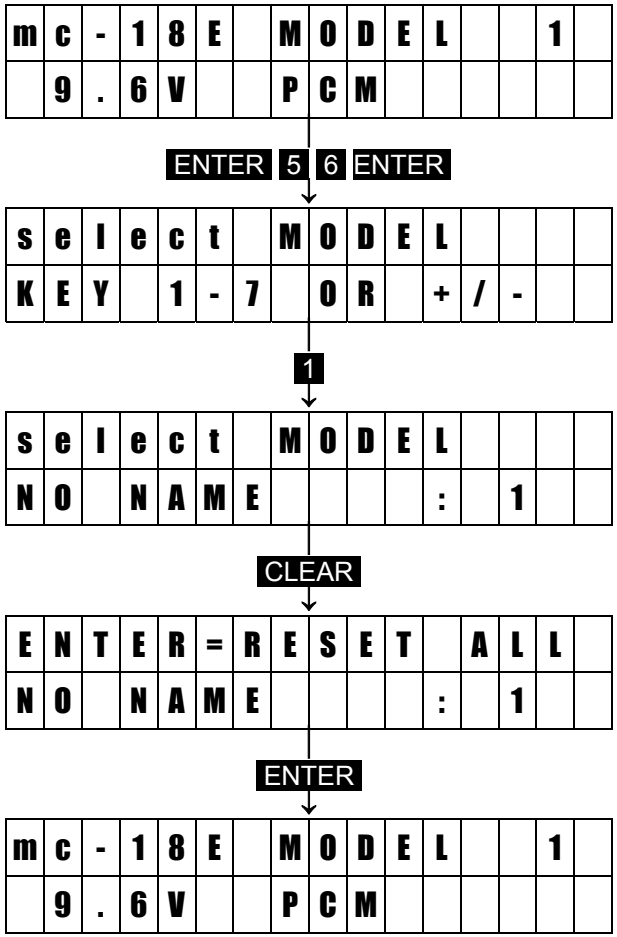
…

ENTER 5 6 ENTER 7 CLEAR ENTER

…

(ENTER 5 6 ENTER 3 0 CLEAR ENTER)

This procedure needs only to be performed once in order to positively delete any programming parts and data which may have been stored in the transmitter memory by an earlier used module, and could still be stored. These program fragments may cause a malfunction if not deleted.



3.) Selection of Model Memory

In order to file the following adjustments under model No, 1, input the following

ENTER 5 6 ENTER 1 ENTER

4.) Entering Model Name

So you'll be able to locate it correctly later on, input the name of your model, by inputting:

ENTER 3 2 ENTER

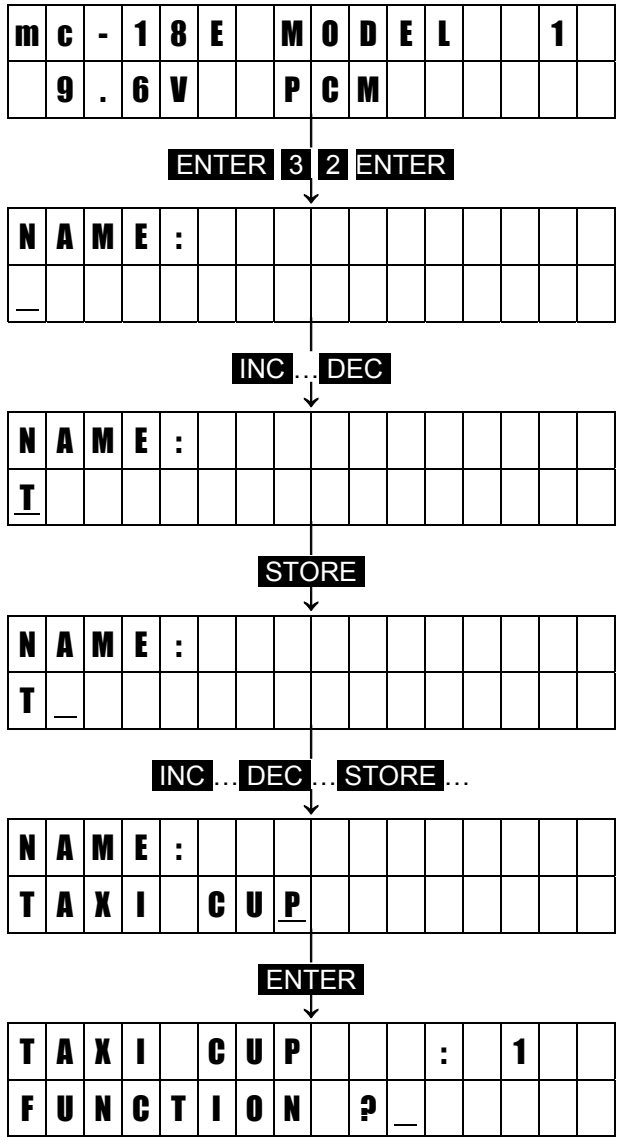
The transmitter now asks for the name, with the cursor being located in the first position of the lower line. Using the INC and DEC keys you select the first letter of the name of the model. This is stored by pressing the STORE key, whereupon the cursor moves to the 2nd position. In this manner, store the complete name of the model (the length of the name must no exceed 11 characters). Using the TURN key changes between uppercase and lowercase letters. If you have entered an incorrect letter, you can backspace using the CLEAR key and the correct it. Having entered the complete name, input is terminated by a press of the ENTER key.

NOTE:

The transmitter is now back in the command mode, indicated on the lower line of the display by "FUNCTION ?", which is to say it is waiting for a code number to be input. During adjustment it will remain in this mode, which can be left by pressing the ENTER key. From normal mode you can switch to the command mode by the ENTER key.

For the ensuing inputs, it is assumed that the transmitter is in the command mode, that is "FUNCTION ?" will be showing on the lower line of the display.

In case you had switched off your transmitter or had accidentally switched to normal mode via the ENTER key, just press the ENTER key again to get back to command mode.



Programming Examples for Fixed-Wing Models

5.) Defining Stick Allocation

Set the control stick allocation you are accustomed to by entering:

5 7 ENTER

Thereupon the lower line of the display will read:

MODE 1

Now press one of the keys 1…4, to suit your normal control mode:

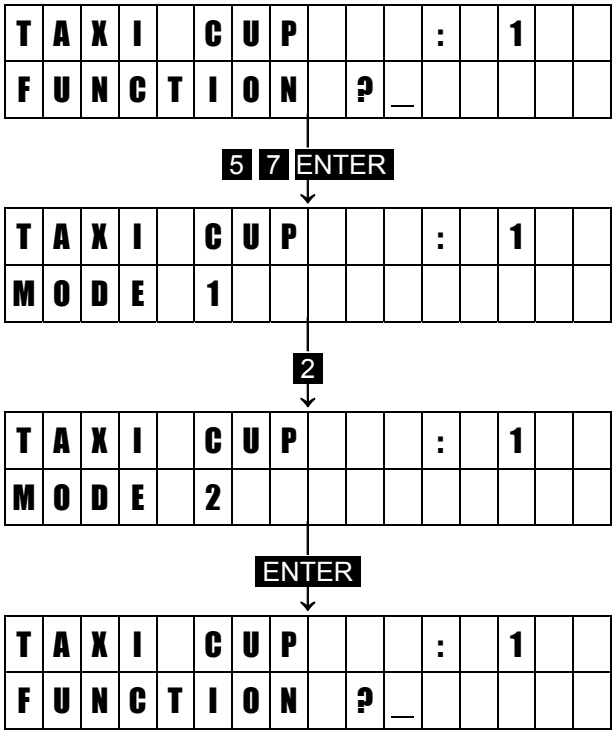
1 = Throttle and Ailerons on the right
Elevator and Rudder on the left

2 = Throttle and Rudder on the left
Ailerons and Elevator on the right

3 = Throttle and Rudder on the right
Ailerons and Elevator on the left

4 = Throttle and Ailerons on the left
Elevator and Rudder on the right

The figure on the display will change accordingly. Terminate the input by pressing the ENTER key and you are once again back in command mode.



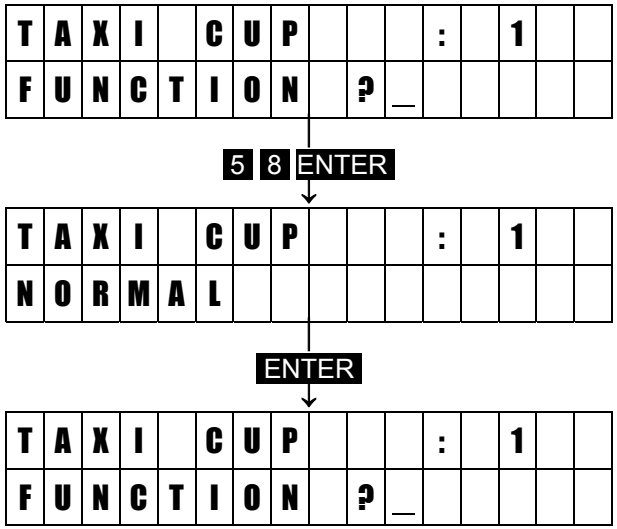
6.) Defining the Model Type

The previous inputs were universally applicable to all types of

model. Now you select the type of model to which your actual model corresponds. For this example it is assumed that you own a perfectly normal power model, the ailerons of which as well as elevator and rudder are operated by a single servo each. Input:

5 8 ENTER

In the lower line of the display now appears the actual model type. At the moment it will reads “NORMAL”. As you do not intend to switch to another model, leave type selection by pressing the ENTER key.



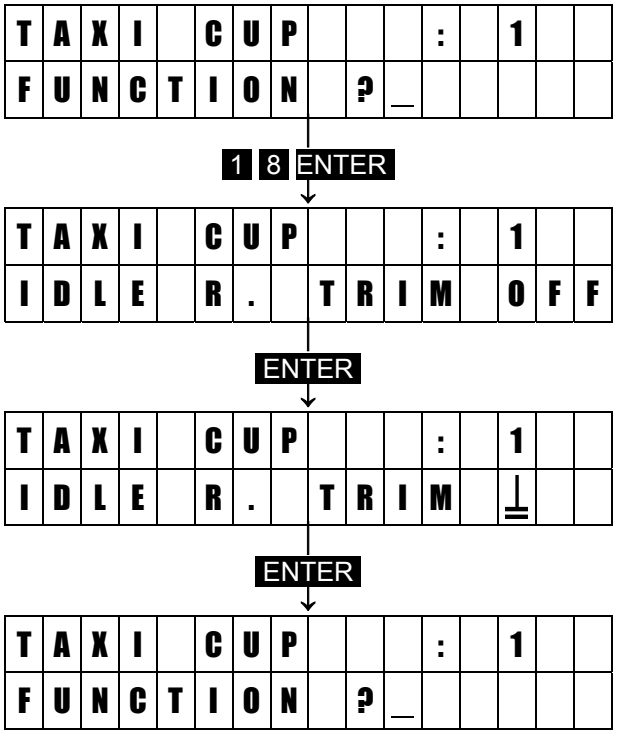
7.) Determining Idle Trim

Define the idle trim to the manner you are used to, e.g. pulling or pushing the throttle stick to increase engine power. To this end, input:

1 8 ENTER

The display then reads: IDLE R. TRIM OFF

Using the INC and DEC keys you may now switch to and fro between ⊥ and ⊤. ⊥ means pushing for full throttle, and ⊤ means pulling. Terminate the selection with the ENTER key.



Programming Examples for Fixed-Wing Models

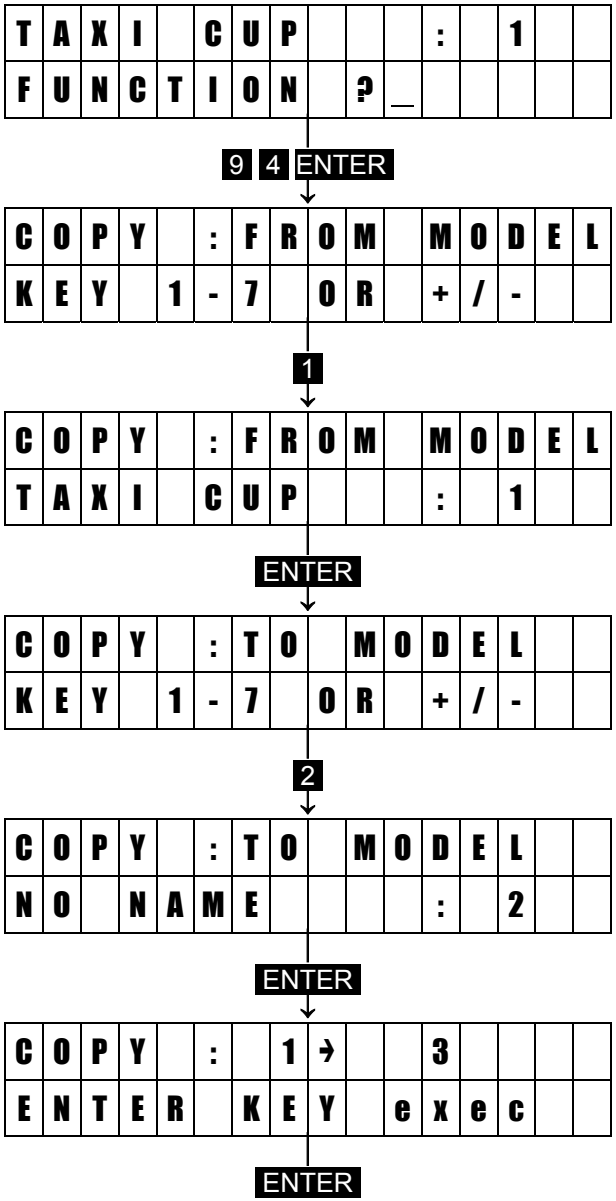
8.) Copying Adjustments

All that's been input so far may be considered as "pilot specific" programming, as these inputs depend on the habits of the pilot and are alike for all models (excepting the name of the model). In order not to have to input these settings for each model memory, you can now copy them first into the other model memories. To this end input:

9 4 ENTER 1 ENTER 2 ENTER ENTER

You have now copied the essential settings of model 1 onto model 2. Repeat the same procedure for the remaining models by:

9 4 ENTER 1 ENTER 3 ENTER ENTER
9 4 ENTER 1 ENTER 4 ENTER ENTER
…
9 4 ENTER 1 ENTER 7 ENTER ENTER
…
(9 4 ENTER 1 ENTER 3 0 ENTER ENTER)



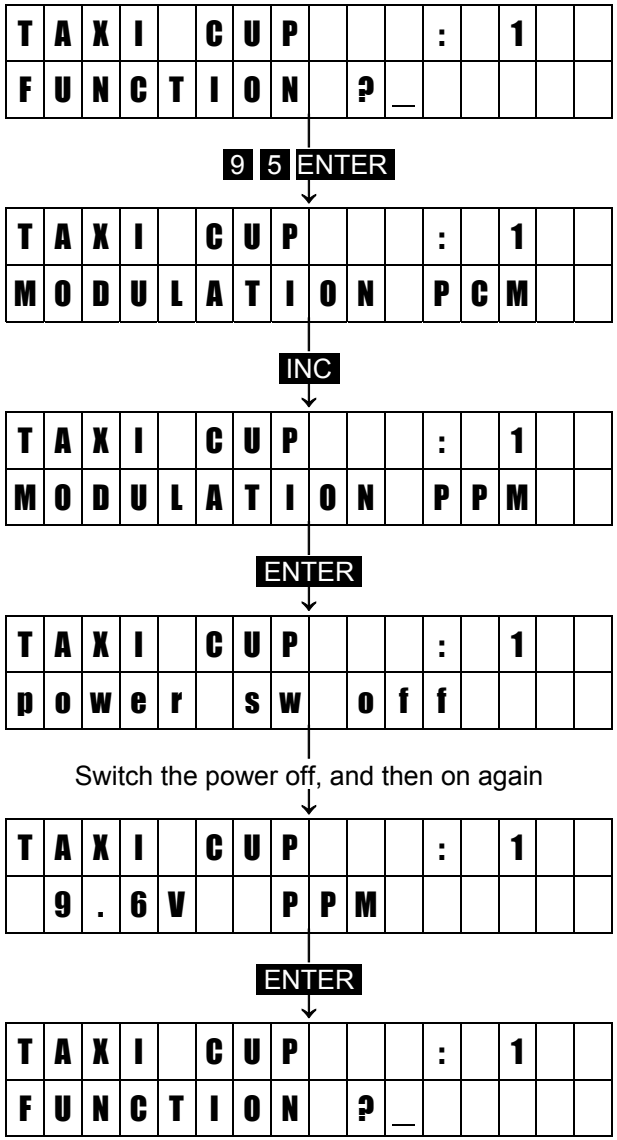
9.) Modulation Mode

If a PCM receiver has been installed in your model you may skip this step. In the case of a PPM receiver just input:

9 5 ENTER INC ENTER

Doing this you have switched to PPM mode, The transmitter now requests you to turn it off so it can change over to PPM.

A reversion to PCM mode is performed in the same way.



10.) Adjusting the Direction of Servo Rotation

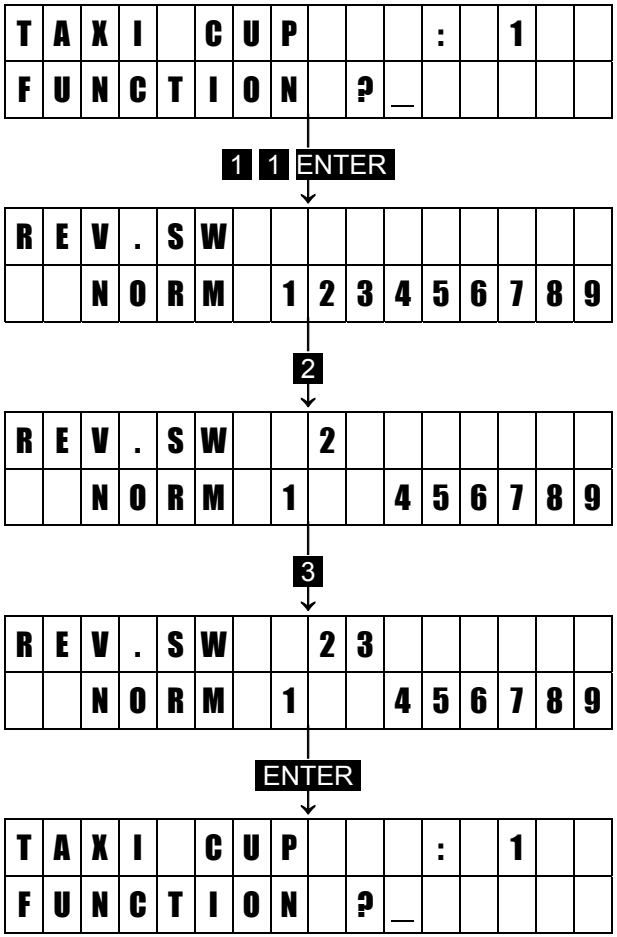
For the ensuing adjustments you now require a model with a ready to operate installed radio set. The servos should be wired to the receiver as follows:

Channel 1 = Engine Throttle
Channel 2 = Ailerons
Channel 3 = Elevator
Channel 4 = Rudder

Turn the transmitter and receiver on now and check the function of the control surfaces. Most likely one or other of the servos will be found to rotate in the wrong direction (it would be matter of sheer luck if not). To correct the direction of rotation of a servo moving in the wrong direction, call servo reversing code 11:

ENTER 1 1 ENTER

The display now indicates the direction of rotation of all servos. Correct the direction of rotation by entering the corresponding channel number so all control surfaces and the throttle move in the right direction. Terminate all input using the ENTER key.



Programming Examples for Fixed-Wing Models

11.) Adjusting Servo Throw

Normally one should choose the size of the control horn and servo arms so they provide approximately the required control surface throw. In this context you should remember: the relative size of the arm of a servo and the lever of a control horn determines the magnitude of the throw of the control surface. All control linkages introduce a certain amount of play, which can not be completely eliminated even when using top quality servos and working with ultimate precision, with the slop increasing with time. Everything should be done to reduce slop as much as possible. Here are some basic rules.

1. Keep control horns as large as possible as this helps minimise slop.

2. Slop will be greater the more acute or obtuse the angle formed by the linkage and control horn. Slop will be smallest when the linkage and horn for a right angle (90°).

3. Servo slop will make itself felt more the smaller the angular range the servo operates over.

When applying these fundamental rules the conclusion must be drawn that full servo throw should be used for the controls of a model, using the largest possible control horns, and that the required control throw should be achieved by adjusting the servo arm.

In practical operation, however, smaller and larger deviations from these ideal conditions have to be accepted, such as the selection of smaller control horns for visual reasons, the control surface linkages will have to be concealed in the gaps between surfaces, or the accommodation of large servo arms is not possible in the fuselage.

Fur such cases the PROFI-ULTRASOFT-Module provides the ability to adjust servo throw, with all the servos and each direction of operation being separately adjustable. To make this point perfectly clear: this possibility should be utilised only after you have mechanically optimised the linkages as far as possible in every case. At first glance, taking the easiest and simplest way of linking the control surfaces and performing adjustments via the transmitter options may appear to be a good solution, but in that case a lot of obtainable control precision will be lost. This, of course, is not limited to the control surfaces, but also applies to the throttle as well. Here again the linkage should be attached to the outermost hole of the carburettor lever and a servo arm chosen which will open the carburettor fully when the throttle stick is in the full throttle position, and will close the carburettor fully with the stick and trim fully pulled back. It is important that the servo is not mechanically restricted in it's motion. If this can not be achieved mechanically the adjustments may then be optimised using the throw adjust (code 12). To achieve this, input:

1 2 ENTER

The select the control channel to be used for throw adjustments:

1 = Throttle
2 = Ailerons
3 = Elevator
4 = Rudder

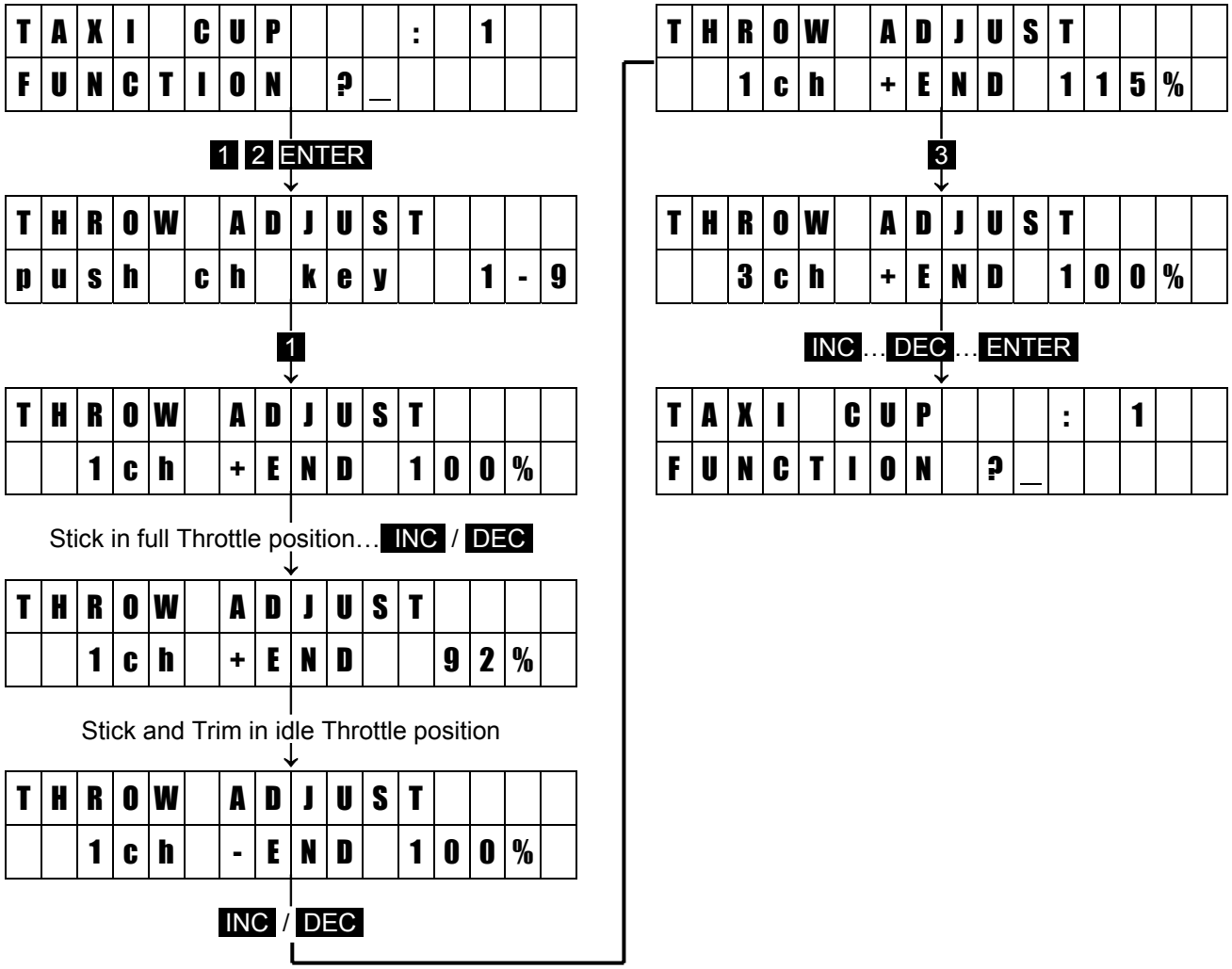
Let us assume you wish to adjust servo throw for the throttle operation, press in this 1 case.

The display now indicates normal servo throw (100%). Shift the throttle stick to the full throttle position and adjust the carburettor with the aid of the INC and DEC keys so it will be fully open, but is not hitting the mechanical stops. The display now shows the servo throw in % of normal servo throw.

Move the throttle to the idle position and set the trim slider for throttle all the way back against it's stop, where the carburettor will be as closed as possible. The display now shows 100% again, since for this side of the servo throw (viewed from the centre) the normal value is still effective.

Throw is now adjusted using the INC and DEC keys so the carburettor is fully closed without hitting the mechanical stop. It is possible that an idle stop screw on the carburettor will have to be adjusted to permit the carburettor to fully close. You should now be able to adjust the RPM of the engine with the idle trim, and also stop the engine with the trim fully back.

In the same manner you'll be able to adjust the throw of the control surfaces, if necessary asymmetrically, for example if the elevator at "full up" deflection blocks the rudder, and downward deflection must not be reduced. Call the elevator position and adjust deflection using the INC and DEC keys so that the rudder remains freely movable. Remember to take changes in elevator trim into account to ensure that fowling does not occur. Terminate the input by pressing the ENTER key.



The model may be considered as now being essentially ready for flight, the vital adjustments having been performed. If you are a beginner you ought to be content with these adjustments and collect practical experience by now flying your model. Although it would not do any harm to try the other examples, you should keep in mind that the latter are “deluxe” options with the aid of which problems encountered when flying certain models can be solved. Flying certain manoeuvres can be made easier and/or advantages can be gained over other contestants in competition flying due to the simplified operation of the transmitter.

Bearing this in mind:

II. Further Examples

Let’s return to the last example in the preceding chapter. The full-span elevator of the tailplane when deflected upwards blocks the rudder mounted above it.

This had been avoided by reducing the upward servo throw correspondingly, also allowing for the possible upward trim movement. The reaction to elevator will be smoother now the down-elevator for the reduced throw is evenly distributed over the entire control throw range from neutral to hard over up. The different control reaction to “up” and “down” may be acceptable in some cases, but might not necessarily be so. The PROFI-ULTRASOFT-Module offers another option for such cases, namely throw reduction.

Programming Examples for Fixed-Wing Models

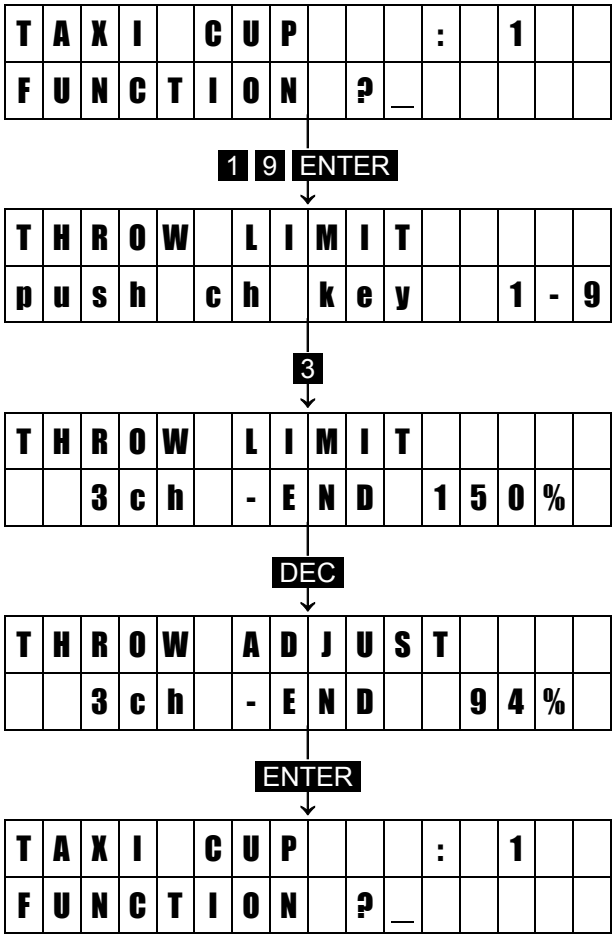
12.) Throw Reduction
Unlike throw adjust, servo reaction to a control stick deflection remains unchanged, provided the pre-set threshold value is not exceeded. On reaching the threshold value, the servo will simply stop there, eve when the stick concerned (or some other signal generator) is moved beyond that point. It does not matter by which of the means the servo reaches the threshold value(by control stick alone or by the interaction of mixers). The only importance is that the threshold can not be exceeded by the servo. In our example we wish to adjust the threshold for the elevator in such a way that jamming of the rudder can not occur, while the elevator action remains normal and no concern is needed over the upward deflection of the control surface. Throw reduction is access by code 19:

1 9 ENTER

Select the elevator channel by entering number and hold the elevator in the “full up” position. By pressing the DEC key you may now reduce the threshold (normally at 150% of normal servo throw) to a value which prevents the elevator hitting the rudder.

When pulling the elevator stick slowly you’ll notice that the servo follows the stick in a normal manner, until it stops a the threshold value, resulting in a “dead” range having been created at the end of the stick travel. It will become larger, if up trim has been added.

This example permits recognising the action of throw reduction, although its normal field of application is in the interaction of several mixers on a specific servo, used for example in the case of plain flaps and flaperons of large sailplane models. Here the threshold action can be set just short of a point where otherwise linkages or hinges would flex or deform.



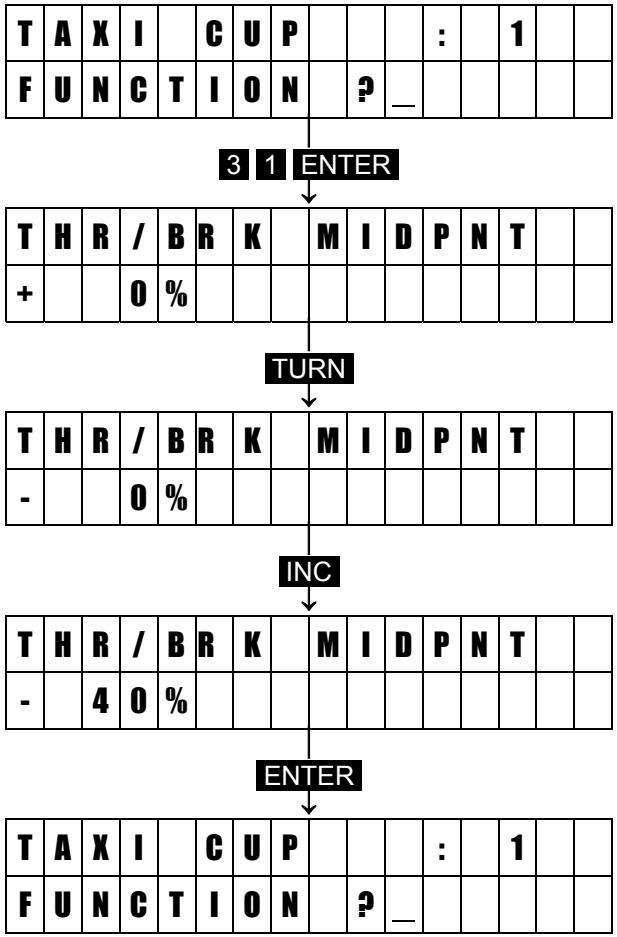
13.) Adapting Throttle Characteristics

If you have flown your power model in the meantime, you may have noticed that while engine speed can be adjusted between idle and full throttle via the throttle stick, the RPM adjustments are not uniformly distributed along the stick throw. In most cases engine speed adjustments for idle to 80% of full throttle will occupy the lower half of the control stick movement, while the upper half of the stick travel has little effect. This depends on the carburettor used of course, but it is typical nevertheless for nearly all engines. The desirable carburettor characteristics would be for the RPM to follow the stick travel in a linear manner.

The PROFI-ULTRASOFT-Module also provides an adjustment option to allow compensation of the above mentioned non-linearity – neutral point offset can be called up for channel 1:

3 1 ENTER

The indicated value 0% mean linear operation of the carburettor control lever by the servo. In the case described above the actuation has to be a progressive one compared to the regressive behaviour of the carburettor. The servo position for the stick neutral point needs to be offset in the direction towards idle, which can be accomplished by press the INC key. Adjustments should preferably be made with the engine running until a continuous rate of engine RPM change has been achieved. Terminate adjustments using the ENTER key.



14.) Trim Storage

By now you have test flown your model and though you built and trimmed it correctly, now that the model flies perfectly straight, the trim levers are no longer in the neutral position. This is unsatisfactory in that the levers may be accidentally displaced and you may not remember their correct positions afterwards. Also when you fly another model it will be difficult to reproduce the correct trim lever positions if they are not at the neutral position.

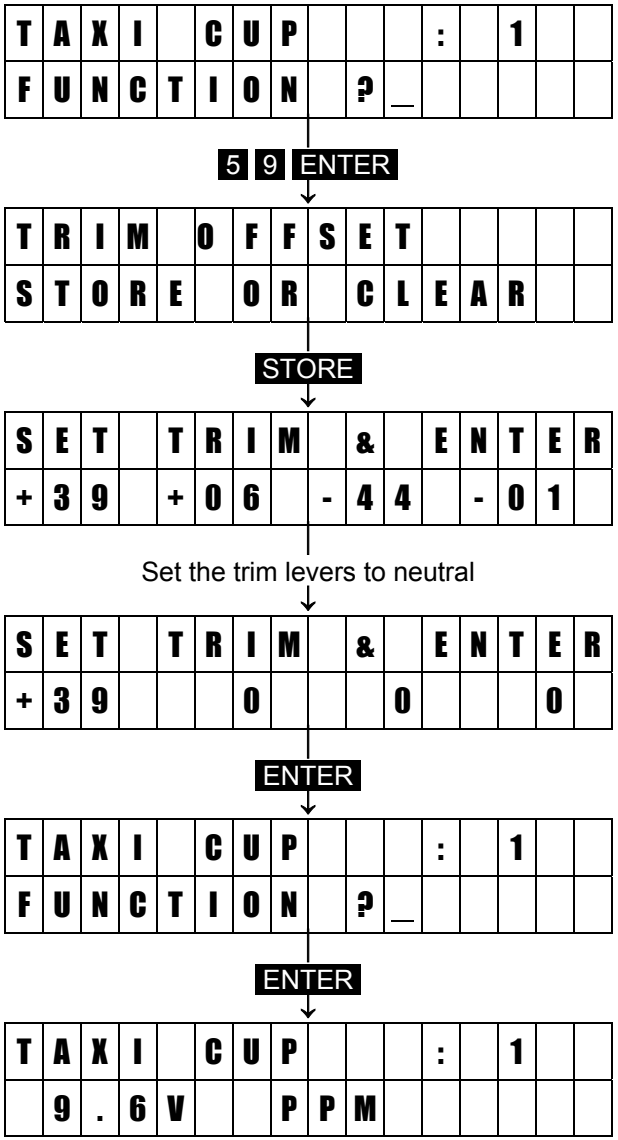
The mc-18 transmitter therefore provides for storage of trim data, so the trim levers can be reset to the neutral position. In this manner you can always reproduce the correct trim adjustment even after a change of models.

To store the in-flight established trim data, input:

5 9 ENTER STORE

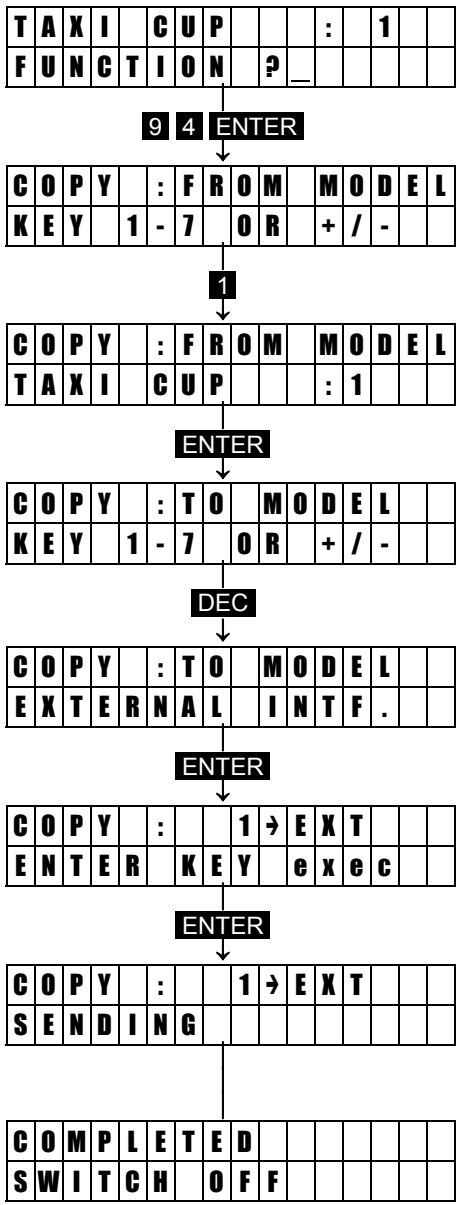
The display now indicates, in it's lower line, the trim lever offset you had set from the neutral position (in the sequence from left to right: throttle, ailerons, elevator, rudder). The corresponding electronic values are now retained and you can return the trim levers to their neutral positions. While you do this you will notice that the display readings will return to zero.

The idle trim lever, through should not be reset as a rule, this being a random position not an in-flight established setting. Terminate the adjustment by pressing the ENTER key. The in-flight established trim will now correspond to the neutral position of the trim levers.



Copying Example – Single Model Memory

Between two mc-18 transmitters
With Programming Interface (Order No. 4180)



Transmitting Unit

Call the copy function

Call the model to be copied, such as model 1, using the keys 1…9 or INC and DEC.

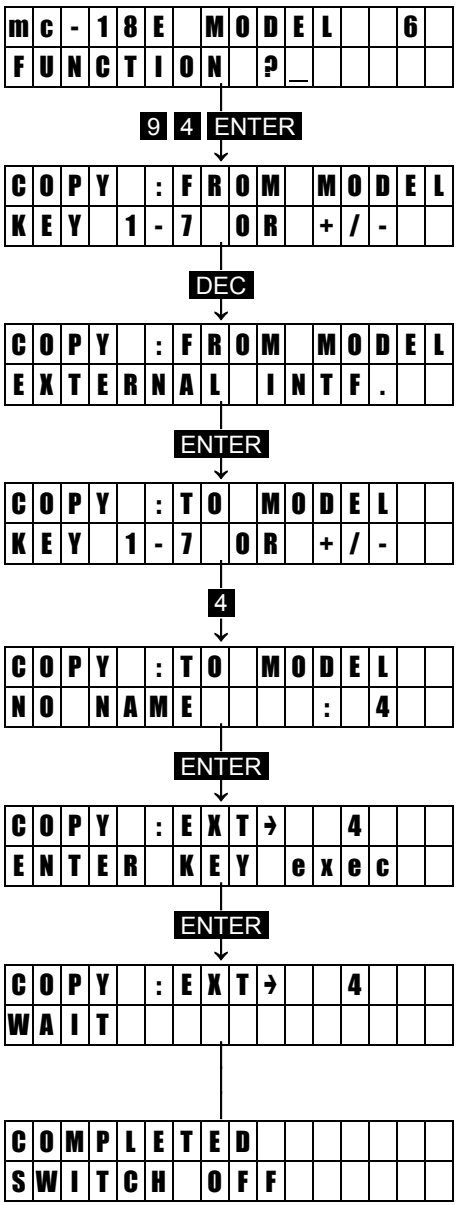
If the model is to be copied externally, call the external interface using the DEC key.

Terminate the copy program selection using the ENTER key.

Unit ready to transmit copy.

Trigger copying process with the ENTER key.

Important
Always trigger the copy process by the ENTER key on the receiving unit first.



Receiving Unit

Call the copy function

If the model is to be copied from the external interface call the interface using the DEC key.

Call the model memory into which it is to be copied, using the keys 1…9 or INC and DEC.

As a safety precaution copying into the currently active memory is not permitted, in this example memory 6.

Terminate the copy program selection using the ENTER key.

Unit ready to receive copy.

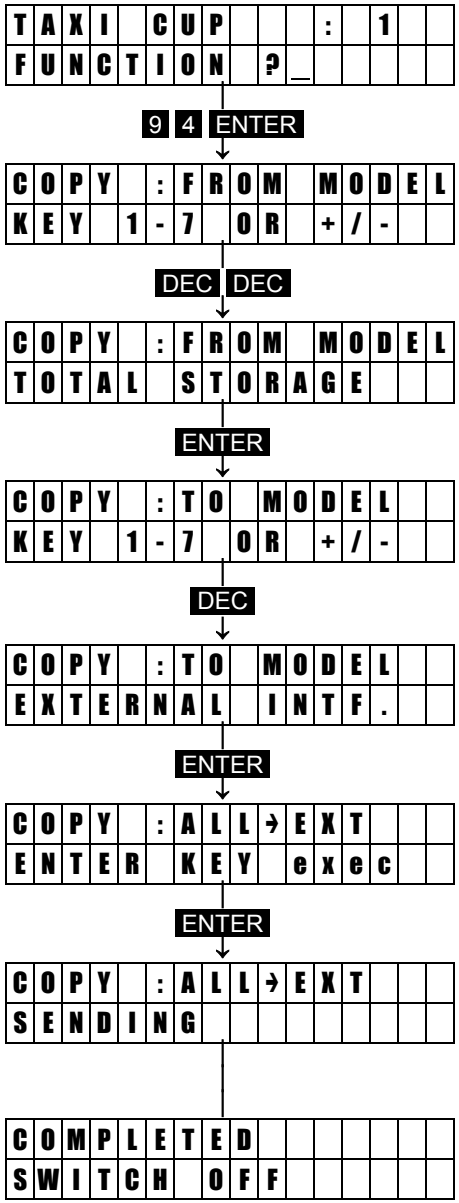
Trigger copying process with the ENTER key.

Important
Always trigger the copy process by the ENTER key on the receiving unit first.

Copying Example – All Model Memory

Between two mc-18 transmitters

With Programming Interface (Order No. 4180)



Transmitting Unit

Call the copy function

Call all model memories by pressing the DEC key twice.

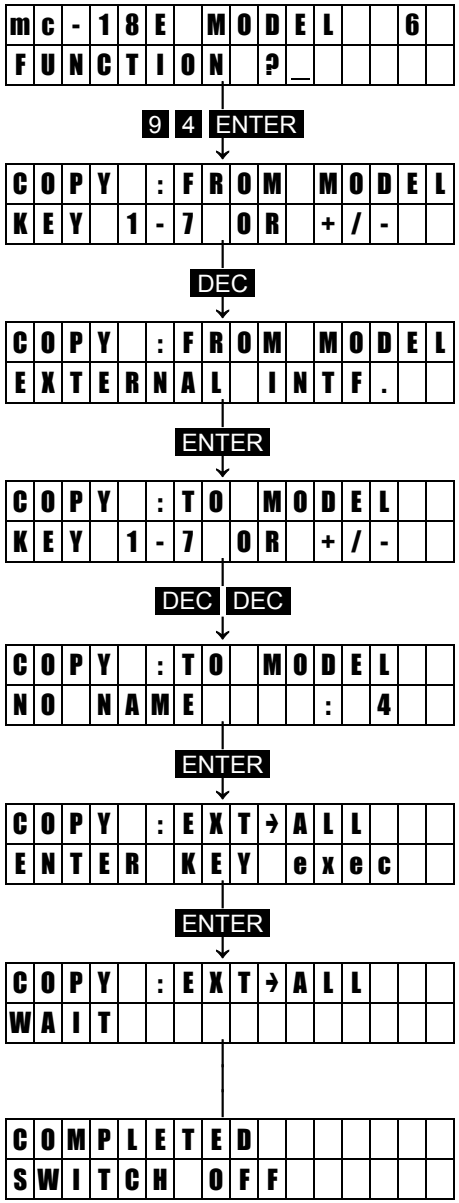
If the model is to be copied externally, call the external interface using the DEC key.

Terminate the copy program selection using the ENTER key.

Unit ready to transmit copy.

Trigger copying process with the ENTER key.

Important
Always trigger the copy process by the ENTER key on the receiving unit first.



Receiving Unit

Call the copy function

If the model is to be copied from the external interface call the interface using the DEC key.

Call all model memories by pressing the DEC key twice.

Terminate the copy program selection using the ENTER key.

Unit ready to receive copy.

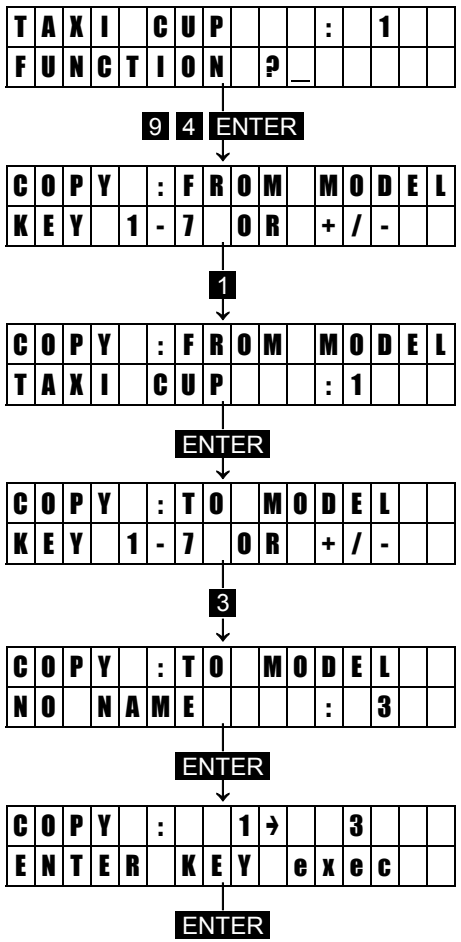
Trigger copying process with the ENTER key.

Important

Always trigger the copy process by the ENTER key on the receiving unit first.

Copying Example – Single Model Memory

Model Memory to Model Memory
In the same Transmitter



Call the copy function

Call the model to be copied, such as model 1, using the keys 1…9 or INC and DEC.

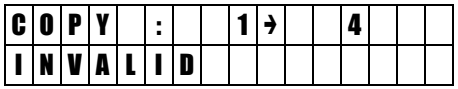
Call the model memory to be copied, into using the keys 1…9 or INC and DEC such as memory 3.

Terminate the copy program selection using the ENTER key.

Transmitter ready to copy.

Trigger copying process with the ENTER key.

As a safety precaution copying into the currently active memory is not permitted.



Indicates that copying into the currently active memory is not permitted.

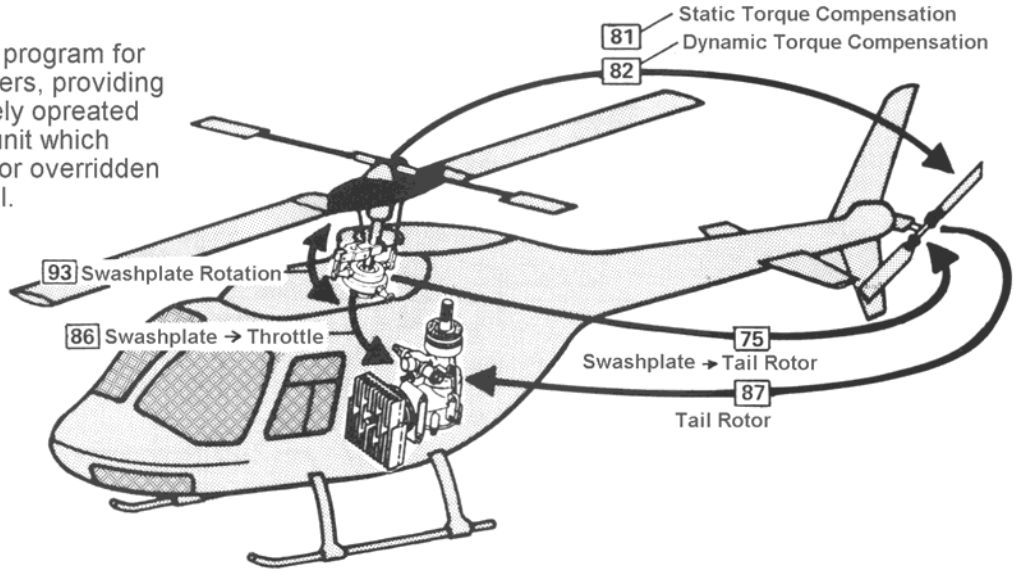
Indicates faulty input while programming, renew the input.

Appears when trying to copy from a 30 memory transmitter to a 7 memory unit.

Heli-Programme

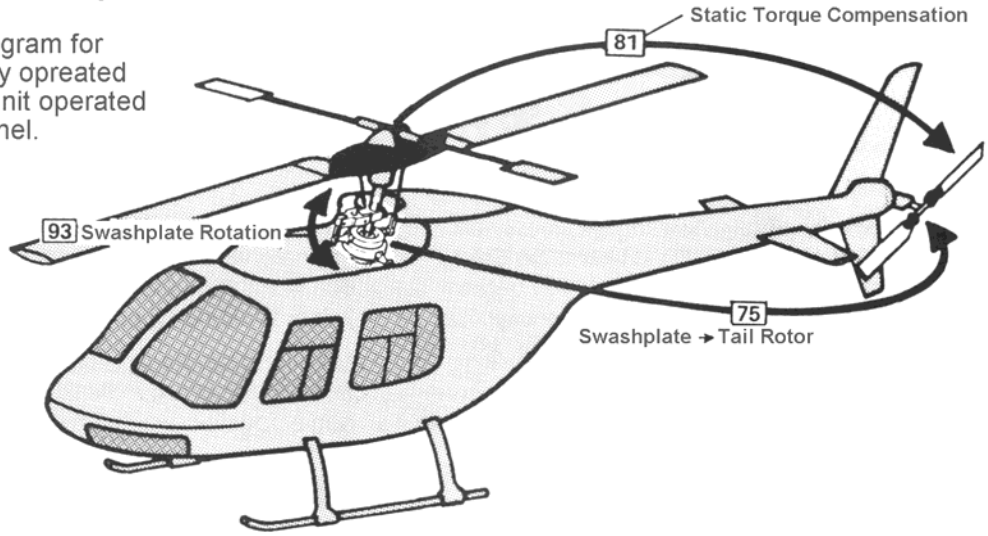
Type 8: Helicopter

Univerasal helicopter program for practically all helicopters, providing they are not exclusively opreated with a speed control unit which can not be turned off or overridden by the throttle channel.



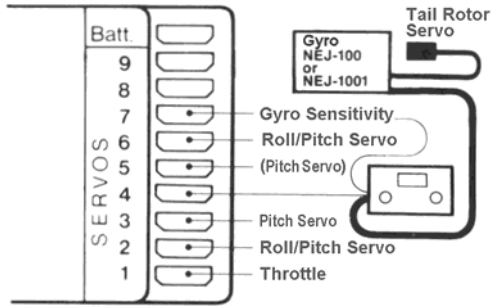
Type 9: Helicopter with Speed Control

Special helicopter program for helicopters exclusively opreated with a speed control unit operated by an additional channel.



Allocation of Receiver Outputs
The servos must be connected to the receiver outputs as follows:

Servo 1 = Throttle
Servo 2 = Roll 1
Servo 3 = Pitch 1
Servo 4 = Tail Rotor
Servo 5 = Pitch 2 control with a 4 servo swashplate or not connected.
Servo 6 = Pitch 2 or Roll 2 for 2, 3 or 4 servo swashplate.
Servo 7 = Gyro Sensitivity (Gain)
Servo 8 = Not connected
Servo 9 = Not connected

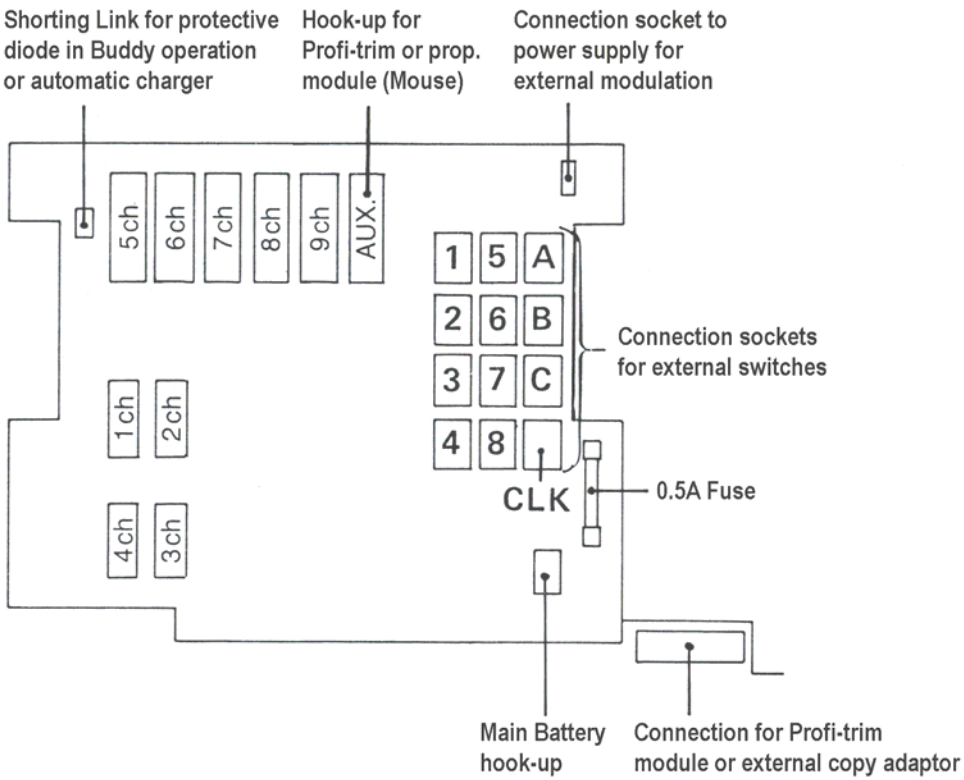


The connection of the speed control (where fitted) has to be made in accordance with the manufacturers instructions.

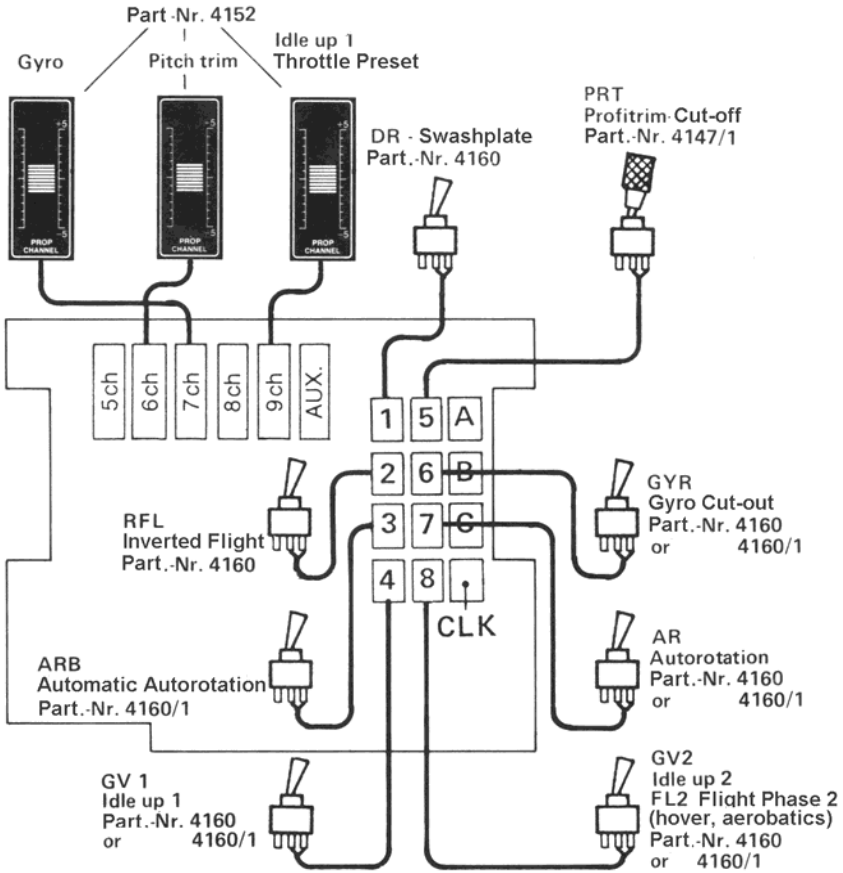
Remedy for Incorrect Direction of Servo Rotation

Unplug the two servos from the receiver.
Swap over and plug back in to the receiver.
Reverse the servos in the Transmitter.

Hook-up of External Operating Elements at the Transmitter Board



Recommended Hook-up of External Operating Elements for Helicopter Programs



The external plug stations 1…8 are allocated to the desired functions using codes 23, 33 and 34.

A three position switch (such as a differential switch, order no 4160/22) is connected, for example to switch OFF, throttle preset 1 and throttle preset 2, the two plugs must be plugged into horizontally adjacent stations only (e.g. 4 and 8), never one above the other (e.g. 3 and 4).

Using an momentary switch (e.g. 4160/11) connected to the CLK connection is used to start/stop the countdown timer. Resetting the stopwatch is performed by pressing the CLEAR key.

The operating elements wired to connections 5ch…9ch can be allocated differently, if so desired using code 37.

The two slider type controls in the central console are normal used as follows:
Channel 6 = Collective Pitch Trim
Channel 7 = Gyro Sensitivity (Gain)

With a slider control connected to “9ch”, throttle preset 1 can be infinitely variable.

With a slider or rotary control connected to “AUX”, analogue adjustment of values can be made.

Code List for HELICOPTER (Type 8)

The code numbers for the options have been chosen to suit in-house technical deliberation, whilst the following descriptions are in the sequential order in which they'll normally be called when performing the setting-up process of a new model rather than numerically.

When a model is being programmed for the first time, be sure to follow this logical sequence. If you fail to follow it, you may forget something or unintentionally upset other adjustments made previously.

The second table list the options for subsequent changes in the operation of the model in function related groups.

Programming a New Model

No.	Display	Meaning	Page
56	MODEL SELECT	Select Model	60
95	MODULATION	PPM/PCM Select	60
57	MODE SELECT	Stick Mode Selection	60
58	MODEL TYPE	Model Type Selection	61
21	GAS STICK DR	Direction of Throttle/Pitch Control	61
32	MODEL NAME	Input Model Name	61
29	THROTTLE TRIM	Allocation of Idle Trim	62
23	SWITCH FUNCT.	External Switch Allocation	62/63
34	SWITCH DR/EXP	Dual Rate/Exponential Switch Set-up	63
68	SWASH TYPE	Swashplate Type Selection	64
69	SWASH ADJUST	Swashplate Mixer Adjustment	65
11	REVERSE SW	Direction of Rotation of Servos	65
37	INP-PORT ASS	Allocation of External Controls	65
67	ATS SELECT	Automatic Torque System Select	66
24	AUTO ROTATION	Autorotation Changeover Set-up	66
25	INV. FLIGHT	Set-up for Inverted Flight	66
26	HIGH PITCH	Maximum Pitch Set-up	67
27	LOW PITCH	Minimum Pitch Set-up	67
28	HOV. PITCH	Hover Pitch Set-up	67
93	SWASH ROTATE	Enter Swashplate Rotation	68
81	STATIC ATS	Static Torque Compensation	68
82	DYNAMIC ATS	Dynamic Torque Compensation	68
83	AUTOR. Rud-of	Positions Tail Rotor in Autorotation	69
84	HOV. THROTTLE	Set-up for Hover Throttle	69
85	IDLE UP	Set-up Throttle Positions	70/71
86	SWSH → THRO MIX	Swashplate to Throttle Mix	72
87	RUDD → THRO MIX	Tail Rotor to Throttle Mix	72
89	GYRO CONTROL	Set-up Gyro	72/73
91	AN. TRIM SW	Set-up for PROFITRIM	75/75
75	SWSH → RUDD MIX	Swashplate to Tail Rotor Mix	75
12	THROW ADJUST	Servo Throw Adjustments	75
16	TRACE RATE	Adjust Effect of Operating Stick	76
19	THROW LIMIT	Servo Throw Reduction	76
15	SUB TRIM	Servo Neutral Point Adjust	76
13	DUAL RATE	Switchable Servo Throw Reduction	77
14	EXPONENTIAL	Exponential Servo Movement	77
35	RED. TRIM	Allows Reduction of Trim Range	78
79	SERVO SLOW-D	Servo Slow Set-up	78
92	SMOOTH SWITCH	Servo Transit Time Set-up	
63	CH1-SWITCH	Channel 1 Dependant Auto Switch	78
51	MIXx CHANNEL	Channel Allocation for Mixers	80/81
33	SWITCH MIX	Allocation of Mix Switches	80/81
61	MIXx COM GAIN	Mixer No x Common Gain Adjust	80/81
71	MIXx SEP GAIN	Mixer No x Separate Gain Adjust	80/81
59	TRIM OFFSET	Storage of Trim Offset Values	82
94	COPY MODEL	Model Copy Facility	82/83
74	SERVO POSIT.	Display of a Servo Position	83
76	SERVO TEST	Allows Testing of Servos	83
73	SWITCH POSIT.	Display of Switch Positions	84
77	FAIL SAFE MEM	Set-up of Failsafe Mode	84
78	FAIL SAFE BAT	Failsafe on Low RX Battery	85
97	ALARM TIMER	Stop Watch Timer	85
98	INTEG. TIME	TX operating Timer	86
88	KEYBOARD LOCK	Lock the Keyboard	86
99	ALL CLOSE	Lock the Transmitter	86/87

Operation

No.	Display	Meaning	Page
56	MODEL SELECT	Select Model	60
59	TRIM OFFSET	Storage of Trim Offset Values	82
13	DUAL RATE	Switchable Servo Throw Reduction	77
14	EXPONENTIAL	Exponential Servo Movement	77
91	AN. TRIM SW	Set-up for PROFITRIM	75/75
Throttle			
84	HOV. THROTTLE	Set-up for Hover Throttle	69
85	IDLE UP	Set-up Throttle Positions	70/71
86	SWSH → THRO MIX	Swashplate to Throttle Mix	72
87	RUDD → THRO MIX	Tail Rotor to Throttle Mix	72
24	AUTO ROTATION	Autorotation Changeover Set-up	66
Collective Pitch			
26	HIGH PITCH	Maximum Pitch Set-up	67
27	LOW PITCH	Minimum Pitch Set-up	67
28	HOV. PITCH	Hover Pitch Set-up	67
25	INV. FLIGHT	Set-up for Inverted Flight	66
Tail Rotor			
81	STATIC ATS	Static Torque Compensation	68
82	DYNAMIC ATS	Dynamic Torque Compensation	68
83	AUTOR. Rud-of	Positions Tail Rotor in Autorotation	69
75	SWSH → RUDD MIX	Swashplate to Tail Rotor Mix	75
Swashplate			
69	SWASH ADJUST	Swashplate Mixer Adjustment	65
93	SWASH ROTATE	Enter Swashplate Rotation	68
Mixer			
61	MIXx COM GAIN	Mixer No x Common Gain Adjust	80/81
71	MIXx SEP GAIN	Mixer No x Separate Gain Adjust	80/81
89	GYRO CONTROL	Set-up Gyro	72/73
Timer			
97	ALARM TIMER	Stop Watch Timer	85
98	INTEG. TIME	TX operating Timer	86
Safety			
77	FAIL SAFE MEM	Set-up of Failsafe Mode	84
88	KEYBOARD LOCK	Lock the Keyboard	86
99	ALL CLOSE	Lock the Transmitter	86/87

Code 56
Model Selection

Selection and Deletion of Models

s	e	l	e	c	t		M	O	D	E	L		
K	E	Y		1	-	7		O	R		+	/	-

The MC-18 transmitter permits the storing the data of seven models and 30 models[3], including all trim data. To this end, actual trim data have to be stored into the trim memory via code 59, so the trim sliders of control functions ailerons, elevator and rudder can be moved to the centre position. In this manner finding trim data required for a newly selected model (after a change of model) will be very much simplified, as all you've got to remember is that all trim levers will occupy the centre position.

After calling code 56, model selection is performed either directly by entering the model number under which the desired model has been stored, or by skimming through the index of stored models to and fro via keys INC and DEC. In either case the name of the currently selected model will appear in the lower line of the display. You still have the possibility to correct your selection by entering another model or by skimming the index once again.

The selected model will be activated by ENTER. If the CLEAR key is pressed instead of ENTER, complete deletion of the selected model data can be initiated. This process is be performed by the ENTER key, and aborted by any other key.

In case the model selected has been programmed for another kind of modulation than the preceding one, the display message "POWER OFF" indicates that you've got to turn the transmitter off and then on again so that the switch from PCM to PPM (or vice versa) can be made.

[3] Transmitters are configured for 30 models, starting with series '89

Code 95
Modulation

Selection of PPM or PCM Modulation

m	c	-	1	8	E		M	O	D	E	L		1
M	O	D	U	L	A	T	I	O	N		P	P	M

The MC-18 transmitter permits operation on PPM (Pulse Position Modulation) or PCM (Pulse Code Modulation).

Switch over is provided by code 95, using the INC and DEC keys.

After a change of the modulation mode, the display text will indicate that the transmitter has to be turned off momentarily, so that it can swap over to the changed modulation.

Code 57
Control Allocation

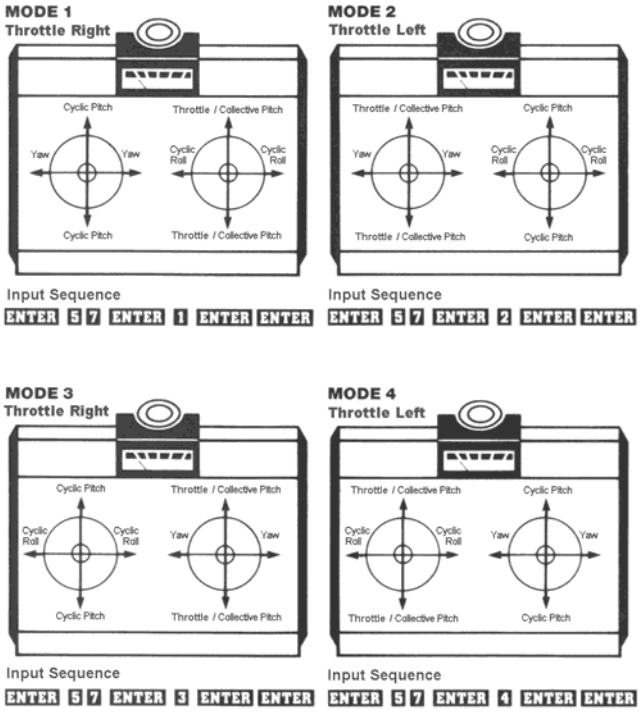
Allocation of Control Functions 1 – 4

m	c	-	1	8	E		M	O	D	E	L		1
M	O	D	E		2								

Fundamentally there are four different modes for allocating the control functions Roll, Pitch, Tail Rotor and Throttle/Collective Pitch to the two control sticks. Which of them is used depends on the individual preferences of the modeller.

For steering a model helicopter, it is preferable to have Roll and Pitch on one stick, with Tail Rotor and Throttle/Collective Pitch on the other (modes 2 or 3).

The selection of the desired mode of operation is performed by selection of code 57 via keys 1...4.



Code 58
Model Type

Selection of Model Type

m	c	-	1	8	E		M	O	D	E	L			1	
H	e	l	l												

The PROFI-ULTRASOFT-Module recognises a total of 9 different model types. The selection has to be performed when beginning to program a model, as it determines which codes may be called. A code number which is incompatible with the model type concerned, will be rejected by a message “INH (WRONG TYPE)”.

The following model types can be selected via buttons 1...9 on activation of code 58, with the selected type indicated in the lower line of the display.

Key	Display	Meaning
1	NORMAL	Conventional model
2	NORMAL/DIFF	Same as 1, but with 2 aileron servos and differential
3	DELTA/DIFF	Deltas and flying wings with aileron/elevator mix
4	UNIFLY/DIFF	Models with plain flaps operated by a single channel
5	QUADRO-FLAP	Same as 4, but flaps operated by 2 channels
6	F3B (3 wing sv)	F3B model with 3 wing-mounted servos (1 channel for flaps)
7	F3B (4 wing sv)	F3B model with 4 wing-mounted servos (2 channels for flaps)
8	Heli	Universal helicopter program including models with RPM control
9	Heli (sp.ctl)	Helicopter with RPM control only

When changing model type via code 58, you must be aware of the fact that some of the already programmed adjustments will be deleted and reset to their basic values, even if immediately switched back to the initial model type.

Code 21
Throttle/Pitch Reversal

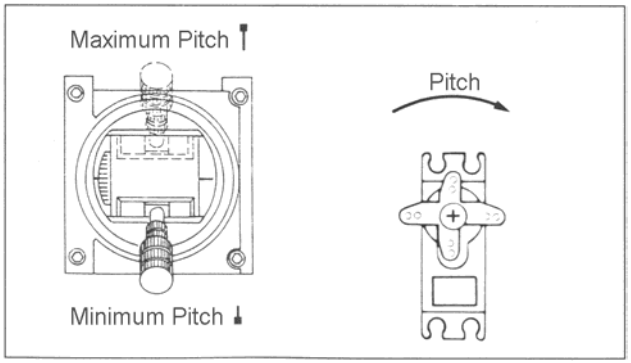
Set-up the Throttle/Pitch Control Direction

m	c	-	1	8	E		M	O	D	E	L			1	
L	O	W		P	I	T	C	H		⏚					

Code 21 enables the pilot to adapt throttle/pitch stick motion to the direction of operation he prefers.

After calling the code, the direction of operation (pitch push or pull) can be reversed by pressing the INC and DEC keys. The currently active adjustment is shown on the display in a stylised control stick which indicates idle stick position.

This setting affects all the other control functions using the throttle/pitch stick, e.g. Idle Up, Idle Trim, DMA-Mixer, Pitch Trim, etc.



Code 32
Model Name

Entering Model Names

N	A	M	E	:										
L	O	C	K	H	E	E	D	2	8	6				

Due to the variety of model programs which can be stored in the transmitter at the same time, it will not be easy to remember the number of a model, the data of which have been stored in memory. For this reason the name of a model can be additionally stored. The relevant test, which must not exceed 11 symbols, is indicated in the multi-data terminals display.

On selecting code 32 the earlier input text will appear or, when programming for the first time, an empty line. Using the INC and DEC keys the letters of the alphabet and numbers 0 through 9 may be selected. Use of the TURN key permits switching from capital letters to lowercase. When the desired character appears it is accepted by pressing STORE and the next character can be selected. When finished, press the ENTER key.

Deletion of data input is performed by pressing the CLEAR key.

If analogue input is used, via a proportional rotary module connected to the AUX socket, for selection of the characters, special symbols will be available in additional to capital letters and numbers, for dressing up a names.

Code 29
Throttle Trim

Selection and Deletion of Models

T	H	R	O	T	T	L	E		T	R	I	M		
N	O	R	M	A	L									

Code 29 determines which flight phase the idle trim is effective under. It is therefore possible during Autorotation to determine, with the idle trimmer position, whether the motor remains running or not.

After calling the code, the flight mode can be selected using the INC and DEC keys.

Display	Idle Trim Effective During
NORMAL	Normal Flight
AUTOR.	Autorotation
NORMAL+AUTOR.	Normal & Autorotation
OFF	Idle Trim Inactive

Code 23
Switch Function

Allocation of External Switches to Model Types 1 – 5

→	C	L	K		G	Y	R		A	R			A	R	P
		N				9				9				9	

External switches installed and connected to plug stations 1 – 8 are allocated to specific functions via code 23. Some of these functions can be activated and de-activated in the process. Allocation can be performed either as per the mechanical mode of operation of the switch (open = OFF, closed = ON) or by pole reversal (open = ON, closed = OFF).

In addition to physically existing switches a logical “phantom switch” is available, designated numeral 9. By allocation of this switch one of the functions can be permanently switched on or off, respectively.

As any number of functions can be allocated to any of the switches, linkages can be realised. Without this mixers would have to be used, which remain available for other purposes.

So it is through the corresponding assignment and use of the freely programmable mixers (code 33), for example possible for a competition helicopter to switch, with only one external switch, from a perfect hovering flight adjustment to a special aerobatics adjustment: Gas pre-selection 2 instead of gas pre-selection 1, dual rate, exponential control, alternative adjustments for pitch and gas in the hovering flight and for minimum and maximum pitch, modification of the gyroscope effect, modification of the trim and correction of the throttle adjustment.

Allocation and pole reversal of external switches

After calling code 23, the functions available for the active model will appear on the upper line of the display, with the allocated switches appearing on the line below. Numerals indicate the switches wired to the corresponding plug stations.

N means that the function in question is de-activated. Flashing numerals indicate that the switch concerned has been allocated with reverse polarity. The small arrow (upper line) indicates the function to which the switch can be allocated at the present time. It can be moved to the right or left by pressing the INC and DEC key, respectively.

As not all of the available functions can be shown at the same time on the display, the latter can be moved – window style – over the two lines, showing the allocations. When the arrow points to the outermost right function, the next function will appear in the display when the INC key is pressed. They can be scrolled left by pressing the DEC key. In this manner any of the functions can be displayed.

To allocate the selected functions press the CLEAR key. As a result a question mark symbol will appear on the lower line. To switch be may allocated by pressing keys 1…9. If the switch is to be reversed, the DEC key has to pressed first.

If a de-activatable, currently active function is selected, pressing the CLEAR key will first de-activate the function, pressing the CLEAR key a second time will display the question mark symbol.

Code 34
DR/EX Switch

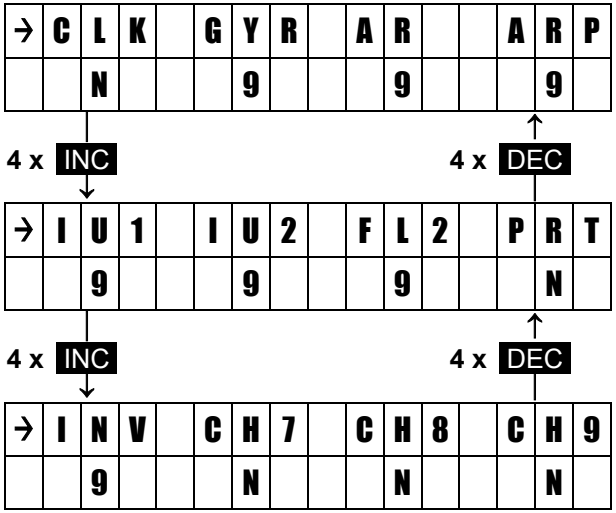
Dual Rate / Exponential Switch Allocation

Available Functions:

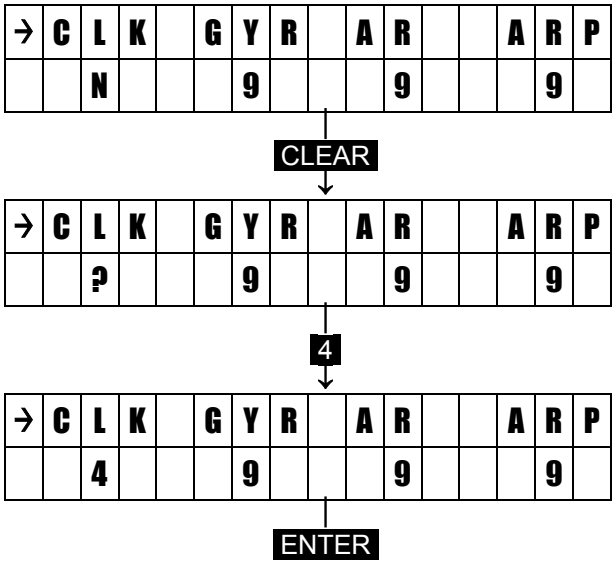
CLK	Stopwatch, runs as long as the switch is closed
GYR	Switches the Gyro mixer on/off
AR	Autorotation Switch
ARP	Automatic Autorotation Switch
IU1	Idle Up 1 selection switch
IU2	Idle Up 2 selection switch
FL2	Activation of the alternative pitch and throttle adjustments for hovering flight.
PRT	Disconnection of PROFITRIM-Module
INV	Inverted Flight Switch
CH7	Operation of Channel 7
CH8	Operation of Channel 8
CH9	Operation of Channel 9

Thus external operating elements can be used as switches for control channels, whereby the two switching positions are processed in such a way as if the end positions of a 2 channel switch attached at this channel (Part No. 4151).
If a normal control is already attached for this channel at the appropriate card location, then it is deactivated by the switch allocation. It can be assigned, however, using Code 37 to another function. In this way channel 9 is available to the helicopter programs, for which no connection is available.

Selection of the individual functions:



Selection of individual functions - Stopwatch



→	D	R		2	3	4			E	X		2	3	4
S	W	I		9	9	9						9	9	9

The switches for the dual-rate and exponential functions are allocated using code 34. In doing so it is possible to trigger several control functions simultaneously without using multi-function switches.

Due to the possibility of reversing switch functions via the DEC key, dual-rate and exponential can be coupled with ant other function switch.

Allocation and reversing of external switches

After calling the designations of the control functions will appear in the upper line of the display for dual-rate and exponential, with the allocated switches concerned in the lower line. The small arrow in the upper line indicates whether the allocation for dual-rate or exponential is being performed, and it's position can be changed using the INC and DEC keys.

Allocation of the switches is performed by pressing the key for the input function (2…4) followed by the switch number, if necessary pressing DEC first to reverse the switch polarity.

After all allocations have been made, press ENTER to store the settings.

Using code 73, switch position, the number and orientation of the switches can be found quickly and reliably.

Code 68
Swashplate Type

Swashplate Type

m	c	-	1	8	E		M	O	D	E	L			1	
S	W	A	S	H		3	S	v	(	2	R	o	l	l	)

For the swash plate control five different programs exist:

1 The swash plate has servos for roll and pitch, it is not however not axially adjustable. Collective pitch change is achieved by a separate servo.

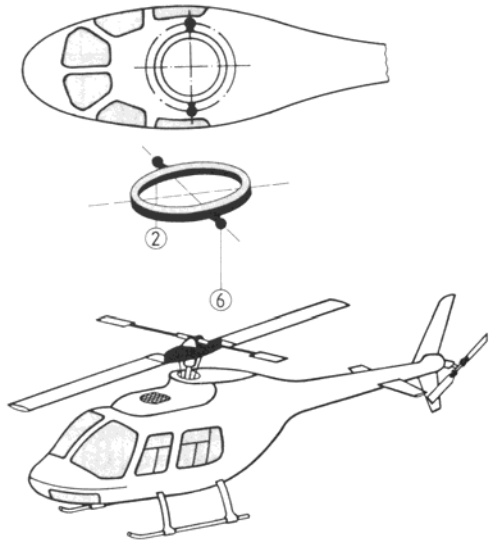
2 The swashplate is axially shifted for the pitch control by two Roll servos; the collective pitch control is decoupled by a mechanical output.

3 Symmetrical three point control of the swashplate by three points at 120° spacing, for which one pitch servo (front or rear) and two Roll servos (laterally on the left and on the right) are connected. For collective pitch control all three servos shift the swashplate.

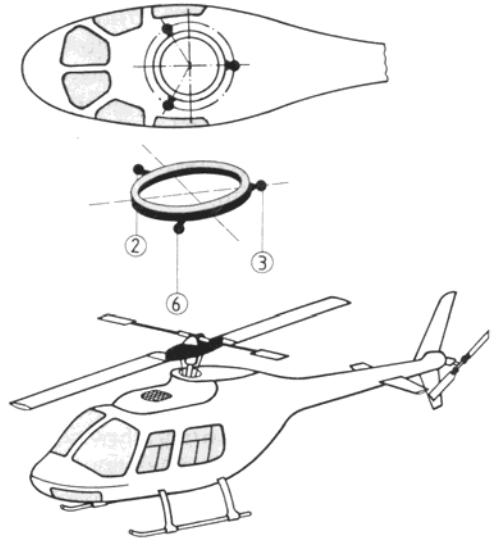
4 Symmetrical three point control as above, however, turned 90° with a roll servo laterally and two pitch servos front and rear.

5 A four servo swashplate with two roll and two pitch servos.

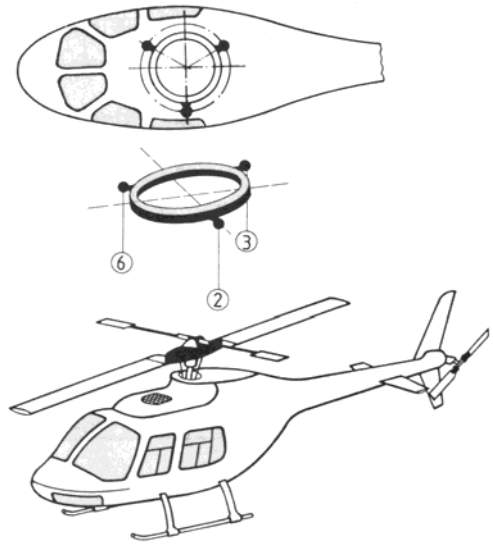
After selecting code 58, the desired type of swashplate can be selected through pressing of the appropriate key **1**…**5**, accepted by pressing the **ENTER** key.



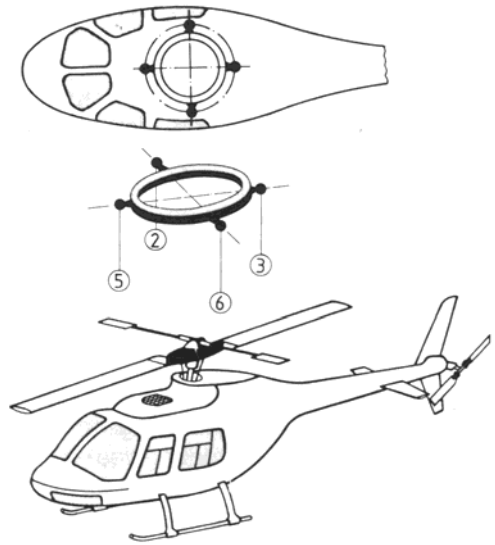
Code-Nr. 68/2
Heli 2 Servo



Code-Nr. 68/3
Heli 3 Servo (2 Roll)



Code-Nr. 68/4
Heli 3 Servo **(2 Pitch)**



Code-Nr. 68/5
Heli 4 Servo **(2 Pitch / 2 Roll)**

Code 69
Swashplate Adjustment

Adjustment of Swashplate Mixers

S	W	S	H	-	P		M	I	X			A	D	J	.
p	u	s	h		k	e	y		2	,	3	o	R	6	

After activating a swash plate mixer (code 68), the mixing proportions are effective for the functions roll, pitch and collective pitch, preset to standard values, which can now be adjusted using code 69 to suit the practical requirements.

After calling Code 69, the request appears, on the display, to input the code number for the function to be adjusted, as follows:

2 = Roll

3 = Pitch

6 = Collective Pitch

In the case of swashplate type 1 (no mixing) these adjustment options are, of course, not provided.

In the case of type 2 (standard HEIM mechanics) only the mix quota for roll and pitch functions are adjustable.

A reversal of the mix quota in each case can be performed by pressing the TURN key, with the prefix changing between + and - accordingly.

Important:
For safety reasons, reversal of the mix quota, using the TURN key, is only possible when the throttle / pitch control stick is moved to the full throttle / full pitch position.

Code 11
Servo Reversal

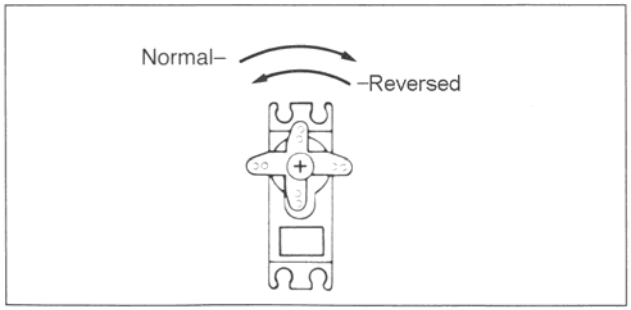
Reversing Direction of Servo Rotation

R	E	V	.	S	W			2	3			6			
		N	O	R	M		1			4	5		7	8	9

Code 11 permits changing the direction of rotation of servo to those required in a model, so the linkages etc., can be installed without paying attention to the initial direction of rotation of the servos in question.

After calling code 11, the direction of rotation of all servos will be simultaneously indicated on the display by their numbers 1…9 with the numbers appearing in the bottom line indicating normal rotation, and those appearing in the upper line indicating reversed rotation.

Important:
The numerals of the servo designation always refer to the receiver outlet to which the servo is connected. Any conformity with the numbering of the control function inputs of the transmitter would be purely coincidental. They won't occur normally because of the complex special programs of these hi-tech models. For that reason a change of allocation of control functions (code 57) won't affect the numbering and direction of rotation of the servos.



Code 37
Signal Generator Allocation

Allocation of Operating Elements Channels 5 – 9

P	O	R	T					5	6	7	8	9			
I	N	P	U	T				5	6	7	8	9			

In some cases, for individual models, it may be desirable to have certain operating elements, such as slider-type potentiometers or channel switches affect other function outputs than those to which they have been allocated by the internal connection.
Code 37 permits free choice of allocation of the operating elements to the function outlets without changing the internal connections. In addition it is possible to have one operating element affect several function outputs.

After selecting, the function inputs (operating elements) appear in the upper line of the display identified by the socket 5…9, and the output to which they have been allocated appears in the lower line. Signal generator 7 is, for example, the slider-type potentiometer is connected to plug station 7.

To allocate one of the function inputs to another operating element, select the function concerned by one of the keys …9, whereupon a question mark symbol appears in the lower line below the selected function. Pressing key 5 …9 allocates this function to the desired operating element, which may have also been allocated to another function, affecting both functions in that case.
Normal allocation will be restored by pressing the CLEAR key.

In the case that a signal generator action should be undesirable, in special case such as a dummy mixer, the signal generator concerned can be turned off via code 72.

Code 67
Direction of ATS

Input of Main Rotor Direction of Rotation

m	c	-	1	8	E		M	O	D	E	L			1	
A	T	S			L	E	F	T							

The direction of rotation of the main rotor is input using code 67, indicating whether the rotor is rotating to the right or the left. To the right means that it is rotating clockwise when viewed from above, and to the left that it is rotating anti-clockwise.

This information is required so that the torque and load compensation mixers will be able to work properly.

Code 81 Static Torque Compensation

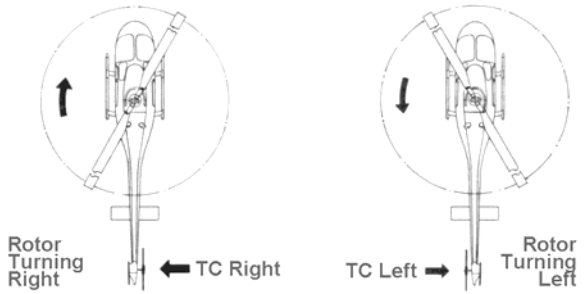
Code 82 Dynamic Torque Compensation

Code 87 Mixer Tail Rotor → Throttle

Code 75 Mixer Swashplate → Tail Rotor

After entering Code 67, the direction of rotation of the Main Rotor can be input, using the INC for anti-clockwise systems and DEC for clockwise rotating Main Rotors.

The entire torque and load compensation system can be turned via the CLEAR key, e.g. for conducting tests and adjustments. For normal flying operation the direction of rotation of the model concerned must be correctly set using this code.



Code 24
Autorotation

Change-over to Autorotation

A	U	T	O	R	O	T		p	o	s			4	0	←
O	F	F				S	T	I	C	K			5	0	

To permit the use of autorotation change-over and autorotation switch has to be installed and allocated using Code 23. When in an active state the functions of throttle and pitch will be separated, with the throttle servo occupying a fixed pre-set position, whilst the pitch control is still performed by the control stick. In addition:

- The torque compensation mixer is turned off.
- The tail rotor is moved into the position set by Code 83.
- Switch over to autorotation settings for maximum and minimum pitch are made.

In addition to a manual activation of autorotation mode, the PROFITRIM-Module provides for automatic switch over, via the pitch control stick, on falling below a certain pitch value after the automatic mode has been prepared by a separate autorotation pre-select switch. This switch has also to be allocated by Code 23.

After entering the adjustment menu the display will read “AUTOROT. INH” meaning inhibited. After actuation of the INC or DEC key the function will be active. Throttle servo position in autorotation is adjusted by the INC and DEC keys. After pressing the TURN key the arrow at the right hand end of the display moves to the pitch setting. The control stick position can be input, where automatic autorotation switching will occur. This position is again set using the INC and DEC keys, with a value of 100% corresponding to neutral position of the pitch stick and a value of 50% reflecting the stick travel stop for minimum pitch.

Code 25
Inverted Flight

Switching to Inverted Flight

m	c	-	1	8	E		M	O	D	E	L			1	
F	L	Y	-	I	N	V		T	r	m		+		1	2

Switch over to inverted flight can be activated by Code 25.

To achieve this a switch (such as Part No 4160) must be installed in the transmitter at a convenient, readily accessible, position and allocated to the inverted flight switch using Code 23.

Flipping this switch instantly reverses the various functions, allowing the pilot to perform inverted flight without having to reverse the control inputs. In this manner inverted flight will be simplified somewhat, as the model can be controlled in the manner the pilot is accustomed to.

After entering Code 25, activation is performed using the INC and DEC keys, or to deactivate by pressing the CLEAR key.

After activation, only approximately 50% of the normal servo throw will be available for collective pitch control in upright and inverted flight. Separate hover pitch trim for inverted flight can be adjusted with the adjustment range here being ±100%.

The following changes result from activating the inverted flight switch:

- Collective Pitch function is reversed.
- The torque compensation mixer is adapted to the reverse collective pitch function.
- Pitch control is reversed.
- Tail rotor function is reversed.
- The appropriate inverted flight settings for maximum and minimum pitch become effective.

Code 26
Maximum Pitch

Adjustment of Swashplate Mixers

H	i		P	i	t	c	h		C	u	r	v	e	
				N	o	r	m	a	l			1	0	0 %

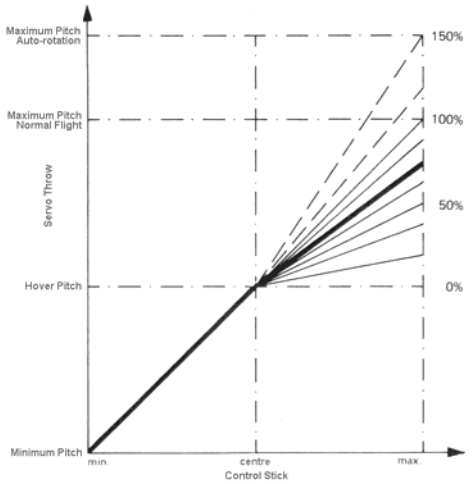
Maximum pitch (collective) data for 4 different flight phases can be stored using Code 26:

- Normal Flight (Normal)
- Autorotation (AT-rot)
- Inverted Flight (FLY-INV)
- Alternative Adjustment (FI2)

Adjustment of the percentage values is performed by the INC and DEC keys, with the values for Normal, Inverted and Alternative Adjustment being adjustable between 0 – 100%, and Autorotation up to 150%.

Values for inverted flight, FI2 and autorotation can be adjusted only after the corresponding options (Codes 24 and 25, if required) have been activated and the switch concerned, after being installed and allocated by Code 23, operated.

Additional analogue adjustments are possible with the PROFITRIM-Module (Part No. 4109).



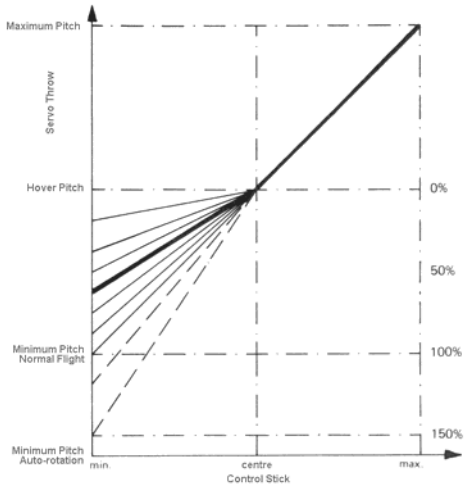
Code 27
Minimum Pitch

Reversing Direction of Servo Rotation

L	O		P	i	t	c	h		C	u	r	v	e	1
				N	o	r	m	a	l			1	0	0 %

Code 27 permits setting the minimum (collective) pitch data for Normal, FI2, autorotation and inverted flight modes. These adjustments are made as described for the maximum pitch adjustments.

Additional analogue adjustments are possible with the PROFITRIM-Module (Part No. 4109).



Code 28
Hover Pitch

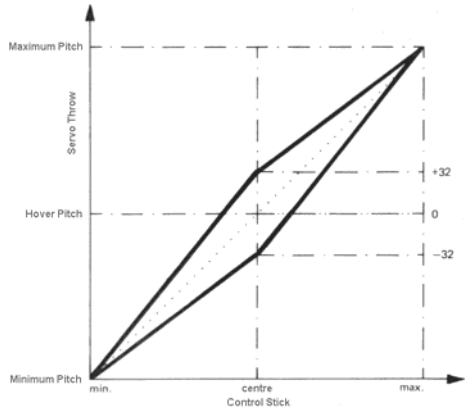
Allocation of Operating Elements Channels 5 – 9

H	O	V	.		P	I	T	C	H					
				N	o	r	m	a	l					0

With this code, the collective pitch values for hovering flight can be adjusted, in such a way that the model will hover with the pitch control stick in the neutral position, without affecting the maximum and minimum pitch adjustments.

Additional analogue adjustments are possible with the PROFITRIM-Module (Part No. 4109).

For adjustment of the alternative flight mode (FI2), a separate value can be entered provided the switch, that has been allocated by Code 23, is actuated.



Code 93
Swashplate Rotation

Virtual Swashplate Rotation

M	c	-	1	8	E		M	O	D	E	L			1	
S	w	a	s	h		R	o	t	.		1	3	'	R	i

In certain circumstances, when applying cyclic control, tilting the swashplate in a direction other than that the planned tilt of the Main Rotor plane may be required. In the case of the four bladed HEIM system the swashplate control system needs to be rotated through 45° to the right so that the control linkages connecting swashplate and rotor head can be set-up truly vertical. In this way ensuring the correct blade control without any undesirable differential effects.

Code 93 permits establishing the described rotation, without changing the mechanical control by the servos. The latter operation is performed as usual with the swashplate being tilted the corresponding direction for cyclic control.

After activation of Code 93, the swashplate linkage can be virtually rotated in anti-clockwise or clockwise direction using the INC and DEC keys respectively, with the number of degrees and the direction of rotation being indicated in the display. The CLEAR key cancels the rotation (reset to 0°).

Code 81
Static ATS

Static Torque Compensation

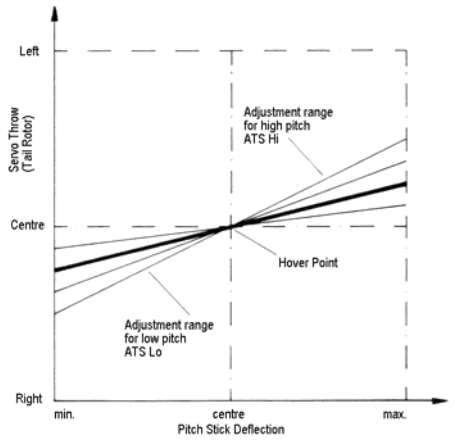
S	T	A	T	I	C			m	a	x		3	0	%	←
								m	i	n		3	0	%	

Static torque compensation (ATS, mixer collective pitch → tail rotor) is adjusted using Code 81, with separate settings for collective pitch above and below the stick neutral position (hover point).

The small arrow on the display indicates the option that can currently be changed:
“max” for climb data
“min” for descent data.

Adjustments are made using the INC and DEC keys, with the TURN key changing the current setting selection.

To permit performing these adjustments the main rotor direction of rotation must be input using Code 67 beforehand, and autorotation change-over must be inactive.
Analogue adjustments of the values are possible with the PROFITRIM-Module (Part No. 4109) and one proportional rotary module (Part No. 4111) for each of the “UP” and “DOWN” settings.



Code 82
Dynamic ATS

Dynamic Torque Compensation

D	Y	N	A	M	I	C		V	o	l			0	%	←
								T	i	m			1		

Dynamic torque compensation is used to compensate for momentary torque fluctuations caused by drive system induced acceleration processes (RPM increase or decrease).

This option is provided mainly for helicopters using speed control (and lacking collective pitch). It may also be used for helicopters which, although equipped with collective pitch control, do not sustain constant system RPM, but change RPM simultaneously with collective pitch control. This holds true for the older types of model helicopters, e.g. the Graupner Bell 212 Twin Jet.

Adjustment:
With this code referring to momentary torque fluctuations, this mixer provides temporary adjustment to the tail rotor (for over swing). To allow this, the magnitude of the deflection () and the duration () can be adjusted separately in this menu.

The small arrow indicates which setting is selected and can be moved by pressing the TURN key.

For modern helicopters flying at constant RPM, throughout the entire pitch range, this mixer is not required and therefore should not be activated.

Code 83
AR – Tail Position

Tail Rotor Position for Autorotation

A	u	t	o	r	o	t	a	t	i	o	n			
R	u	d	d		o	f	f	s	e	t		+		1 5

Under normal flight conditions the tail rotor of a helicopter generates a constant thrust which serves to compensate for the torque of the main rotor acting on the fuselage.

During autorotation, this torque is not encountered as the rotor is being rotated by the airflow passing through it, and not being powered by the engine. Therefore torque compensation by the tail rotor will not be required.

Though the tail rotor blades are stopped during autorotation, in the majority of currently used model helicopters it will still produce a certain amount of thrust during the shut down phase, causing the tail of the model to swing over and presenting a poor image. The same also holds true during practise landing approaches where the idle speed of the engine is too high, causing the tail rotor to keep running.

The adjustments performed by Code 83, which are activated on switching to autorotation, permit setting the angle of incidence of the tail rotor blades to 0° thus preventing the tail rotor from generating thrust. In the case of tail rotors which are kept running during the autorotation phase, adjustments can be made to generate a slight negative thrust (acting against the normal direction of Main Rotor rotation) to compensate for gearbox and bearing friction which try to rotate the fuselage in the opposite direction of the tail rotor.

These adjustments, performed using Code 83, determine the tail rotor neutral position in autorotation. Normal tail rotor trim, including the trim data stored in the trim memory, is turned off as are the mixes affecting the tail rotor.

Code 84
Hover Throttle

Throttle Settings for the Hover

H	O	V	.		T	H	R	O	T	T	L	E		
				N	o	r	m	a	l		+		1	3

Code 84 permits adjusting the carburettor setting for hovering flight (neutral position of the throttle / pitch stick) without affecting the high and low speed regimes, in such a way that the desired engine speed will result. The adjustment range comprises of 32 steps, with the value 0 corresponding to normal, linear control. Negative values result in advanced throttle characteristics, positive ones result in retarded throttle actuation.

Adjustments are made using the INC and DEC keys, with the CLEAR key resetting to linear (0).

In conjunction with options 26 (maximum pitch) and 28 (hover pitch) it is now no problem to obtain constant system RPM from hovering flight to maximum climb, with the helicopter hovering with the throttle / pitch control stick in the neutral position.

Proceed as follows:
Start by having the helicopter climb vertically for some time, with the collective pitch control stick in the end position – the engine should then operate at the desired RPM. This depends on the engine output and the weight of the model. In the case of the engine speed being too low, reduce the maximum blade angle using code 26. If the engine RPM in climbing flight is too high, increase the maximum pitch accordingly.

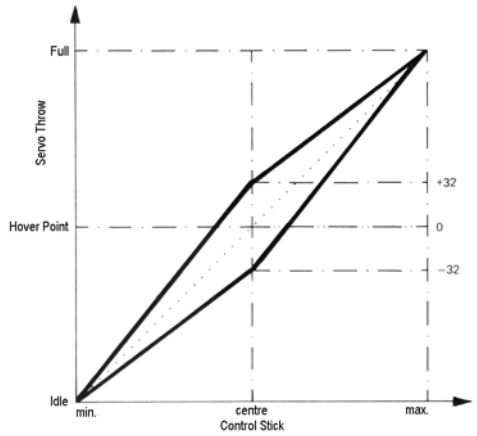
When satisfied with adjustments, transition the model to hovering flight. This should be achieved at the neutral throttle / pitch stick position. If the latter has to be shifted in the direction of full throttle / pitch to achieve hovering flight, this should be compensated by increasing the setting using Code 28 until the model hovers with the stick at neutral.

In the alternative case that the model hovers with the stick below the neutral position, the value in Code 28 has to be reduced.

Hover point engine speed is now adjusted using Code 84 to the same engine speed as established during the earlier case of maximum climb.

These adjustments may possibly have to be repeated alternately with Code 28 (hover pitch) until a perfectly constant engine speed in hover and climb has been achieved.

BE SURE TO NOTE:
These adjustments are of vital importance for the entire tuning of the model helicopter and for that reason must be executed with the greatest care. All other adjustments depend on a correctly matched throttle / pitch relationship!



Code 85
Throttle Pre-Sets

Throttle Pre-sets

I	d	l	e		u	p	(	1	)	G		5	0	%	←
				P	o	i	n	t					0		

Throttle pre-set mainly serves to prevent a reduction of system RPM when pitch is reduced below the hover point. Throttle pre-set is thus only effective below the hover position of the throttle / pitch control stick, which is normally the stick neutral point.

In rare cases, throttle pre-set is used to increase system RPM for certain manoeuvres, generally for model helicopters where the construction of the rotor does not permit constant hover and aerobatic RPM. In such cases a pre-set must remain active beyond the hover region.

In order to accommodate all requirements the PROFI-ULTRAOSFT-Module provides two pre-sets which can be switched on separately and which can also be adjusted independently of each other, in both magnitude (G) and take-over point. The take-over point is that point along the throttle / collective pitch control stick up to which the pre-set will be effective. When pitch is increased still further, only the earlier set-up throttle / pitch relationship will remain effective.

Adjustments:
On entering Code 85 (and possibly activating the switch concerned) adjustments can be made for throttle pre-set (1) and (2) for values of (G) between 0 - 100% and for the take-over point with ±64 steps about control stick neutral position.

The small arrow on the right side of the display indicates which setting can be adjusted and is moved by pressing the TURN key.

Adjustment 0 for take-over point corresponds to stick neutral, negative values displacing the point downwards and positive values moving it up the pitch control region.

The adjustments are made by getting the model to fly forwards at a higher altitude and descending by pulling back on the collective pitch stick, then adjusting the pre-set value (G) until the RPM does not increased or decrease. This point adjustment should correspond to the hover point, that is near 0. Normally the throttle pre-set (1) will be adjusted in this way so that throttle pre-set (2), which can be adjusted differently can be used for special applications.

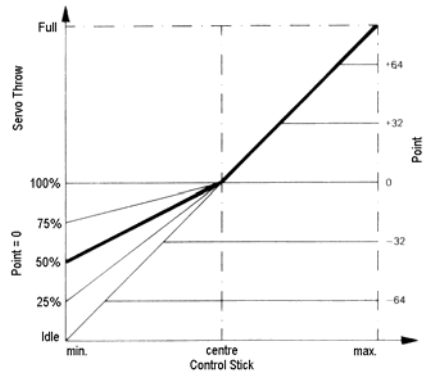
It is possible, for example, to adjust the pre-set value to 100% resulting in the marginal case of “power-on approach” adjustment. In this case the throttle will not be affected by pitch control below the take-over point, but it holds a constant value which corresponds to the stick position at the take-over point set. Above the take-over point the throttle will follow the collective pitch in the normal way.

For some model helicopters such an adjustment might prove advantageous for aerobatic flight. They should be avoided though for models equipped with HEIM mechanics.

Another option for the application of the 2nd throttle pre-set are the manoeuvres of the FAI competition programmes. In order to reach the maximum RPM in the lift-off phase the pre-set value of 100% should be selected and the take-over point should be positioned slightly below the hover point. This kind of adjustment can not be recommended for normal flight operation and aerobatics as the RPM in steep descent will increase dramatically, which will disturb the equilibrium of the adjustments of the model. After termination of the hover manoeuvres, one switches back to normal throttle pre-set (1).

If an additional slider control has been installed for throttle pre-set (1), the pre-set value (G) can be adjusted varied infinitely between 0 and the programmed value. After starting the engine, when the engine is still idling, this permits increasing the throttle pre-set slowly and smoothly instead of the normal abrupt change. The display indicates the currently pre-set value, including the effect exerted by the slider.

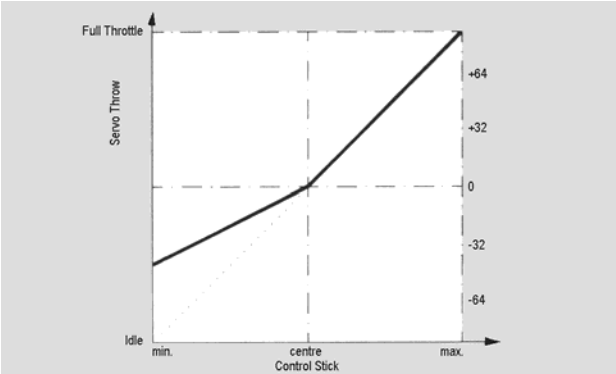
Running up throttle pre-set can be programmed using Code 92 after actuating the switch.



The diagram illustrates the relationship between the two adjustment options: Point adjustment displaces the take-over point along the control stick curve by ±64 steps, while (G) adjustment determines the slope of the curve below that point.
A (G) value of 100% always results in constant carburettor setting below the take-over point . How wide the carburettor is open depends is, however, determined by the point adjustment.

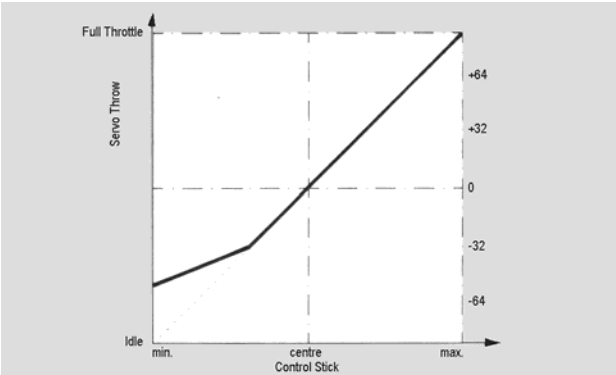
Examples of Throttle Pre-set (Idle Up) Adjustments

1. G = 50%, Point = 0



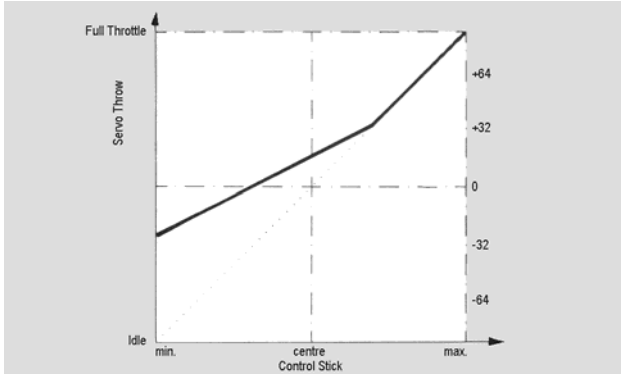
This diagram shows adjustments often encountered in practical use. The hover point has been selected as “point”. A “G” of 50% results in the throttle servo being markedly slaved by the throttle / pitch control below the hover point.

2. G = 50%, Point = -32



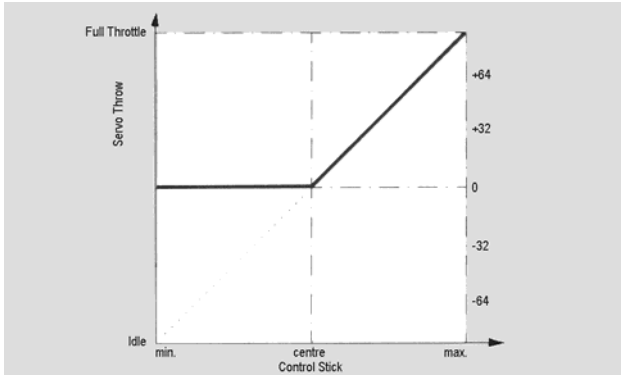
Here “G” has been left unchanged, while the take-over point has been moved farther down (-32). The diagram makes clear that the initial value for the carburettor opening has been lowered, due to “G” being retained at 50%.The slope of the curve in the lower region remains unchanged.

3. G = 50%, Point = +32



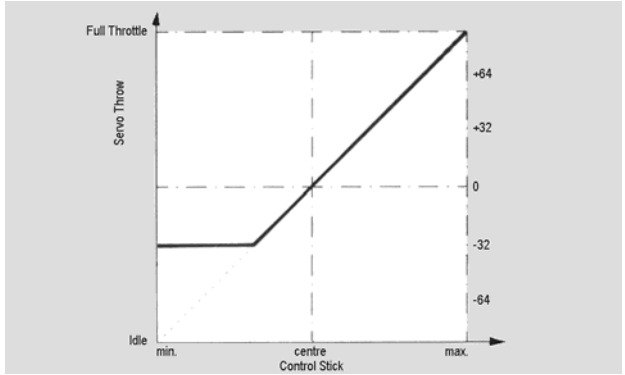
For this example, the take-over point has been moved upward, while “G” remains unchanged. The diagram illustrates that throttle preset now affects the hover flight region, a condition which should normally be avoided.

4. G = 100%, Point = 0



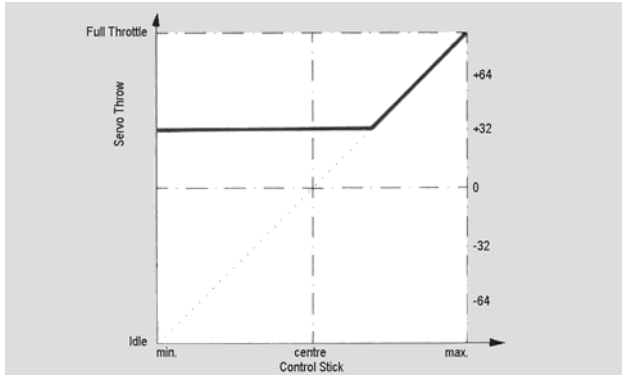
In this example, the take-over point is returned to the hover flight point again (point = 0). With “G” set at 100%, a genuine power on approach effect results, which is to say that the servo will hold a constant value below the take-over point, while being slaved in the normal way by the throttle / pitch control above it. This kind of throttle preset is useable, e.g. for throttle preset (2) hover manoeuvres of the FAI competition programme described earlier.

5. G = 100%, Point = -32



When the take-over point is displaced downward, the diagram above results. The throttle servo is slaved here to a point far below the hover point.

6. G = 10%, Point = +32



This last diagram shows the effect of moving the take-over point upward. It demonstrates that here too, marked rise of hover RPM will have to be achieved, which can not be stable as no load-dependent tuning is performed. This kind of adjustment may only be switched on for some of the aerobatic manoeuvres to avoid unwanted loss of RPM in inverted flight with the pitch reduced markedly, if at all.

Code 86
Swashplate → Throttle Mix

Mixer Swashplate → Throttle

mc18/U	MODEL	4
MIX	SWASH→1	29%

This adjustment option takes into account that not only an increase of pitch requires a corresponding increase of throttle, but large cyclic control movements as well.

Advantages are provided mainly in aerobatic flight, e.g. when executing rolls where full cyclic deflections require a marked increase in engine output, whilst medium collective pitch only gives a half open carburettor.

The Code 86 mixer permits slaving the carburettor control in dependency to the swashplate tilt in any direction from the level position. The mix quota is adjustable between 0 – 100%.

Adjustments are made using the INC and DEC keys., with the CLEAR key returning the value to 0.

Code 87
Tail → Throttle Mix

Mixer Tail Rotor (single-sided) → Throttle

mc18/U	MODEL	4
MIX	4(L)→1	30%

It is known that the control of a helicopter about the vertical axis is performed by the thrust of the tail rotor, (normally compensating for the torque effect of the drive system acting on the fuselage), which is increased or decreased (in extremes cases even reversed). Increasing tail rotor thrust requires a corresponding reaction in engine output in order to keep the system RPM constant.

The Code 87 mixer, permits adjusting the throttle slaving to the tail rotor as necessary. The slaving that occurs is single-sided, to that side where the thrust of the tail rotor needs to be increased. The direction depends on the direction of rotation of the main rotor; in the case of an anti-clockwise rotating system, slaving of the throttle occurs when the tail rotor is deflected to the left, with clockwise systems to the right.

Adjustment of the direction of rotation is performed automatically by activating the torque compensation mixer, Code 67. With torque compensation turn off, mixer Code 87 will also be inactive.

Adjustments:
Adjusting the model requires flying several fast pirouettes in the direction of the main rotors rotation (in the case of HEIM systems left-hand ones) or to hover in a strong wind at right angles to the helicopter with correspondingly large tail rotor deflection. The slave value has to be adjusted so as not to lower the RPM. In the case of a HEIM system, the slave value will be approximately 30%.

Adjustments are made using the INC and DEC keys and reset to 0 by pressing the CLEAR key.

Code 89
Gyro Mixer

Automatic Gyro Gain Control

GYRO	CTRL	100
	sens	70%

Gyroscope fade out by the tail rotor control. With code 89, the effect of the Gyro as a function can be influenced by the tail rotor control. With the tail rotor stick in the neutral position the effectiveness of the gyro is adjusted using the slider control (7). The effectiveness is will be reduced to a value corresponding to the lower stop of the slider (7) when actuating the tail rotor control. The position of the control slider (50…100%), where the minimum value will be reached, can be adjusted: 100% corresponds to full deflection and 50% to half deflection of the tail rotor control stick.

Important: The effectiveness of stabilisation of the gyro depends on the adjustments of the two regulators on the gyro: regulator 1 adjusts the minimum gyro effect whilst regulator 2 the maximum effectiveness.

Adjusting the gyro sensor:
Maximum possible stabilisation of the helicopter about the vertical axis by a gyro depends on various factors: the main one is that the linkages should be free to move and slop free, furthermore a powerful and fast servo is a prerequisite for optimum control. Rule of thumb – the faster the reaction of the gyro to a sensed rotation of the model is countered by a corresponding compensating change of tail rotor thrust, the wider the adjustment of gyro effectiveness can be opened without causing the tail of the model to begin oscillating, and the better will be the stability about the vertical axis. Any delay in correcting a deviation, be it caused by a slow servo or friction, sticking or flexing of control linkage, or too much control effectiveness, may cause the tail of the model to oscillate when gyro effectiveness is adjusted to too low a value, a situation which must be cured by a corresponding reduction of gyro effectiveness.

High forward speed and hovering in strong head wind can also result in the stabilisation action of the fin, combined with the gyro stabilisation, causing an excessive reaction which will be recognised by oscillation of the tail of the fuselage.

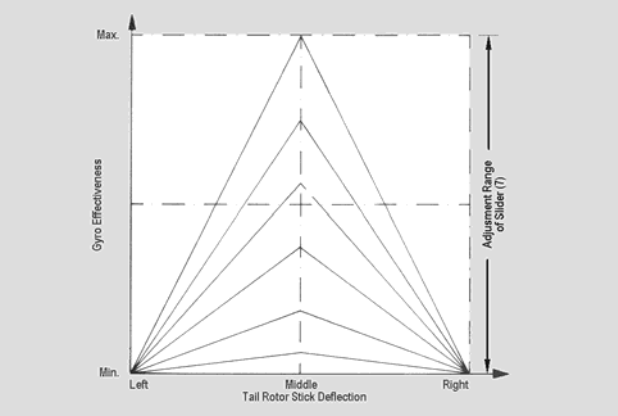
In order to permit achieving optimum stabilisation in any situation gyro effectiveness can be adjusted by the transmitter. Slider (7) serves that purpose in conjunction with the two adjust regulators for the gyro. In the upper end position of the slider, only regulator 2 will be effective; the latter can be opened until the model, when hovering in calm conditions, is just before the point of beginning to oscillate. In the lower end position of the slider (7), only adjustment regulator 1 is effective. With regulator 1 set against the left stop (gyro effectiveness 0), maximum effectiveness can be infinitely adjusted between 0 and the maximum effectiveness adjusted by regulator 2 and slider (7).

In normal cases one will also open regulator 1 to a value where, even at high speed and in strong head winds, the tail does not begin to oscillate. Gyro effectiveness can then be fine tuned to suit weather conditions and the program to be flown.

For special manoeuvres gyro effectiveness can be automatically reduced using Code 89 by operating the tail rotor control. Imagine slider (7) as being moved from its adjusted position to the lower stop on displacement of the tail rotor stick from its neutral position. How much gyro effectiveness is reduced depends on the setting of the gyro adjustment regulator 1.

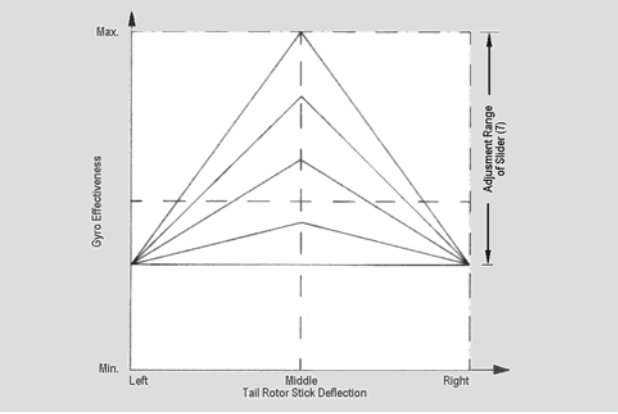
Examples:

1. Adjust regulators: Regulator 1 – Left Stop
   Regulator 2 – Maximum



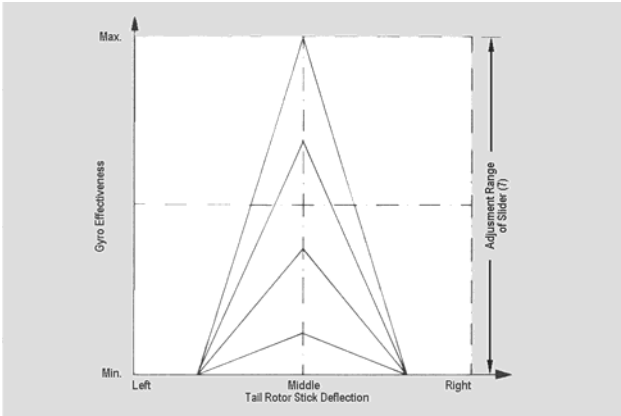
Gyro effectiveness can be infinitely variably adjusted from 0 up to maximum by slider 7. Actuation of the tail rotor control results in linear fading of gyro effectiveness with value 0 reached at the control stick end points.

2. As 1., but with the adjustment regulator 1 of the gyro sensor opened by 30%.



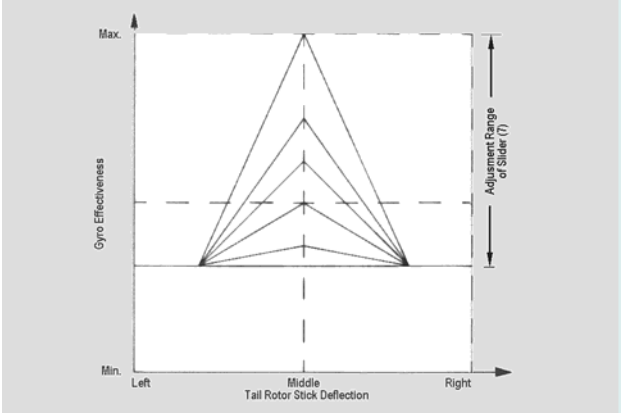
The gyro effectiveness can be varied between the two adjusted values by slider 7, but can not be reduced to 0. Automatic fading by the code 67 mixer is also effective only down to the value set be regulator 1.

3. Same as 1., but with gyro mixer at 60%.



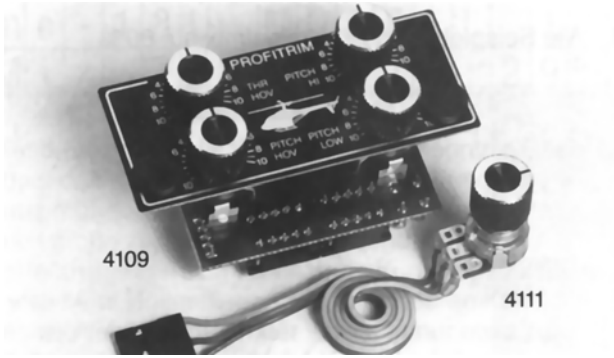
Unlike example 1, complete fading has occurred by 60% of tail rotor control stick deflection.

4. Same as 2., but with the gyro mix at 60%.



Here too, minimum gyro effectiveness is obtain at 60% of the control stick deflection, however, the value is not 0 as (in example 3), but corresponds to the adjustment of regulator 1 at the gyro sensor.

PROFITRIM-Module



the PROFITRIM-Module (Part No. 4109) is available as special equipment, which permits adjusting the primary functions in a common manner by rotary controls (regulators). The module is installed into one of the upper module stations of the transmitter case and features four regulators for the functions:

1 = THR HOV - Hovering Throttle
2 = PITCH HOV – Hovering Pitch
3 = PITCH HI – Maximum Pitch (normal flight)
4 = PITCH LO – Minimum Pitch (normal flight)

Up to four additional proportional rotary modules (Part No 4111) can be connected to this module for functions:

5 = Static Torque Compensation (climb)
6 = Static Torque Compensation (descent)
7 = Pitch minimum for Autorotation
8 = Throttle Preset 2 (Idle-Up 2)

These external controls can be connected either singly or in any desired combination, with installation performed at convenient stations in the transmitter case. Activation of the PROFITRIM-Module is done using Code 91; the adjust regulators can be switched on and off either singly or in any desired combination.

In this manner, the adjustment regulators can be superimposed over the pre-programmed adjustments when required (e.g. when test flying a new model).

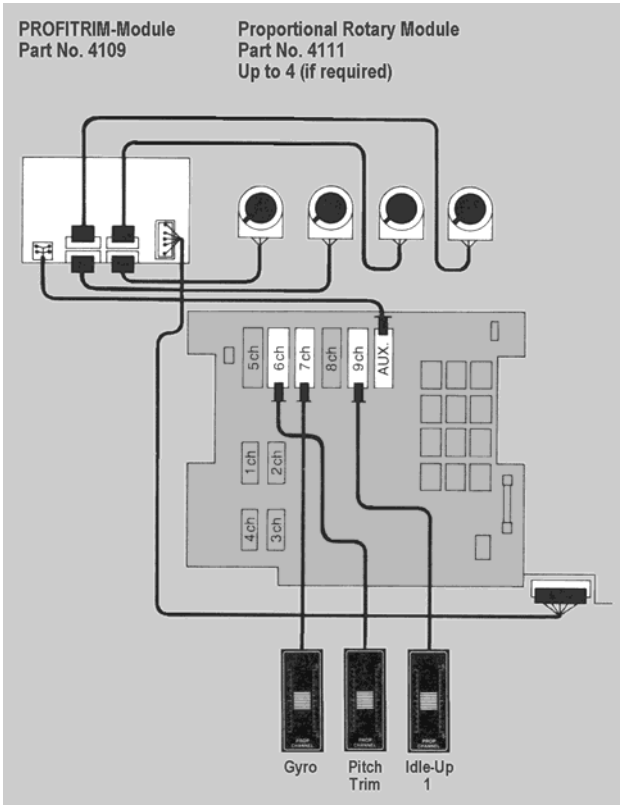
The adjustments established in flight in this way, can be transferred into the program later on (Code 91), so they will be available unchanged when changing models.

The values preset by programming can be varied up to 30% with the aid of the adjust regulators, with the neutral position of the latter corresponding to the pre-programmed value.

By entering the code number of the function concerned, the currently active adjustment can be read on the display. Transfer of this adjustment into the program occurs by switching the PROFITRIM-Module adjust regulator concerned off, with Code 91, shifting it to neutral position and switching it on again.

The selective activation of individual adjustment regulators in the case of fully trimmed models permits the selecting some of the trimmers, e.g. for throttle and pitch for hovering flight – so established hover adjustments of the model can be corrected for prevailing weather conditions or a momentary running condition of the engine. The remaining trimmers can remain switched off to protect against accidental changes. Using an external switch, allocated by Code 23, the entire PROFITRIM-Module system can be switched on and off, with no storage of the adjustments data occurring. The switch permits switching on the trimmers on only when they are needed.

Wiring Diagram



Code 91
PROFITRIM Activation

Activating the PROFITRIM-Module

A	N	.	T	R	I	M						5	6	7	8
			A	C	T			1	2	3	4				

Code 91permits switching the trim regulators of the PROFITRIM-Module, and additional proportional rotary modules that may be connected to it, on and off singly or in any desired combination.

When a regulator is switched off, the adjustments performed with that regulator are transferred into the programming.

After entering Code 91, the display simultaneously shows the operating states of all regulators, with the upper line of the display showing the numbers of the inactive controls, and the lower line showing the active ones. The regulators are switched between on and off by entering the control number 1…8.

1 = Hover Throttle
2 = Hover Pitch
3 = Maximum Pitch
4 = Minimum Pitch

5 = Static Torque Comp. (Climb)
6 = Static Torque Comp. (Descent)
7 = Minimum Pitch (Autorotation)
8 = Throttle Preset 2 (Idle-Up 2)

With a PROFITRIM-Module that is not fully expanded, those functions for which a rotary module has not been connected should be reactivated.

Code 75
Swashplate → Tail Mix

Mixer Tail Rotor → Swashplate

S	W	S	H	→	R	U	D	D						
												1	0	%

Code 75 takes into account that not only does an increase of collective pitch require a matching torque compensation, but large cyclic control movements will also require it.

This is mainly in the case of extreme aerobatics requiring large pitch control deflections (e.g. Bo-turn, tight loops) where non-compensated torque results in the model rotating to a larger or lesser extent about the vertical axis during execution of the manoeuvre, thereby spoiling the impression of the presentation.

Code 75 permits static tail rotor compensation to be dependant on the swashplate tilt in any direction, with mix quota being adjustable between 0…100%. Adjustments are made using the INC and DEC keys, with resetting to 0 achieved with the CLEAR key. The direction of mixing is automatically determined by the adjustment of Code 67 (torque compensation).

Code 12
Servo Travel Adjust

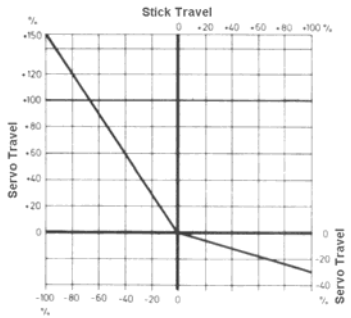
Adjusting Servo Travel

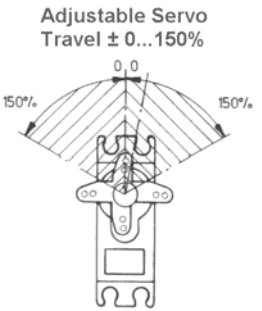
T	H	R	O	W		A	D	J	U	S	T			
p	u	s	h		c	h		k	e	y		1	-	9

Code 12 permits adjustment of servo travel for either side of motion independently. The range of adjustment is 0 – 150% of normal servo travel.

Important:
Unlike code 16, changing the signal generator, these adjustments refer directly to the servo concerned, independent of the source of the signal for the servo – be it control stick or any of the mixer functions.

After calling code 12 and input of the servo concerned using keys 1 …9, the travel of the selected servo will be indicated, with a prefix + or – indicating the side. For adjustment and display, the operating element (control stick, slider, rotary control or switch) has to be moved to the end station in question. The desired servo travel can then be adjusted with the INC and DEC keys, and may be reset to default travel (100%) by pressing CLEAR.





Code 16
Signal Generator Setting

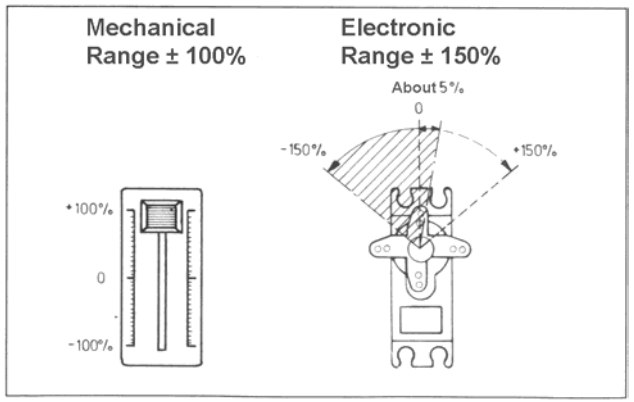
Changing Control Travel

TRACE RATE													
push		ch		key			6	-	8				

Control travel resulting from actuating an operating element on function inputs 6 – 8 is adjusted by code 16.

The range of adjustments amounts to 0 – 150% of the normal range. Unlike code 12 (servo travel adjust), these adjustments refer to the operating element (slider, rotary control or switch) independent of the latter acting directly on a single servo or via a complex mixing and coupling function on several servos.

After calling code 16 and input of the function concerned via keys 6 …8, the adjusted control range will be indicated with a prefix + or – indicating the side. For adjustment and display the operating element concerned has to be moved to the end point in question. The control range is then adjusted using the INC and DEC keys, or set to the normal (100%) via the CLEAR key.



Code 19
Servo Travel Restrict

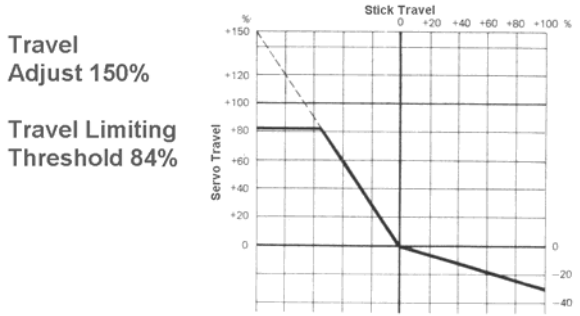
Limiting Servo Travel

THROW LIMIT													
push		ch		key			1	-	9				

As a result of the cumulative action of mixers, the resulting deflection of servos may exceed the normal travel range. All Graupner servos feature a reserve of an additional 50% of the normal range. The transmitter restricts motion to 150% to prevent stalling the servos by mechanical constraints.

In certain cases it may prove advantageous to have servo travel limiting to become operative at a lesser servo travel, if for example, deflection is limited mechanically and the servo range normally used in flight must not be restricted unnecessarily, but unacceptably large travel might result from extreme combinations.

Code 19 permits adjusting the travel limiter threshold in 16 steps between 9 – 150% of normal control range, individually for each channel and each side of neutral. To this end, the desired channel has to be called first, by using keys 1 …9, followed by shifting the stick, slider, etc., to the desired end point. The travel limit can then be adjusted via the INC and DEC keys.



Code 15
Neutral Adjust

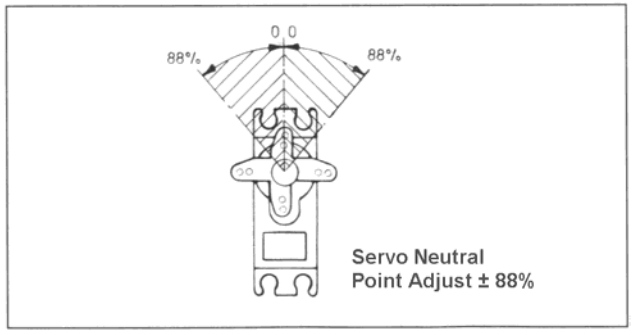
Adjusting the Servo Neutral Position

SUB TRIM													
push		ch		key			1	-	9				

For adjusting servos which do not comply to normal standards (servo neutral 1.5ms) and for extreme requirements, the neutral position can be adjusted within a range of ±88% of normal servo travel.

After calling the servo concerned via keys 1 …9, the servo neutral position can be adjusted with the INC and DEC keys; pressing CLEAR restores the initial normal neutral position.

This adjustment refers directly to the servo concerned and is independent of all other trim options.



Code 13
DUAL RATE

Adjustable Servo Throw Reduction

D	U	A	L		R	A	T	E							
p	u	s	h		c	h		k	e	y			2	-	4

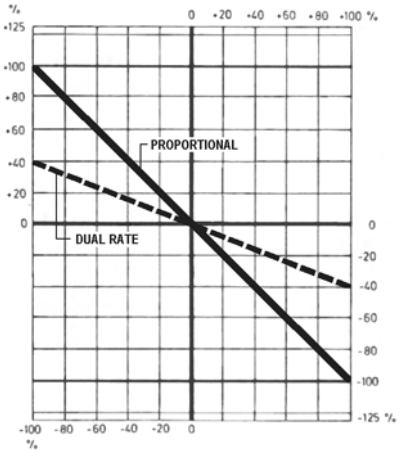
The dual-rate function permits in-flight switching of control characteristics, with the range of adjustment being variable between 0 – 125% of the normal range for each of the two switch positions. The switched must have been allocated beforehand using code 34.

Dual rate refers directly to the corresponding stick function, independent of whether it affects a single servo or, optionally via complex mixing and coupling functions, several ones. In the case of helicopters, it can be used for the swashplate and tail rotor controls.

After calling code 13 the desired control functions can be selected via keys 2…4:

- 2 = Roll
- 3 = Pitch
- 4 = Tail Rotor

Adjustments of the control curve are performed using the INC and DEC keys after the switch has been moved to the appropriate position (P0/P1).



Code 14
EXPONENTIAL

Progressive Control Characteristics

E	X	P	O	N	E	N	T	I	A	L					
p	u	s	h		c	h		k	e	y			1	-	4

Exponential control permits obtaining sensitive control of a model near the neutral position of the function concerned, whilst maximum travel remains unaffected. The degree of progression can be adjusted from 0 to 100%, with 0 corresponding to normal linear travel.

The three control functions roll, pitch and tail rotor can be switched from linear to progressive control using switches, which have been allocated by code 34 beforehand, or from one progressive adjustment to another progressive one.

These adjustments refer directly to the corresponding stick function, no matter whether it affects a single servo or, optionally via complex mixing and coupling functions, several ones. In the case of helicopters, it can be used for the swashplate and tail rotor controls.

The throttle / collective pitch control stick can also be adjusted for progressive control characteristics. In the case of high performance helicopters featuring surplus power (such as the Lockheed 286h) it permits damping excessively twitchy reaction to the throttle / collective pitch control inputs in the hover, without affecting total adjustment of the model.

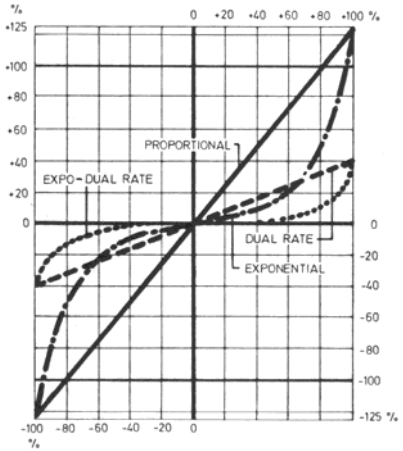
After calling code 14 the desired control functions can be selected via keys 1…4:

- 1 = Collective Pitch / Throttle
- 2 = Roll
- 3 = Pitch
- 4 = Tail Rotor

Adjustments of the control curve are performed using the INC and DEC keys after the switch has been moved to the appropriate position. (P0/P1)

Exponential control of the throttle / collective pitch function is permanently adjusted for the model concerned and, for obvious reasons, can not be switched off.

In some cases linking the two functions of dual-rate and exponential may make sense. This is achieved by using the same switch when allocating the dual-rate and exponential switches using code 34.



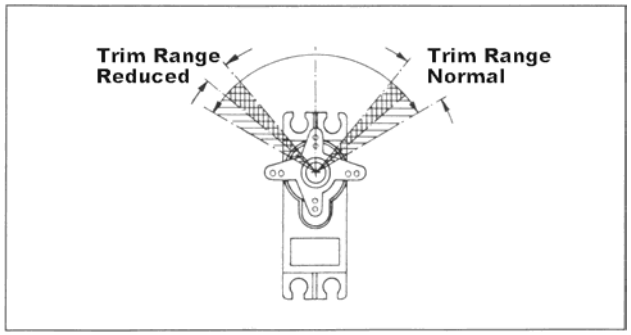
Code 35
Trim Reduction
Reducing Trim Range

T	R	I	M		N	O	R	M	.		1			4	
T	R	I	M		R	E	D	.				2	3		

When using dual-ate and/or exponential, trim may in some cases, not appear sensitive enough because of the ratchet steps. Code 35 permits reducing the trim action tom 50% independently for each control function.

After calling code 35, the display will indicate the control functions using normal trim in the upper line, and reduced trim in the lower line. Using keys 1…4 permits switching the functions between the two options.

1 = Throttle
2 = Roll
3 = Pitch
4 = Tail Rotor



Code 79
Servo Slow Down
Slowing-Down Transit Time

S	L	O	W		D	O	W	N		8	c	H			
T	R	A	V	E	L		T	I	M	E		0	.	5	s

In some special cases, such as retracts, the normally fast transit time of a servo does not look right.

With code 79, the transit time of a servo connected to any of the channels may be slowed-down from 0.5s to 30s when moving from one end point to the opposite end point.

After activation of code 79, the desired channel has to be selected using keys 1 …9.

Transit time is slowed down by the INC key, with steps being very small for short transit times and larger with longer ones. Below 1.5s the steps are so small that the display only changes after several steps. In all some 50 intermediate values are provided. Pressing the DEC key reduces the transit time and the CLEAR key cancels the deceleration completely.

This function is not compatible with retract servos such as G503 (order N° 3977) and C2003 (order N° 3890).

Code 92
Switch Slow Down
Slowing Down Throttle on Start Up

S	m	o	o	t	h		I	U	1	=	7	.	5	s	
							A	R		=	2	.	7	s	

When a switch is used for activating throttle preset 1, the carburettor of a model standing on the ground with its engine idling will be opened abruptly. Apart from looking rather unrealistic, the sudden acceleration is definitely not beneficial to the gearbox, and in the case of free swivelling rotor blades (HEIM) results in considerable imbalance in the entire rotor system during acceleration. This is due to displacement of the rotor blades until they correctly line up again by centrifugal force at higher RPM.

Problematic too, is the interruption of autorotation by re-switching the engine abruptly to full throttle by the autorotation switch while practising flight in autorotation with the engine idling. The torque shock loads incurred by such a procedure can damage the gearbox, as well as rotate the helicopter about the vertical axis.

To prevent such effects in each of these cases, Code 92 permits selecting a certain time lag, in the course of which the throttle will be accelerated to a predetermined value, for the case concerned, on actuation of the relevant switch. Both time constants appear on the display after calling Code 92. “OFF” indicates that no slow-down has been programmed and the servo operates at normal speed. A time lag ranging from 0.5…30 seconds can be set using the INC and DEC keys, with steps being very small for short transit times and larger with longer ones. The arrow (right hand end of display) indicates whether adjustment of the value the throttle preset 1 (IU1) or autorotation (AR) is made using the input keys.

Code 63
Channel 1 Switch

Automatic Channel 1 Dependent Switch (Throttle/Spoiler)

C	H	1	-	S	W	I	T	C	H	=	?			

For special functions it is desirable not to perform switching by an external switch, but automatically via the channel 1 stick (throttle and spoiler), whereby exceeding a critical stick position provides switch position ON, while falling below provides switch position 0, or vice versa.

The threshold point can be placed anywhere along the stick travel and the modeller can decide whether the upper or lower portion is to activate switch position to the ON state. The automatic switch is allocated to one of the external switch connectors (1…8) whereby it is unrestrictedly included into the free programmability of the external switches via codes 23, 33 and 34.

If a normal switch is also wired to this connection, the two switches (e.g. the external switch and the automatic one) will be wired in parallel. With reversal of polarity being possible with either type of switch, logical links between the two of them can be realised.

“AND“ Link
Both switches must be closed so the connected function(s) can be performed.

“OR” Link
The connected function(s) is (are) performed when either switch is closed.

As a result the external switch may be used to perform automatic switch over by the stick. By including the automatic switch into a free allocation of external switch any combination of functions can be switched in dependency of the control stick position.

Programming:

After calling, via code 63, the transmitter, as in the above display, indicates it is waiting for the input of the external switch connection (1…8), to which the automatic switch is to be allocated. After the connection number (e.g. “8”) has been input the display will read like:

C	H	1	-	S	W	I	T	C	H	=	8			
	=			C	H	1	S	=			P	8	=	

Here the interaction of the automatic switch and a possibly connected external switch is shown. The stylised control stick at the left of the lower line indicates the direction of deflection of the throttle/spoiler stick with the switch in the open position. Direction can be reversed by hitting the TURN key.

The switch state (open or closed) of the channel 1 switch is indicated in the centre of the lower line. By moving the stick the function can be checked and the threshold point be adjusted. To do this the stick is moved to the position at which switching is to occur, then press the STORE key.

The right end of the lower line displays the switch state of a switch wired to its allocated external switch connection.

The interaction of the external switch and automatic channel 1 switch is displayed at the right end of the upper line of the display.
The allocation of the channel 1 switch is cancelled by pressing the CLEAR key.

Code 51, 33, 61 and 71
Free Program Mixer

Programming Mixers and Dummy Mixers

In addition to the available mix and coupling functions, all model programs provide a number of freely programmable mixers. In the case of type 1 - 3 models nine mixers are at the disposal of the user, types 4 and 5 have four mixers available, for F3B types 6 and 7 a total of seven, and for the helicopter types 8 and 9 there are four mixers available.

The mixers link an input signal to an outlet signal, with allocation performed by code 51. As any optional control function can be fed as an inlet signal, the outlet signal affects any desired control channel, not a control function. Distinguishing between these two terms is of utmost importance. Control function refers to the outlet signal of an operating element, that is a stick with or without trim, slider, rotary control or a channel switch, which in the course of the ensuing action passes through all the mix and coupling functions of the model program. A control channel is the outlet signal for a specific receiver connection, which until it arrives at the servo can only be affected by throw adjust, neutral point adjust, throw reduction or control surface reversing.

Mixers may also be switched in series for special applications, which is say that in addition to the control function proper all other preceding mixers can also be used as inlet functions. All F3B mixers (see F3B programs) and all freely programmable mixers with a lower number are considered as preceding mixers.

To give you an idea, imagine that instead of a control function (see above) the outlet signal of a control channel is used as the input function of the mixer before it passes through throw adjust, neutral point adjust, throw reduction or servo reversing.

Each of the freely programmable mixers can be turned on and off by one of the switches allocated using code 33.

Vital parameters of the mixers are the mix quotas which determine how strongly the inlet signal affects the control channel wired to the outlet of the mixer. They also set the direction of the mixed signal and the neutral point of the mixer, that is the point on the control characteristic curve of the inlet signal where the mixer does not affect the control channel wired to the outlet (normally this will be the neutral point of the control stick).

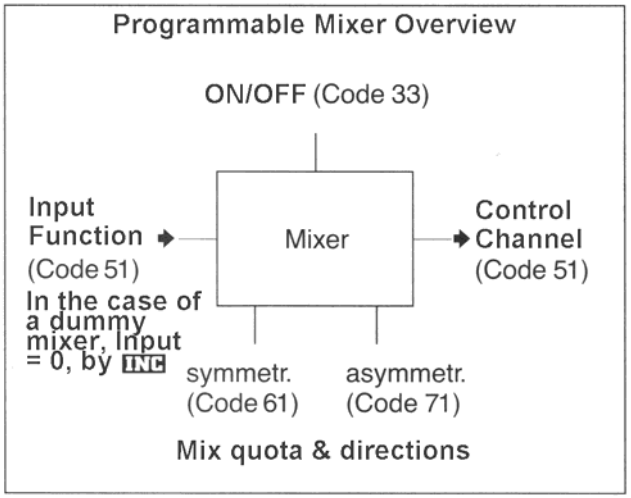
In the case of freely programmable mixers, these parameters can be adjusted over a wide range. The neutral point can be shifted to any desired point of the control throw of the operating element wired to the inlet (the distance from neutral point is called the OFFSET). The mixing ratios can also be adjusted in both directions above and below the neutral point, either in symmetrical (code 61) or asymmetrical (code 71) fashion. The mix direction can also be set for both sides using codes 61 and 71 by setting the values as + or -.

As a single control function can serve as inlet for an optional number of mixers, and any number of mixers may affect a control channel, the freely programmable mixers permit achievement of special, highly complex, applications.

A so called dummy function may also be allocated as an inlet signal, that is a control function that is not available as a true operating element, but provides a consistent control signal. In this manner it is possible to mix an additional constant trim signal into a control channel dependant on a switch allocated by Code 33.

For dummy mixer programming examples please refer to pages 114, 115 and 117.

Mixer Programming Overview



1. Channel Allocation (Code 51)
To program a mixer first call code 51, via which the channels to be linked are determined.

On the display then appears “MIX ?”, asking the operator to input the number of the mixer to be used. After the number has been input, the display changes to:

M	I	X		1										
I	N	H												

With INH meaning Inhibited.

This indicates that the mixer is not yet active, otherwise the numbers of the already allocated control channels will be displayed instead of INH.

Start by entering the control functions by keys 1…9, which are to act is input signal of the mixer. If the dummy mixer indicated by “0” is to be used press INC, or if the preceding mixer is to be used as the input press the DEC key before the input function number, which will be indicated by an arrow in front of the input channel. Then input the control channel (=servo output) into which the signal will be mixed.

M	I	X		1										
	4	→	8		T	R	I	M		O	F	F		

If, as in the example above, the input is one of the control functions 1 – 4, it can be decided whether trim is also to affect the mixer input or not. Pressing the INC or DEC key will enable the trim, whilst pressing the CLEAR key will disable it.

M	I	X		1										
	4	→	8		T	R	I	M		O	N			

Channel allocation of the mixers is confirmed by the ENTER key. Programming can be continued by entering the next mixer number, or terminated by pressing the ENTER key again.

2. Allocation and Polarity Reversal of External Switches (Code 33)
A switch which allows the mixer to be turned on and off is allocated to the mixer by code 33.

M	I	X	E	R			1	2	3	4				
S	W	I	T	C	H		9	9	9	9				

The upper line indicates the mixer numbers, with the allocated switches shown on the bottom line. Switches are allocated by entering the number of the mixer, whereupon a “?” appears in the lower line, and then entering the desired switch number, the polarity of which can be reversed by pressing the DEC key first. The phantom switch “9” can be used, in which case the mixer remains permanently on (basic setting of all mixers). When in doubt, switch number and switch position can be established quickly and reliably using code 73.

3. Adjusting the Symmetrical Mix Quota (Code 61)
If a symmetrical (common) mixer (in relation to the neutral point) is required, the mix quota and direction is set using code 61.

M	I	X	1		C	O	M			4	→	8		w	/
o	f	s				O		-	S		+		3	2	%

Mix quota is adjusted using the INC and DEC keys, the process can be speeded up by pressing the 6 or 8 key, which increases or decreases the value in steps of 10 respectively. The direction of mixing is determined by the + or – prefix to the mix quota, and can be changed by pressing the TURN key.

To alter the neutral point of the mixer, shift the corresponding operating element (stick, etc.) into the required position and press the STORE key. The offset from the normal neutral point captured in this way is transferred to the display.

Adjustment is confirmed by pressing the ENTER key. Afterwards, further mixes can be adjusted by entering their number, or the adjustment process terminated by pressing the ENTER key again.

4. Adjusting the Symmetrical Mix Quota (Code 71)

Code 71 permits adjusting separate mix quota and mix directions for the two sides of the control function at the mixer inlet.

M	I	X	1		S	E	P			4	→	8		w	/
o	f	s				O		-	S		+		2	8	%

The setting of the mix quota is performed in the same way as for code 61 using the 6, 8, INC and DEC keys. In this case the operating element has to be set to the side requiring adjustment (displayed with the prefix + or – ahead of “s”). The direction of mixing can be adjusted separately for either side using the TURN key. Neutral point offset is achieved by moving the operating element of the control function to the required position and capturing the value using the STORE key.

Code 59
Trim Data Memory
Storing Trim Data

T	R	I	M		O	F	F	S	E	T				
S	T	O	R	E		o	r		C	L	E	A	R	

Code 59 is used for storing actual trim data. It can be used in addition to display trim data stored in the memory. After calling the display will show the following message.

T	R	I	M		O	F	F	S	E	T				
S	T	O	R	E		o	r		C	L	E	A	R	

From here, branching occurs to the functions of “Trim Storage” or “Display of Stored Trim Data”.

a) Trim Storage

To store actual trim data, press the STORE key. As a result, the display will show

S	E	T		T	R	I	M		&		E	N	T	E	R
+	2	2		-	0	2		+	0	2		-	1	5	

↑ Idle ↑ Roll ↑ Pitch ↑ Tail Rotor

with the lower line indicating the positions of the trim levers as a deviation from the neutral position. With the aid of the display the trim levers are then shifted to the neutral position, a step which does not change the trim positions of the model. By pressing the ENTER trim data storage process is terminated and the previous in-flight established tri data now corresponds to the mechanical neutral setting of the trim levers.

Important:
In normal cases the trim lever for idle trim should not be changed, as the indicated value does not represent a value which has been established in flight, but a random value for the idle trim position. If a larger deviation from normal value has been stored for function 1 (throttle), this will lead to malfunction of the idle trim. When in doubt the stored trim data for function 1 should be displayed and, if necessary, deleted as described below.

b) Display of trim data memory

If the CLEAR key is pressed instead of the ENTER key the stored trim data of each function can be displayed now using keys 1…4 and if necessary deleted (returned to 0) by pressing the CLEAR key. The trim values are:

1 = Idle Trim
2 = Roll
3 = Pitch
4 = Tail Rotor

The deletion of trim memories should preferably be performed for all of the functions prior to entering the data for a new model, so the same range will be available for storing trim data in any direction when test-flying that model.

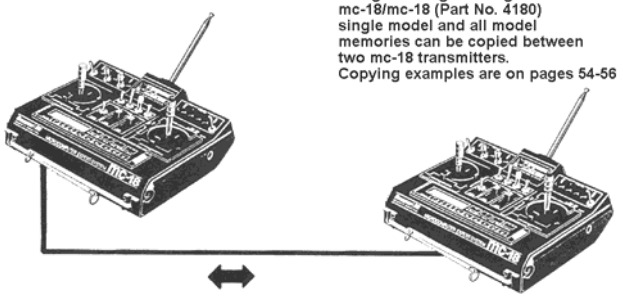
Code 77
Copying
Model Copying Functions

C	O	P	Y		:	F	R	O	M		M	O	D	E	L
K	E	Y		1	-	7		O	R		+	/	-		

Code 94 permits copying model data form one model to another one, and also via an external interface of a transmitter to another mc-18 transmitter. With the aid of a separately available PC adapter, order N° 8181, it is also possible to transfer either individual model adjustments data or the complete contents of the memory of the transmitter (all models) into a personal computer compatible with industrial standards via the serial interface of the latter, saving it there on a disk for possible re-transfer to the transmitter (or some other transmitter).

A special cable, order N° 4180, will be required for the transfer to another mc-18 transmitter, which has to be plugged into the connection socket for the PROFITRIM module of both transmitters.

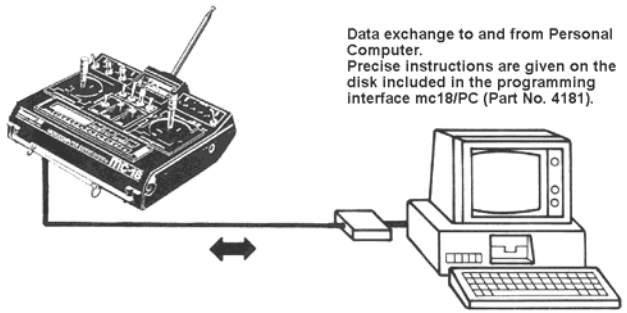
After activation of code 94, the transmitter expects the input of the model memory of which a copy is to be produced. This is achieved either by input of the model number or by skimming through the list of models using the INC and DEC keys. The selection is then made by pressing the ENTER key. Then the model memory, into which the copy is to be produced, is selected in the same manner.



The copying process is triggered by pressing the ENTER key, with all previously stored data being transferred to the model memory, into which the data is copied. If the name of the model the data of which is being copied has been entered, this name will also be transferred to the copy, but with a + symbol added to the last letter of the name to distinguish it from the original. For safety reason, model memories that are active at the moment must not be copied!

When copying from one transmitter to another, or to a personal computer, selection is performed by keys INC and DEC, with “external interface” for source at the receiving transmitter, and as target for the sending transmitter. In addition, the “all-models memory” option is available, which permits transferring all model memories simultaneously. In that case, the options of both units have to be set accordingly. The transfer process should be initiated by the receiving unit via the ENTER key, followed by the sending one.

In the case of transmitters with the extended memory (for 30 models), on deletion (code 56) and when copying (code 94) a back-up copy of that memory will be made onto which the copy is transferred or which is being deleted. This permits reversing accidental deletion or overwriting of model adjustments, this back-up copy being copied onto a normal memory station. Just call code 94 as usual and input “from model” memory station 31.



Code 74
Servo Position

Display of Servo Position

S	E	R	V	O		P	O	S	.					
p	u	s	h		c	h		k	e	y		1	-	10

The actual position of each servo can be shown exactly with the aid of code 74. In this manner, the interaction of different mixers on a specific servo can be determined with accuracy, and the operation of throw reduction can be controlled. Battery fail-safe (code 78) can also be checked.

For the simulation of battery fail-safe position relying on the menu. The operating element for channel 1 or channel 8 is adjusted to the percentage value set using code 78, and the control surface throw checked at the servo after calling code 74.

After calling the request for the selection of the control channel to be checked will appear in the display. To select the channel, use keys 1…9 and INC (for channel 10). After entering the channel number, the lower line of the display will indicate after the channel number, the exact servo position within a range of ±150% of the servo throw in either direction, with 0% corresponding to the neutral position. Using keys 1…9 and INC, other control channels can be displayed. To terminate the display of servo position, press the ENTER key.

Code 76
Servo Test

Testing Servos 1 – 9

m	c	-	1	8	E		M	O	D	E	L			1
E	N	T	E	R	=	S	E	R	V	O	T	E	S	T

To check all servos for proper function, check them one after another by executing full deflections in both directions, starting from the neutral position. After calling code 76, the test program will be executed in an endless loop until interrupted by pressing the ENTER key. In this way, the receiver can be checked over a longer period.

Code 73
Switch Position

Display of Switch Positions

Switch		1	2	3	4	5	6	7	8	9
		⌇	⌇	⌇	⌇	⌇	⌇	⌇	⌇	⌇

For checking the installation of switches and their connections to plug stations 1…8, the switch positions of all external switched are indicated by code 73, with an automatic channel 1 switch, possibly programmed by code 63, being taken into account.

The display always refers to the actual mechanical switch position of the switch concerned, independent of its having possible been reversed by code 23, 33, or 34.

Please Note:
In the case of mixers a closed switch will normally turn off the mixer concerned, not on!

Code 77
FAIL SAFE

Programming the Fail Safe

mc-18E		MODEL		1	
FAIL	SAFE		HOLD		

This is possible only in PCM mode with mc-18 receivers.

The inherently higher operational reliability of Pulse Code Modulation (PCM) as compared to the simpler Pulse Position Modulation (PPM) results from the ability of the micro-processor installed in the receiver to recognise when a received signal has been corrupted or stopped by outside interference.

In such cases, the receiver automatically replaces the false signal with the last correctly received one stored in the receiver. In this manner interference of short duration will be eliminated.

In the case of longer lasting disturbance of the transmissions, the operator may choose between two options:

1. HOLD

The servos hold that position which corresponds to the last correctly received signal, until the receiver manages to receive a new intact signal again.

2. FAILSAFE

The servos move a pre-set position until an acceptable signal is again received by the receiver. The delay, determining the time from loss of signal to the triggering of the fail-safe program, can be adjusted in three steps (1.0s, 0.5s and 0.25s), to allow for different model speeds.

After calling code 77, switching can be performed by the INC key between HOLD, FS 1.0s, FS 0.5s and FS 0.25s. To record the positions for the servos the control functions have to be moved to the required positions at the transmitter, then press the STORE key. This step stores the current adjustments as the fail-safe settings, which are transferred at regular intervals to the receiver. The receiver stores these fail-safe values for use in the case of signal loss.

Fail-safe adjustments can be overwritten at any time, even in flight, by calling code 77 and changing the current transmitter fail-safe data by pressing the STORE key.

Code 78
FAIL SAFE Bat

Activating Battery Fail-Safe

m	c	-	1	8	E		M	O	D	E	L			1	
B	A	T	T		F	.	S	.		O	F	F			

The automatic battery fail-safe serves to warn the pilot of dropping receiver battery voltage and to give him a chance to avoid an impending crash caused by depleted receiver batteries.

As soon as the voltage at the receiver battery drops below a predetermined value, a servo permanently allocated to the battery fail-safe function and acting as an indicator of the imminent depletion of the receiver power supply will be actuated. In the case of a fixed-wing model program, this will be the servo wired to channel 1 (throttle). For helicopter programs it will be channel 8, which could for example be used for switching on the lights, etc.

For the position, to which the servo will be shifted, three different values may be programmed:

+75% Three-quarter deflection in one direction
0% Servo neutral position
-75% Three-quarter deflection in the opposite direction

When checking adjustments, the servo position display (code 74) will prove helpful.

The fail-safe display can be cleared again by actuating the operating element concerned for a moment (e.g. throttle stick for fixed-wing) and the servo can then be controlled in the normal manner. A model should be landed straight away after the battery fail-safe has been indicated. After code 78 has been called the display will read “BATT F.S. OFF”. Pressing the INC key activates the battery fail-safe and permits selecting the display position of the servo in sequential order –75%, 0%, +75%, OFF. Pressing clear will switch off the battery fail-safe immediately.

ALARM TIMER and Stopwatch

The PROFI-ULTRASOFT-Module offers two stopwatch functions.

3. Stopwatch with normal display (hours, minutes and seconds).

4. Timer alert, with seconds display.

One of these options can be selected for each model program.

A stopwatch, once programmed, will appear on the lower line of the display each time the transmitter is turned on, it does not need to be called over and over again. Once triggered the stopwatch will continue to run even when inputs are made during its operation via the keyboard.

Stopwatch with normal display.

The stopwatch with normal display may be programmed by allocating a switch to function “CLK” using code 23. A prerequisite is that the alarm timer (code 97) is not activated. The clock will then run as long as the allocated switch is closed. Using the CLEAR key it can be reset to 0.00.00 when not running (if running the transmitter switches to list of codes mode of operation). By this programmable switch allocation, the stopwatch function may be coupled with the tow hook, permitting the exact duration of flight (starting from release of the tow-line) to be recorded.

Code 97
Stopwatch

Stopwatch

T	I	M	E	R		6	0	0	s	e	c		←		
A	L	A	R	M			3	0	s	e	c				

After calling code 97, the message “TIMER OFF” will appear on the display. The timer is activated by the INC or DEC key, whereby the stopwatch, possibly programmed by code 23, will be turned off. The alarm timer can be deactivated by the CLEAR key. Timer run can be adjusted on the upper line of the display in 10 second increments using the INC and DEC keys. In the lower line a point of time can be set when, prior to the expiration of the return time, an acoustic signal alerts the flyer. The arrow at the right hand end of the display indicates which time can currently be adjusted, and is moved by pressing the TURN key.

After the set time has run down to 0, it is indicated by a longer acoustic signal. The timer continues to run, so that the time beyond 0 can be read.

Start/Stop instructions can be given by keys 2 and 3 respectively, or via an intermediate switch (order No. 4160/11) connected to plug station CLK, or a kick button (order No. 4144).

If a switch for the timer has been allocated by code 23, operation of the alarm timer will be performed exclusively by that switch.

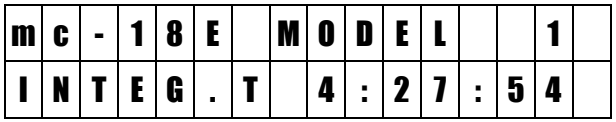
Acoustic Signal Sequence:

100s before zero: every 5 seconds
20s before zero: every 2 seconds
10s before zero: every second
0s Extended Signal

A + symbol on the display indicates that the time shown is that beyond zero. The maximum timer capacity is 900 seconds beyond zero.

Code 98
Operating Timer

Transmitter Operating Timer



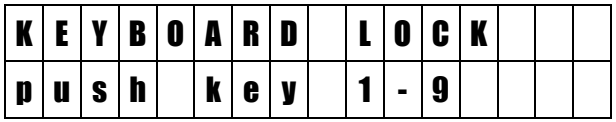
The operating timer displays the time the transmitter has been switched on and monitors the transmitter power supply.

After the batteries have been charged, could 98 should therefore be called and indicated time reset to 0 by pressing the CLEAR key.

The operating time is then measured whilst the transmitter power switch is on. This permits the cumulative operating time to be displayed at any moment by calling code 98.

Code 88
Input Lock

Code Lock for Keyboard Input



The input lock prevents changes of transmitter settings by unauthorised persons or accidental pressing of the input keys. The lock does not prevent unimpaired use of the transmitter when flying models using the elements activated, but no inputs will be possible via the keyboard, hence a change of models is not possible.

Activation of the keyboard lock is performed using code 88 and entering an optional 3 figure combination using keys 1…9, followed by the ENTER key.

The lock becomes effective by turning the transmitter off and on again. After pressing the ENTER key, the request “push key word” appears. Only after entering the correct combination of numbers will the lock be released. The lock remains released until the transmitter is turned off, after which it will be active and it has to be unlocked again.

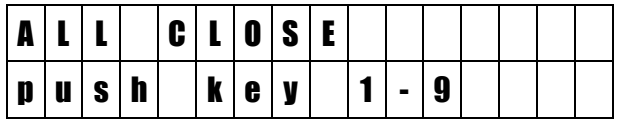
The combination of numbers can be changed at any time, after releasing the lock, by calling code 88 again and entering the new combination.

To clear the input lock completely, the CLEAR key has to be pressed instead of entering a combination. The input has to be terminated by pressing the ENTER key.

Please ensure you remember the combination you set, or you will have to return the transmitter to Graupner Service for decoding.

Code 99
Transmitter Lock

Numerical Transmitter Lock



As a precaution against theft an electronic transmitter lock can be enabled using code 99. It prevents the putting the transmitter into operation unless the correct combination of figures is input after turning the transmitter on.

Activation of the transmitter lock is achieved by calling code 99 and entering an optional 3 figure combination using keys 1…9, followed by the ENTER key.

The lock becomes effective after the transmitter has been turned off. On activation of the transmitter, the request “push key word” will be displayed and it is only after entering the correct combination of digits that the lock will be released, permitting the transmitter to be used. The keyboard, however, remains locked as in the case of code 88. After pressing the ENTER key, the request “push key word” appears again and the correct combination must be entered to obtain access to the settings.

The lock remains released until the transmitter is turned off, after which it will be active and it has to be unlocked again.

In the case where the combination entered for the input lock (code 88) differs from the combination of the transmitter lock (code 99), the combination of numbers for code 99 will also apply to the input lock and replace the figures previously entered into code 88.

When the lock has been released the combination of digits can be changed at any time by calling code 99 and entering a new combination. To remove the lock completely instead of entering a new combination, the CLEAR key has to be pressed instead of entering a combination. The input has to be terminated by pressing the ENTER key.

For safety's sake the lock has to be removed prior to starting with flight operations! To this end, proceed as follows:

Turn on the transmitter

Input the correct combination of digits

Press the ENTER key

Input the correct combination of digits again

Call code 99

Press keys ENTER CLEAR ENTER

Please ensure you remember the combination you set, or you will have to return the transmitter to Graupner Service for decoding.

Helicopters with Speed Control

(Model Type 9)

This program is suitable for model helicopters exclusively operated with speed control normally operated off an additional channel and which does not utilise any signal from the channel which in models without speed control operates the carburettor. As a result all compensatory functions affecting the engine are missing from this model type. Other control functions affect the channel which controls the regulator (autorotation switching) in a logical way.

When using RPM regulators which can be switched off or overridden by the normal throttle action, model type 9 should be used.

In model 9, all type 8 functions will be available except the following:

Code	Function
82	Dynamic Torque Compensation
84	Hover Throttle
85	Throttle Presets (Idle Up)
86	Mixer Swashplate → Throttle
87	Mixer Tail Rotor → Throttle

Code 23, allocation of external switches, differs accordingly.

Speed controls of this type are available in a variety of designs, but the majority of them are operated via an additional channel. That is to say, a channel that is not affected by the normal control functions and is actuated by a slider-type regulator. Using the latter the engine can be started and its idle adjusted (lower region of slider), the required value for the operating RPM adjusted and the engine cut-off (lower stop).

For this function, channel 1 is used, acted upon by a slider type regulator wired to connection "ch9". Unlike model type 8, this channel is not affected by the collective pitch control. Using a regulator of the type described above in conjunction with model type 9 results in improved operating comfort.

To start the engine, set the slider-type regulator against the lower stop and adjust the idle with the idle trim control. Using the idle trim, the engine can also be shut off. The slider-type regulator can be used to achieve the RPM required for flight, with the option that direct switching to a value set earlier with the slider is possible using a switch allocated with Code 23. Switching can be performed the hard way, or preferably using a time lag ranging from 0.5…30 seconds adjustable via Code 92.

Helicopter Programming Examples

In case you have become slightly confused by the unusually large number of functions offered in the preceding chapters of these instructions, the following are to show you by way of examples how a practical, usable, model set-up can be programmed in a minimum of time. In doing so the essential functions will be activated, while the “deluxe” options meant for competition pilots will not be considered initially. In the following chapters this basic program will then be expanded by additional options, followed by a few examples from the PROFI’s bag of tricks. Here the basic principles of computer RC will become clear:

From the extensive range of functions you select only those, which are actually required and forget the rest of them. If, in the course of time, you need more of them, all you have to do is activate additional functions.

Be sure to duplicate the following examples step by step, so you won’t forget or overlook anything. In this manner you’ll actually get automatically familiar with your R/C equipment and won’t consider it nearly as complicated as it may have appeared at first glance.

1.) Preparations

You have installed the module into the transmitter as per the instructions. Close the case of the transmitter again and turned the transmitter on. The display will read:

m	c	-	1	8	E		M	O	D	E	L			1	
	9	.	6	V			P	C	M						

Depending on what kind of module had been installed previously in your transmitter the display may show another model number or another modulation mode.

2.) Executing RESET (Important)

Call model memory 1 and clear it completely. To do this input:

ENTER 5 6 ENTER 1 CLEAR ENTER

If the transmitter had previously been switched to PCM you now have the basic position of the display again. If not, the request will appear to turn the transmitter off. This is because it has been switched to the default position of PCM modulation. Comply with the request and then turn it on again a moment later, thereafter you will be in the basic position.

For safety’s sake, so you won’t forget it later, execute a reset (right now) on all the remainder of the model memories. To do this, input:

ENTER 5 6 ENTER 2 CLEAR ENTER

ENTER 5 6 ENTER 3 CLEAR ENTER

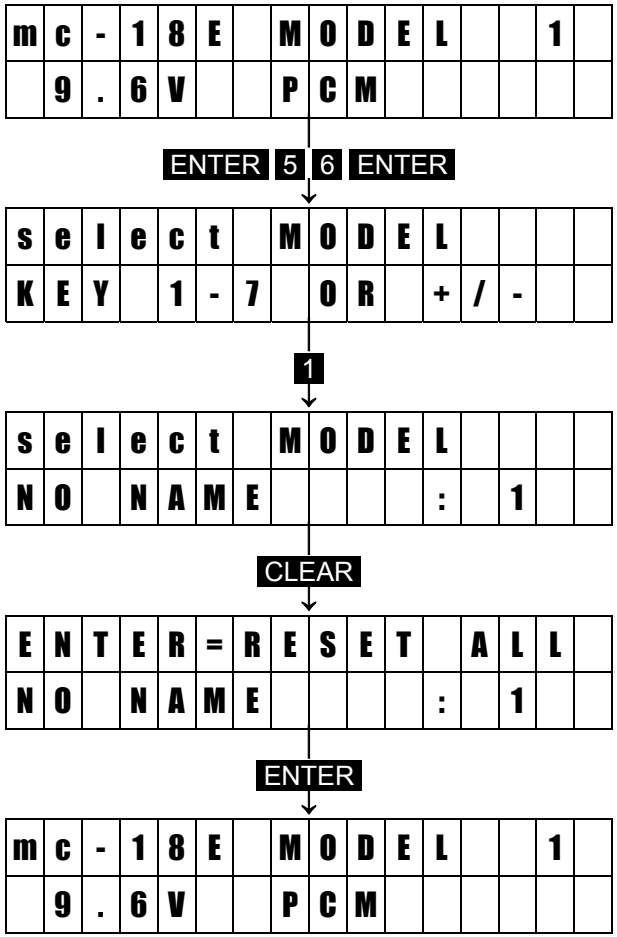
…

ENTER 5 6 ENTER 7 CLEAR ENTER

…

(ENTER 5 6 ENTER 3 0 CLEAR ENTER)

This procedure needs only to be performed once in order to positively delete any programming parts and data which may have been stored in the transmitter memory by an earlier used module, and could still be stored. These program fragments may cause a malfunction if not deleted.



3.) Selection of Model Memory

In order to file the following adjustments under model No, 1, input the following

ENTER 5 6 ENTER 1 ENTER

4.) Entering Model Name

So you'll be able to locate it correctly later on, input the name of your model, by inputting:

ENTER 3 2 ENTER

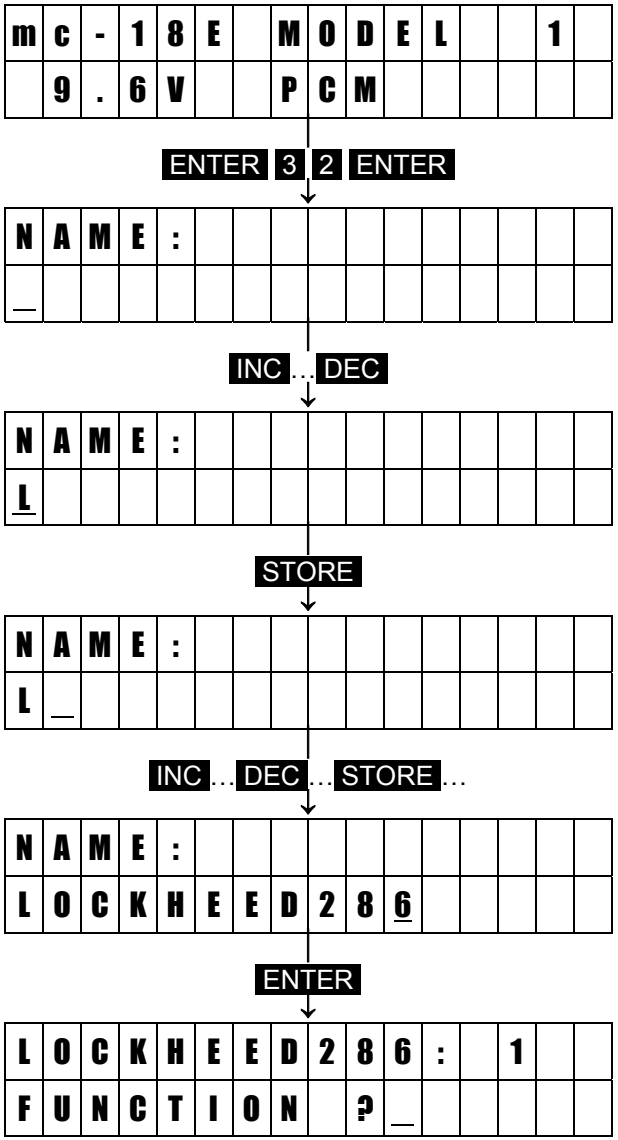
The transmitter now asks for the name, with the cursor being located in the first position of the lower line. Using the INC and DEC keys you select the first letter of the name of the model. This is stored by pressing the STORE key, whereupon the cursor moves to the 2nd position. In this manner, store the complete name of the model (the length of the name must no exceed 11 characters). Using the TURN key changes between uppercase and lowercase letters. If you have entered an incorrect letter, you can backspace using the CLEAR key and the correct it. Having entered the complete name, input is terminated by a press of the ENTER key.

NOTE:

The transmitter is now back in the command mode, indicated on the lower line of the display by "FUNCTION ?", which is to say it is waiting for a code number to be input. During adjustment it will remain in this mode, which can be left by pressing the ENTER key. From normal mode you can switch to the command mode by the ENTER key.

For the ensuing inputs, it is assumed that the transmitter is in the command mode, that is "FUNCTION ?" will be showing on the lower line of the display.

In case you had switched off your transmitter or had accidentally switched to normal mode via the ENTER key, just press the ENTER key again to get back to command mode.



Helicopter Programming Examples

5.) Defining Stick Allocation

Set the control stick allocation you are accustomed to by entering:

5 7 ENTER

Thereupon the lower line of the display will read:

MODE 1

Now press one of the keys 1…4, to suit your normal control mode:

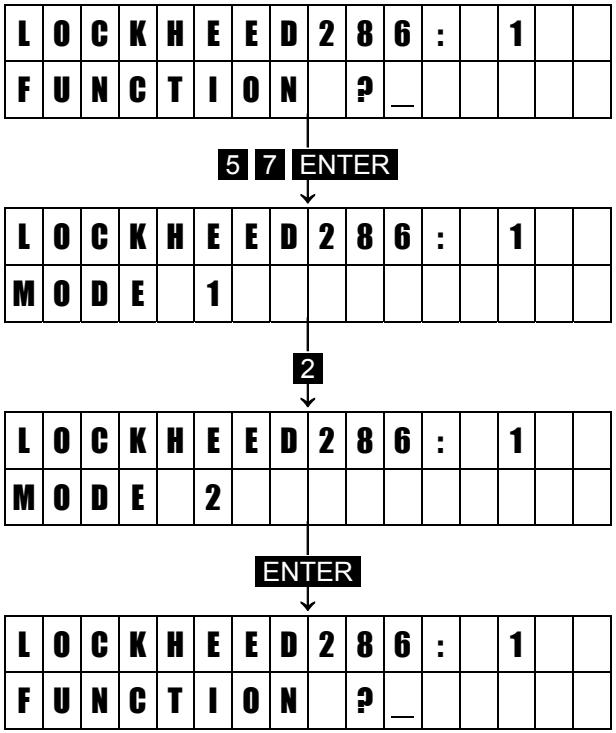
1 = Collective Pitch and Roll on the right
Pitch and Tail Rotor on the left

2 = Collective Pitch and Tail Rotor on the left
Roll and Pitch on the right

3 = Collective Pitch and Tail Rotor on the right
Roll and Pitch on the left

4 = Collective Pitch and Roll on the left
Pitch and Tail Rotor on the right

The figure on the display will change accordingly. Terminate the input by pressing the ENTER key and you are once again back in command mode.



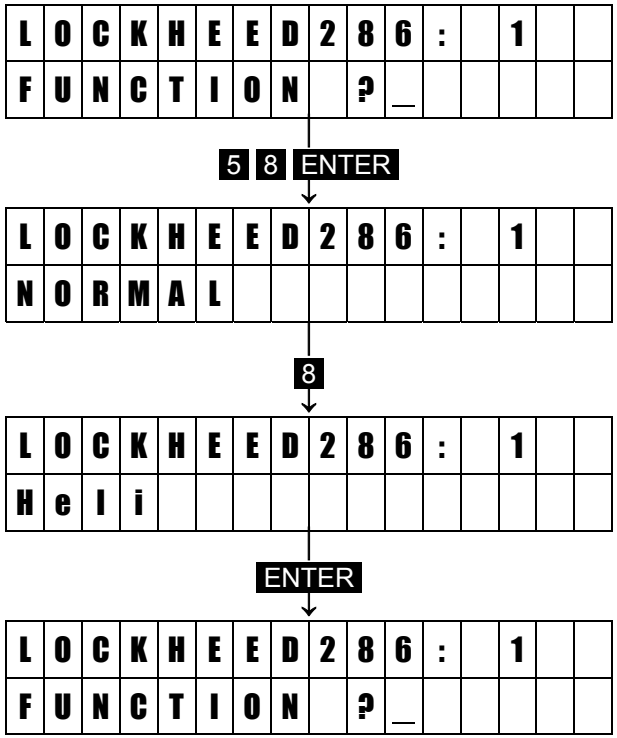
6.) Defining the Model Type

The previous inputs were universally applicable to all types of

model. Now you select the type of model to which your actual model corresponds. For this example it is assumed that you own a perfectly normal power model, the ailerons of which as well as elevator and rudder are operated by a single servo each. Input:

5 8 ENTER

In the lower line of the display now appears the actual model type. At the moment it will reads “NORMAL”. To switch over to the Heli program, press key 8 and the display will change to “Heli”. Leave type selection by pressing the ENTER key.



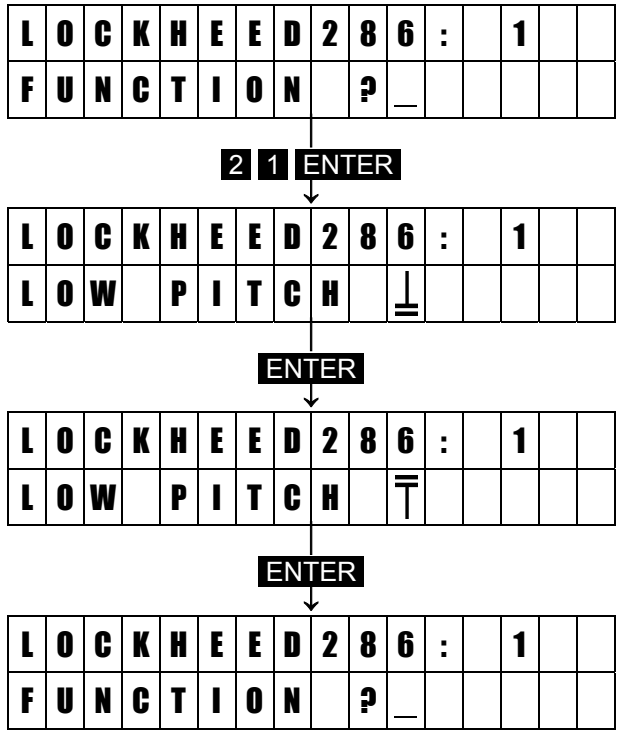
7.) Determining Collective Pitch / Throttle Stick Direction

Determination of the collective pitch / throttle control direction you are used to, e.g. pulling or pushing the throttle stick to increase collective pitch. To this end, input:

2 1 ENTER

The display then reads: LOW PITCH ⊥

Using the INC and DEC keys you may now switch to and fro between ⊥ and T̄. ⊥ means pushing for full throttle, and T̄ means pulling. Terminate the selection with the ENTER key.



Helicopter Programming Examples

8.) Allocation of Switches

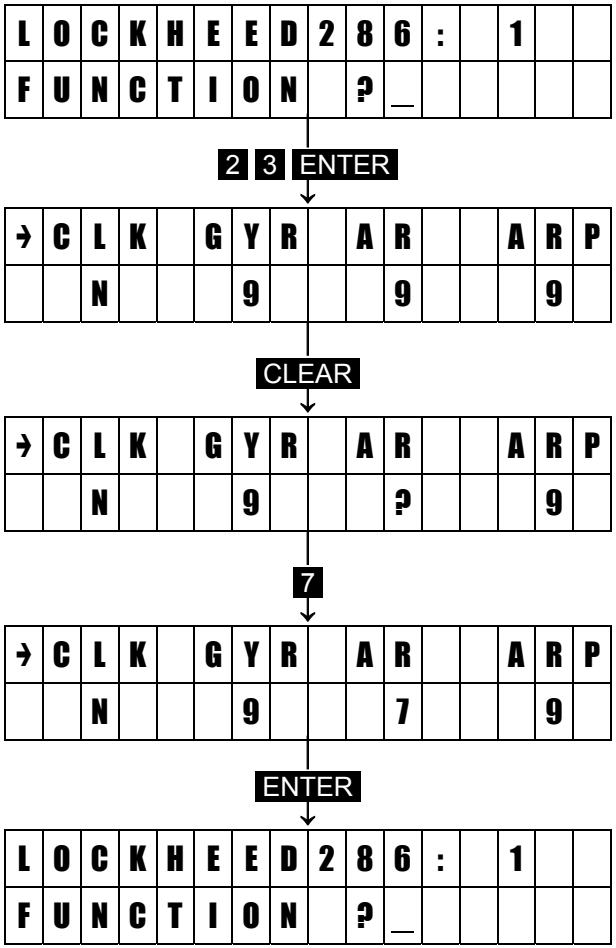
Now set-up the transmitter so that switch you want for autorotation is connected to socket “7”. To allocate the switch, input:

2 3 ENTER

In the upper line of the display the various functions that can actuated by switches appear, with the switches allocated to them listed below the relevant function. A small arrow (upper line) indicates which function is about to be adjusted. This arrow is moved to the right or left using the INC and DEC keys. Press the INC key twice to shift the arrow to the “AR” setting as this is the function you wish to allocate the switch to. The press

CLEAR 7

Number 7 will now appear in the lower line below the “AR” caption. Terminate input by pressing the ENTER key.



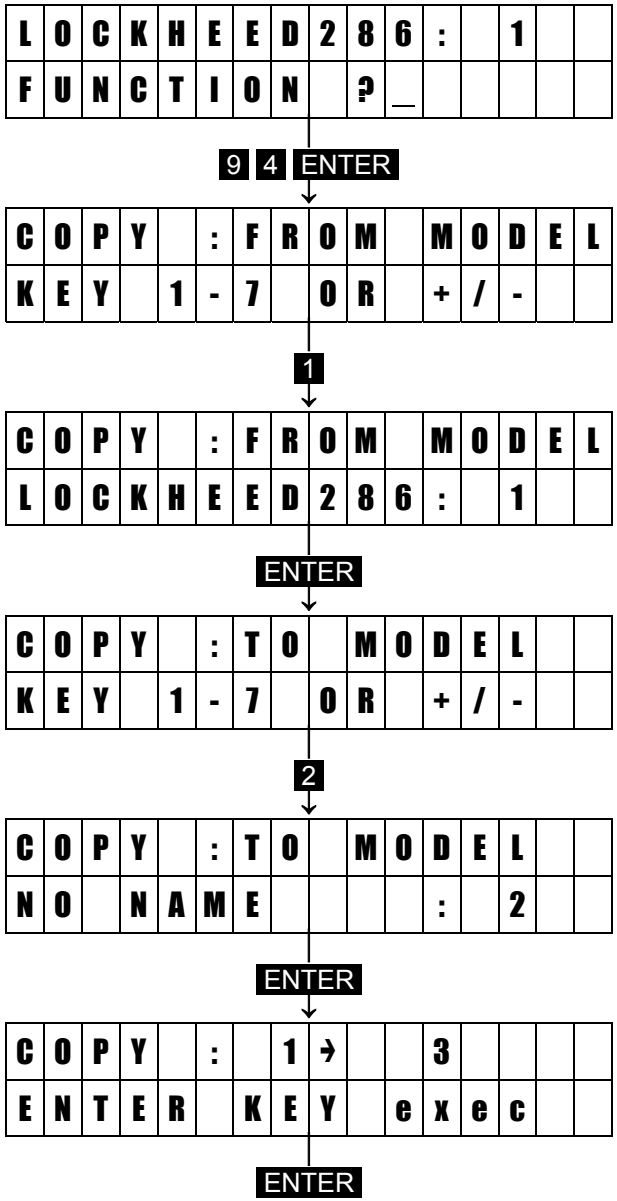
9.) Copying Adjustments

All that’s been input so far may be considered as “pilot specific” programming, as these inputs depend on the habits of the pilot and are alike for all models (excepting the name of the model). In order not to have to input these settings for each model memory, you can now copy them first into the other model memories. To this end input:

9 4 ENTER 1 ENTER 2 ENTER ENTER

You have now copied the essential settings of model 1 onto model 2. Repeat the same procedure for the remaining models by:

9 4 ENTER 1 ENTER 3 ENTER ENTER
9 4 ENTER 1 ENTER 4 ENTER ENTER
…
9 4 ENTER 1 ENTER 7 ENTER ENTER
…
(9 4 ENTER 1 ENTER 3 0 ENTER ENTER)



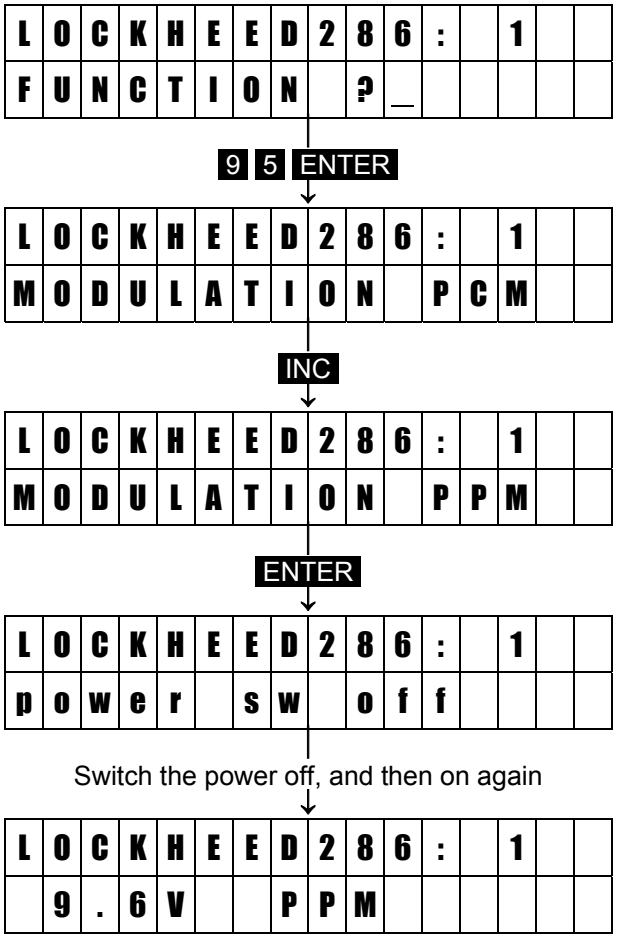
10.) Modulation Mode

If a PCM receiver has been installed in your model you may skip this step. In the case of a PPM receiver just input:

9 5 ENTER INC ENTER

Doing this you have switched to PPM mode, The transmitter now requests you to turn it off so it can change over to PPM.

A reversion to PCM mode is performed in the same way.



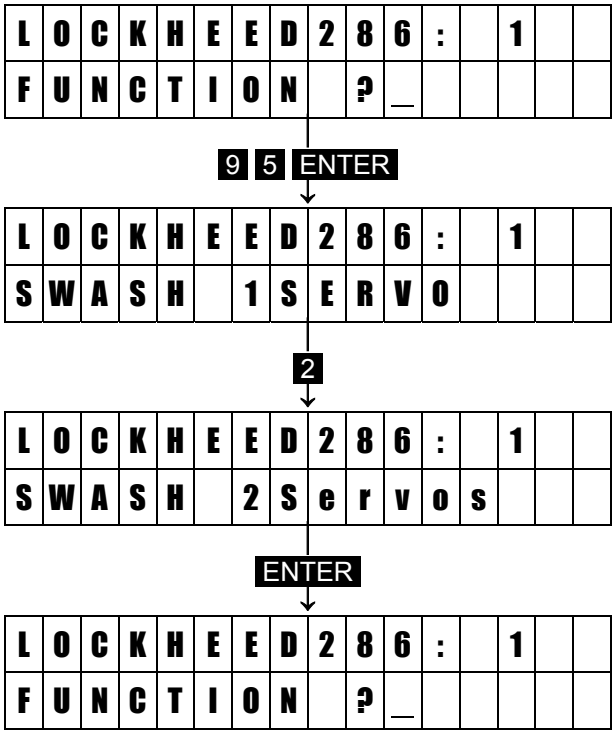
Helicopter Programming Examples

11.) Type of Swashplate Control

Depending on which type of pitch control your model helicopter has, the matching rotor head mixer has to be selected by:

6 8 ENTER

This is followed by the key 1…5 for the type concerned, and terminated by pressing the ENTER key.



12.) Direction of Torque Compensation

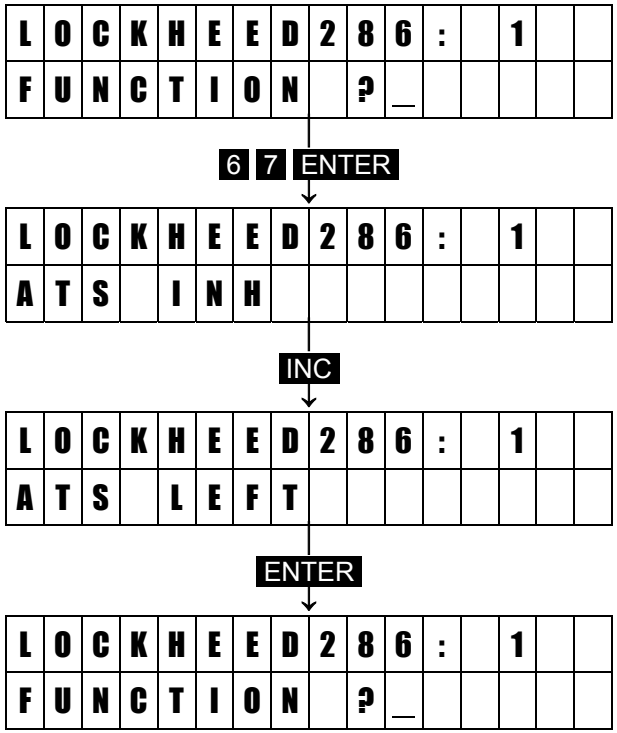
Next is the activation Torque Compensation. For a helicopter with clockwise rotating main rotor (viewed from above) input:

6 7 ENTER DEC

Or for anti-clockwise rotating rotors, input:

6 7 ENTER INC

Terminate the setting by pressing the ENTER key.



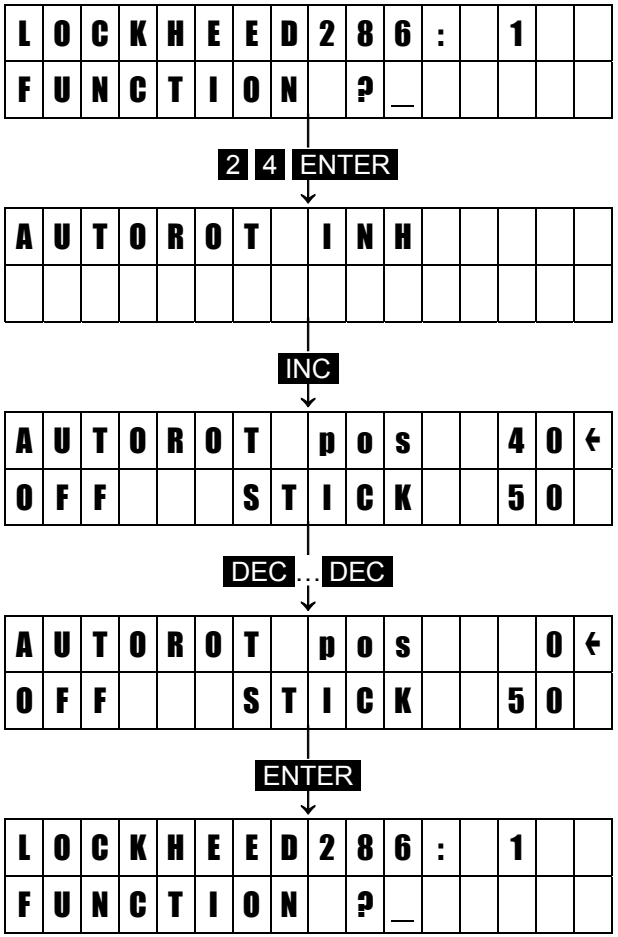
13.) Activating the Autorotation Switch

Activate the autorotation switch to allow the engine to be shut-off by the autorotation switch. To achieve this, input:

2 4 ENTER INC

Terminate the input by pressing the ENTER key.

For the following adjustments the receiver must e turned on. The servos should be connected to the receiver outputs as per the instructions.



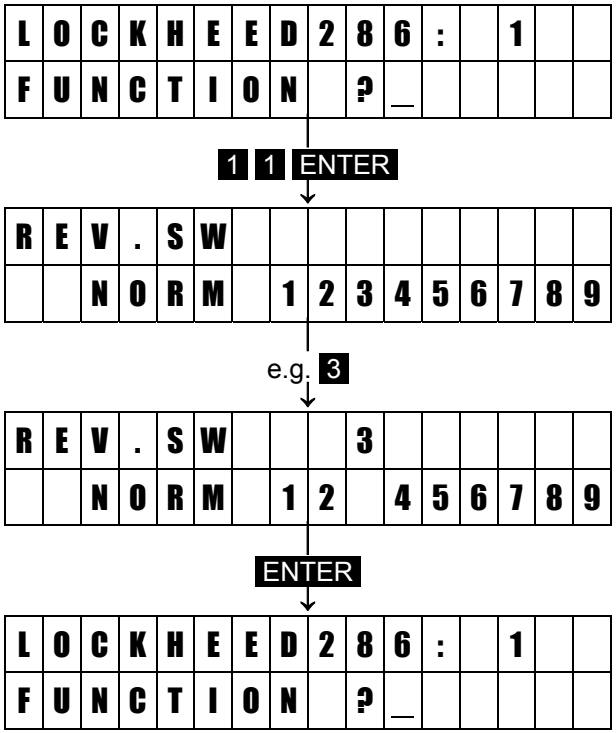
14.) Adjusting the Direction of Servo Rotation

Check the function of the control surfaces. Most likely one or other of the servos will be found to rotate in the wrong direction. To change the direction of rotation of a servo moving in the wrong direction, call servo reversing code 11:

1 1 ENTER

The display now indicates the direction of rotation of all servos. Correct the direction of rotation by entering the corresponding channel number so all control surfaces and the throttle move in the right direction.

When all the servos are rotating the correct way, terminate all input using the ENTER key.



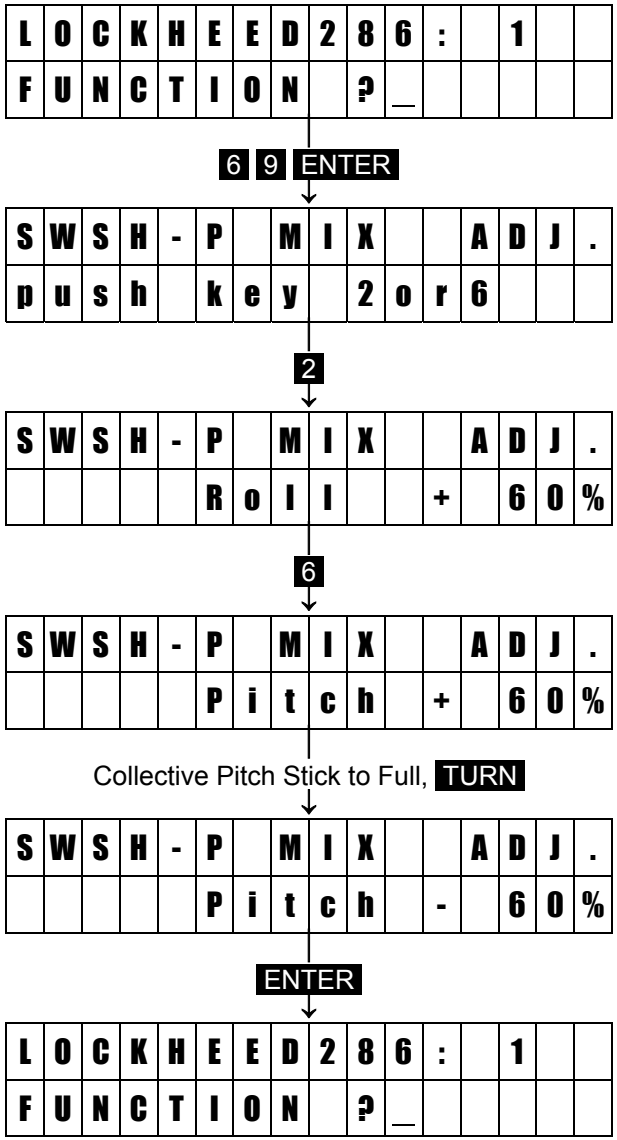
IMPORTANT:
If you use a rotor head mixer (e.g. for HEIM heads) be sure to check each servo singly for its direction of rotation in roll, pitch and yaw. If a servos direction of rotation is incorrect for all of the functions you need only reverse the direction of rotation, as described above. If, however, the direction of rotation is correct for roll but wrong for pitch, you'll have to reverse these functions in the rotor head mixer. This is achieved by:

6 9 ENTER

You may then select the roll function by key 2 and the pitch function by key 6, and depending on the type of swashplate, collective pitch by key 3. By pressing the TURN key the direction of the individual function, represented by the prefix + or -, is reversed. For safety reasons, the collective pitch stick must be at the "full pitch" position to be able to do this. Terminate entry by pressing the ENTER key.

NOTE:

You may possibly have to execute alternating adjustments of Codes 69 and 11 until all the servos rotate the correct direction for all functions. It's a matter of practice how fast you finish the job. In any case, you may be sure that working adjustments can be achieved in this way.



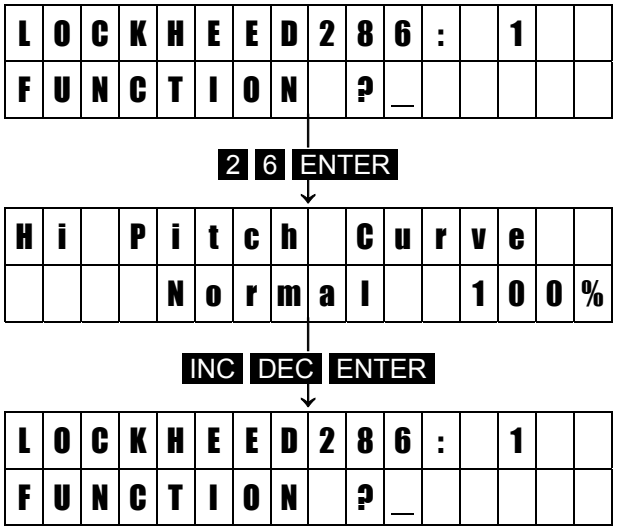
15.) Adjusting the Pitch

After connecting a slider-type control to the connector socket for channel 6 (as supplied that will be the slider in the centre), move it to the neutral position. Now check whether the collective pitch control range corresponds approximately to the requirements for the helicopter by moving the collective pitch stick from the lower to the upper stop and observing how the blade setting of the model reacts. If the control range is too large or too small attach the links at the servo farther inboard or outboard respectively, or if necessary replace the servo arm with a different design. In any case, make sure that the control range is not smaller than required. It is possible to adjust the magnitude of the deflections over a wide range via the transmitter, but it will be advantageous to use deflections which are the right size mechanically. The following adjustments allow for the control range being a bit wider than required.

Adjust the maximum pitch by:

2 6 ENTER

The display will now read “Hi Pitch Curve” and below that the percentage of the normal servo throw value, here shown as 100%.



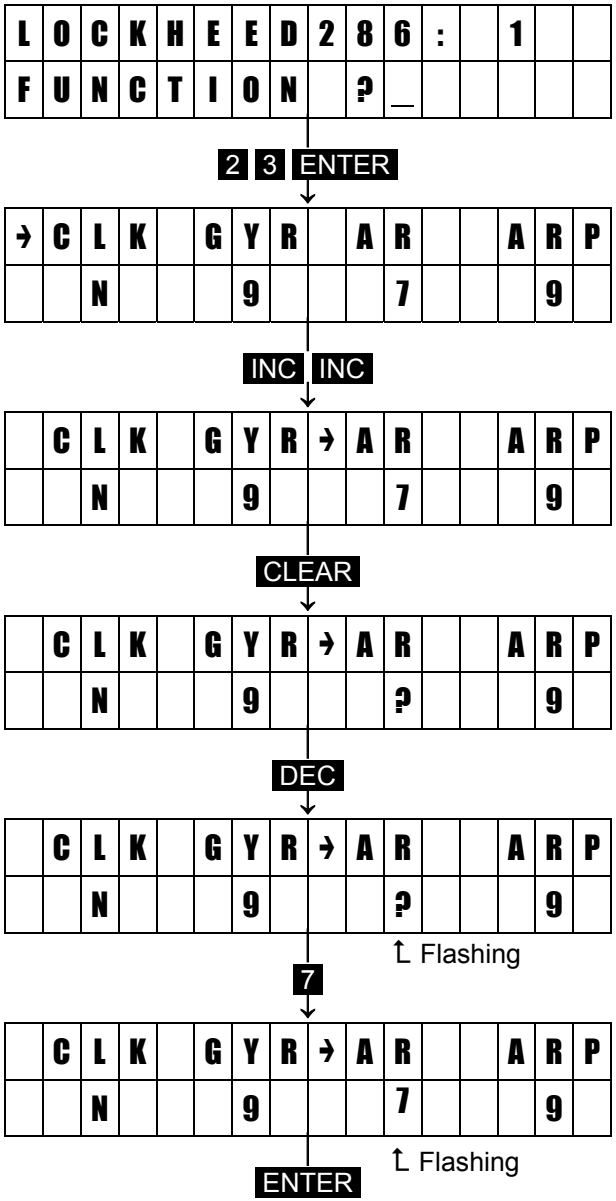
Helicopter Programming Examples

NOTE:
If ahead of the value the word “Normal” is not displayed, but “AT-rot” appears instead the autorotation switch is in the active position. Return the switch to OFF. If you are not familiar to this direction of actuation of the switch, you may invert it without making any mechanical changes. Simply use Code 23 (switch function), move to the “AR setting and, as described in chapter 8, input:

CLEAR DEC 7

The “7” below the “AR” will now be flashing indicating that the switch has been reversed (inverted). Terminate the input by pressing the ENTER key. The autorotation switch should now respond as required.

Adjust the maximum pitch value for normal flight by the DEC key to the desired value and terminate the input by pressing the ENTER key.



Set the value fro minimum pitch by entering:

2 7 ENTER

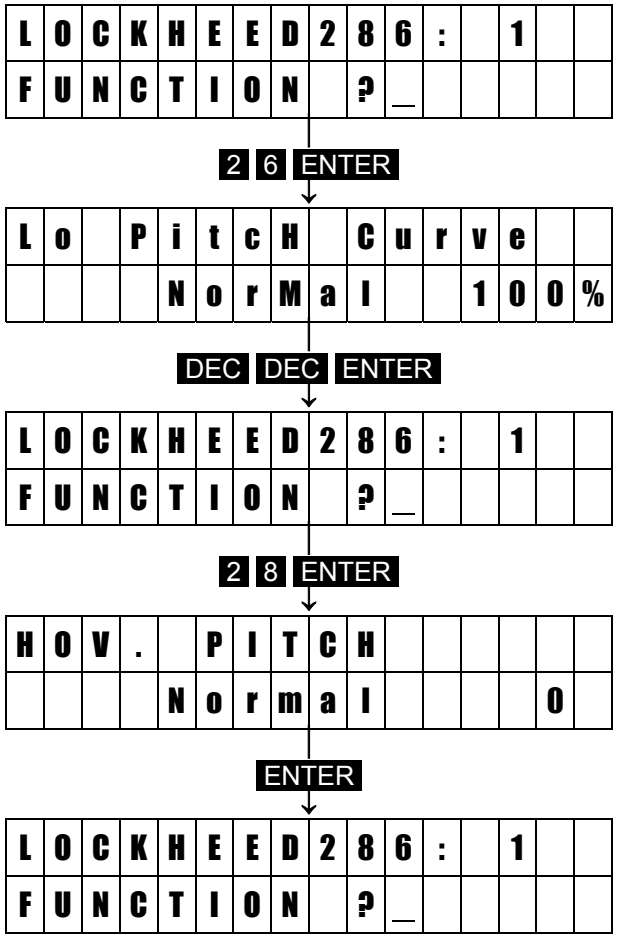
Reduce the value by the DEC key to the desired value and terminate the input by pressing the ENTER key.

Now check that the collective pitch for hover is achieved at approximately the neutral point of the collective pitch control stick. Correct any deviation by:

2 8 ENTER

Move the stick neutral position and adjust the hover pitch value using the INC and DEC keys. The range of adjustment is ±32 steps.

Terminate the input by pressing the ENTER key.



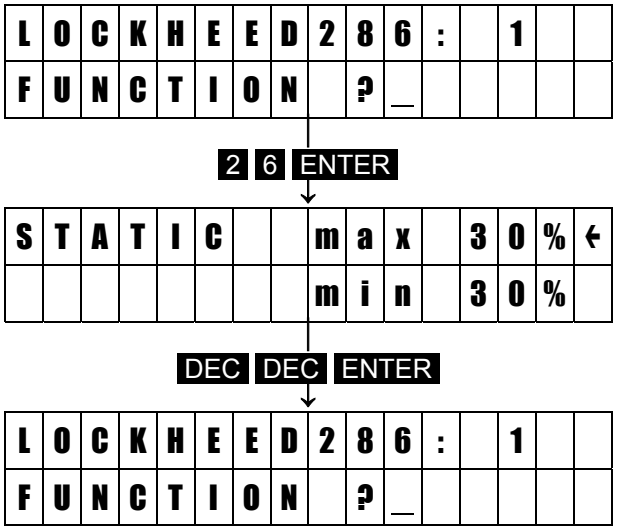
16.) torque Compensation

The static Torque Compensation can be adjusted separately for climb and for descent. In case correct values for torque compensation are on hand, from building instructions or based on experience, they may be input as follows:

8 1 ENTER

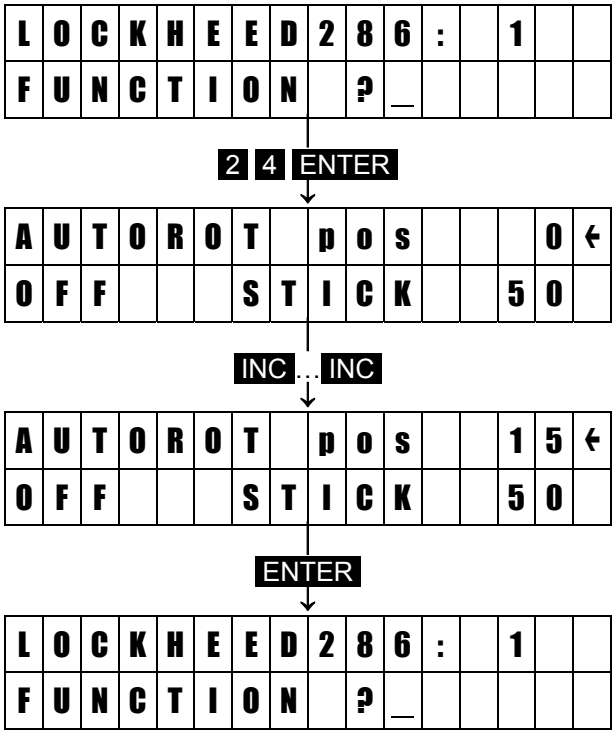
In the display the compensation values will appear for climb (“max”) and descent (“min”). In each case the small arrow indicates the value to be adjusted. The arrow is moved using the TURN key. Perform adjustments by pressing the INC and DEC keys and terminate the changes by pressing the ENTER key.

NOTE:
In case accurate adjustment values are not available it is better to skip this point. The input values provide acceptable results in most cases.



17.) Operation of the Carburettor

Move the throttle / collective pitch lever to the full throttle position. The carburettor should open completely without binding of the throttle linkage; if necessary readjust the linkage. Now actuate the autorotation switch, the carburettor must fully close. If the linkage is restricted in this position, reduce the servo travel using Code 24, where you increase the “pos” value as necessary.

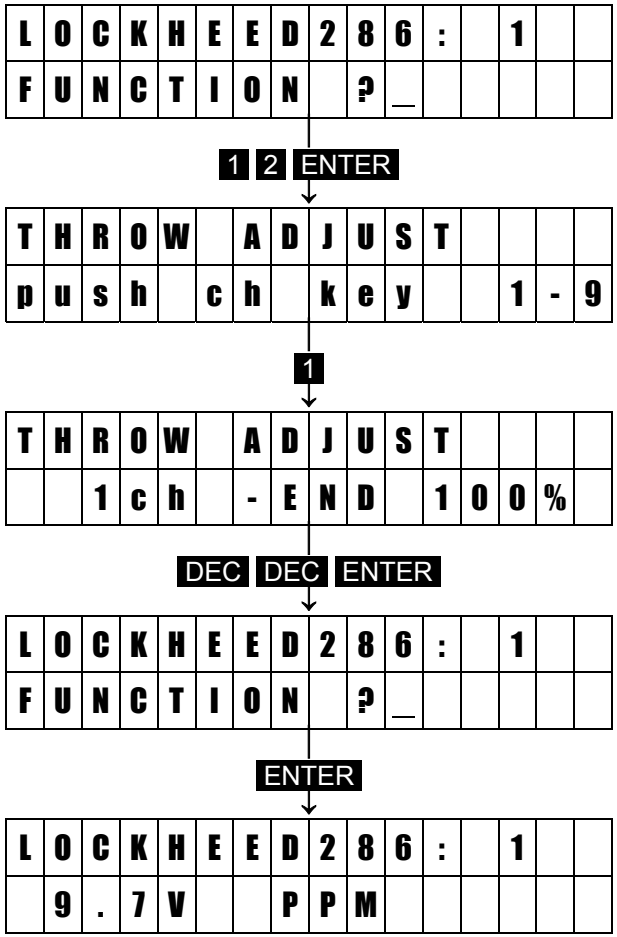


Reset the autorotation switch to the “normal flight” position again and collective pitch / throttle stick to the idle position. You should now be able to adjust the idle region of the carburettor using the trim lever. If the servo is too large or too small, it can be adjusted using Code 12. To do this input:

1 2 ENTER 1

Leave the collective pitch / throttle stick in the idle position and adjust the servo throw using the INC and DEC keys. Terminate input with the ENTER key.

The command mode is left by pressing the ENTER key again.



The basic adjustment of the mc-18 for helicopter operation is now complete. This adjustment encompasses all the required functions which the helicopter beginner and the less experienced helicopter pilot needs to control his model. Fine tuning of the various values can be performed in the course of flying operations, but all that is essential has been provided to permit performing these steps quickly and in an uncomplicated way. It is good practice to take along a small note which list only the code numbers of the options used for programming when flying the model with this adjustment. It should look like this:

Throttle
84 Hover
24 Autorotation

Pitch
26 Max.
27 Min.
28 Hover

Tail Rotor
81 Static Torque Compensation

Rotor Head
69 Mixer Adjustments

Miscellaneous
59 Trim Memory

In this way, you will have a complete list of adjust options on hand during flight operations, which have been used for programming.

Helicopter beginner should be content with these adjustments for their first piloting exercises, until they master hovering flight, and refrain from activating more options which they are not yet capable of using.

This basic programming will be expanded upon now for the advanced helicopter pilot. We will:

1. Add a throttle preset

2. Supplement autorotation adjustments, and

3. Compensate for fluctuations by tail rotor control

In this context, it is assumed that the model already flies correctly on its basic programming.

Helicopter Programming Examples

1. Throttle Presets (Idle Up)

Three activation options exist for throttle presets; by slider-type control, by switch or by a combination of both.

a) Throttle Preset by Slider-type Control

As supplied, the mc-18 transmitter sports two slider-type controls in the central console. The right one adjusts gyro gain in the helicopter programs, and the other one (at the centre) may be used for trimming collective pitch. A third control may be installed for throttle preset (which in this case is connected to the socket marked “9ch”), alternatively the central slider can be used for this function as collective pitch trim is not required due to the numerous pitch adjustment options. In the latter case, one can simply unplug the connector from “6ch” and plug it into “9ch”, but the software offers a much more elegant solution, programmed exchange of the two connecting sockets. If you decide to use this option, proceed as follows:

3 7 ENTER

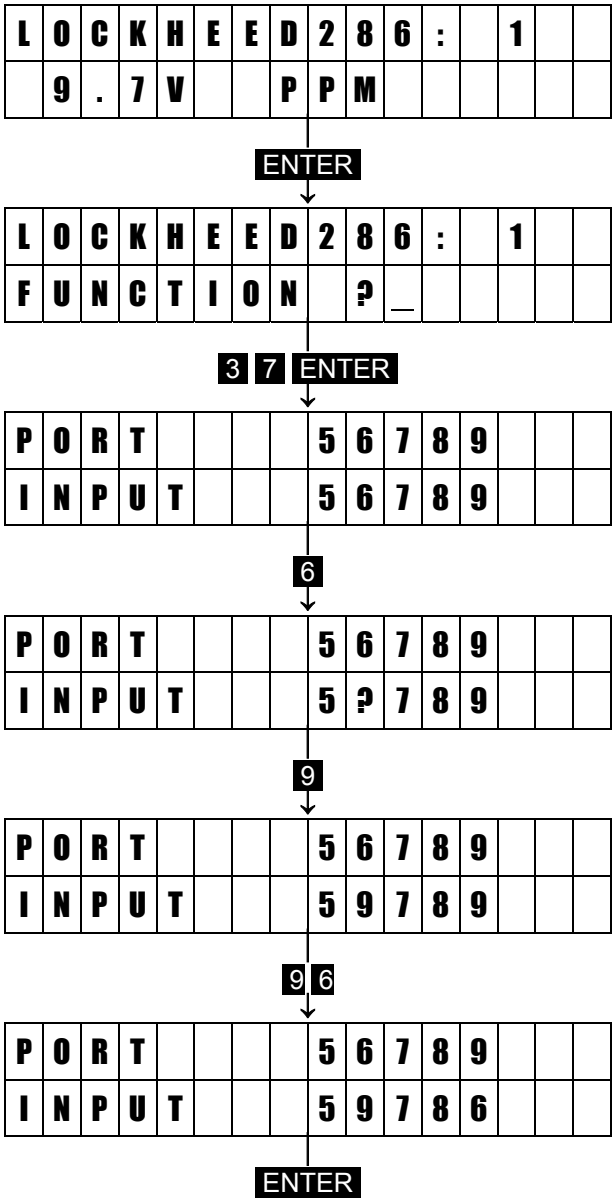
The display shows the numbers of the operating elements (switches, slider-type controls, rotary potentiometers, etc.) in the lower line, and the allocation of channels 5…9 in the upper line.

We are now going to exchange the operating elements for channels 6 and 9. To do this input:

6 9 9 6

Now operating element 9 is positioned below channel 6 on the display, while operating element 6 appears underneath channel 9 (which, in the helicopter programs adjusts throttle preset).

Terminate the input by pressing the ENTER key.



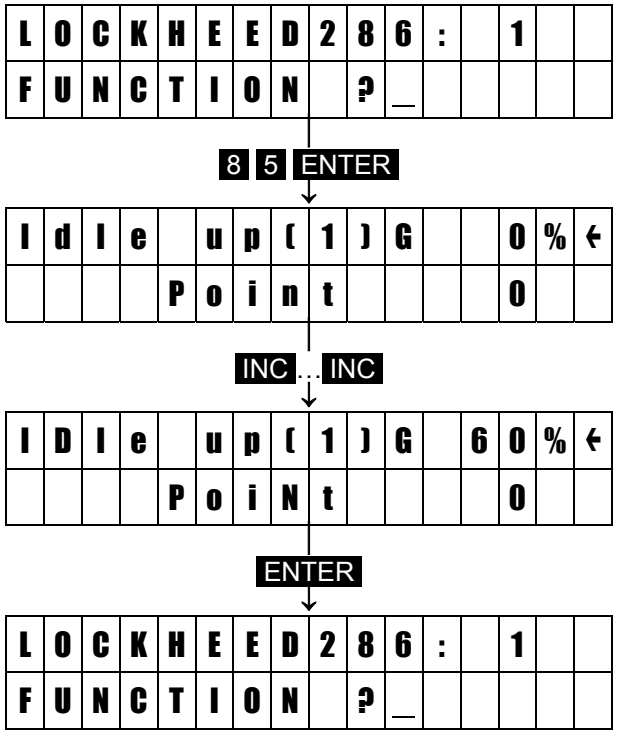
To now adjust the throttle preset, input:

8 5 ENTER

The upper line of the display now shows the percentage value of “G”, and in the lower line the take-over point. The small arrow indicates which value can be adjusted. Leave the arrow behind the value of “G” in the upper line.

Shift the slider to the upper stop and set a value of 60% now via INC key. If you move the slider downward, the display now indicates that you can change the throttle preset value infinitely between 0 and the adjusted maximum value. As a result, you’ll start the engine with throttle preset faded out (slider at the bottom stop) and increase RPM slowly prior to take-off using the slider, up to the preset value (at the upper stop). To establish the correct preset value flight, set the maximum value higher than required and adjust the throttle preset using the slider in the course of flying. After finishing the flight you can read the value of “G” from the display and set the maximum figure to match the displayed value.

Terminate input by pressing the ENTER key.



b) Throttle Preset using a Switch

In place of the slider you may use a switch for activating the throttle preset. Install the switch and connect it to socket 4, and input:

2 3 ENTER INC INC INC INC

The arrow points to “IU1” meaning throttle preset (Idle Up) 1. By entering :

CLEAR 4

You allocate the switch at socket 4 to throttle preset 1. Terminate input by pressing the ENTER key.

When adjusting the throttle preset values proceed as described above.

To avoid abrupt increases of RPM on actuation of the switch, the module provides Code 92 (slow-down of spin-up switches). Call this option by entering:

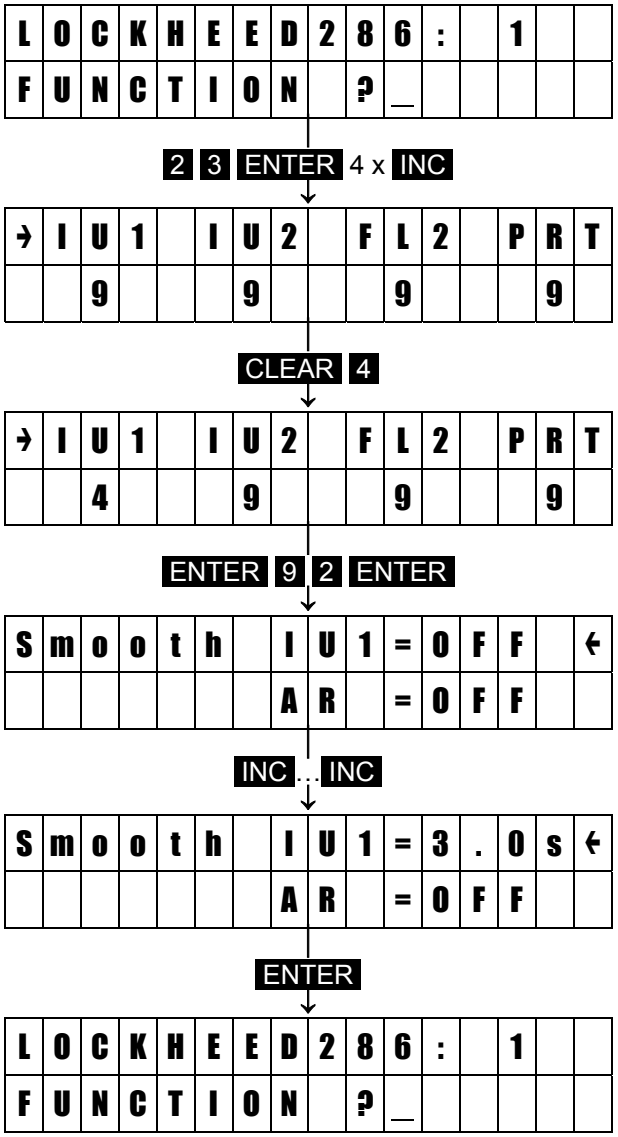
9 2 ENTER

and pressing the INC key, until the value to the right of IU1 reads approximately 3.0s. Terminate input with the ENTER key.

When you activate throttle preset using the switch, the carburettor will not be opened abruptly, and the RPM will increase slowly to the preset figure (in this example the spin-up phase will be 3 seconds).

c) Throttle Preset by Switch and Slider Control

The two methods can be combined so throttle preset can be activated by switch as well as effected using the slider.



2. supplemental Autorotation Adjustments

Up to now, you have used the autorotation switch only to shut down the engine in an easy way without changing idle adjustments.

As an experienced helicopter pilots, you'll of course want to perform landings in autorotation mode, this being the only possibility for a helicopter surviving engine or tail rotor failure occurring at greater heights. With flight in autorotation differing so much from power-on flight the mc-18 offers a couple of alternative adjustment options, which in autorotation replace the power-on adjustments. They are activated by switching to autorotation (normally by the autorotation switch, but a 2nd automatic option exists, which will be described later).

Switching to autorotation triggers the following changes:

- The throttle servo is uncoupled from the pitch servo and it takes up the position set-up with Code 24.
- Values for maximum and minimum pitch are changed.
- All torque compensation mixers are turned off because engine induced torque is not generated during autorotation.
- The tail rotor moves to a fixed position, which is determined using Code 83. Tail rotor trim, including trim memory, are switch off.

The necessary adjustments will be performed as follows:

a.) Maximum Pitch Adjustment for Autorotation

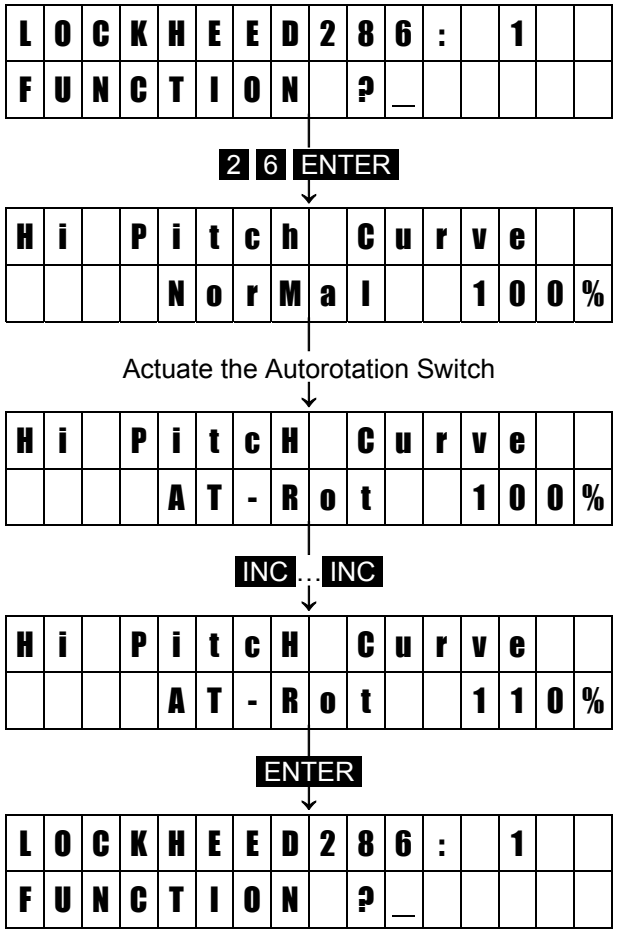
During power-on flight, the maximum blade angle is limited by the available engine power output. In autorotation, however, it is limited only by the point of flow separation of the main rotor blades. For autorotation a higher maximum pitch value may therefore be set to make sure adequate lift will be generated on landing, even when the RPM decreases.

Call the maximum pitch adjustment by:

2 6 ENTER

The adjusted power-on (and in-flight verified) maximum pitch value can be read while "Normal" is showing in the lower line of the display. Actuate the autorotation switch, so that "AT-rot" is displayed in the lower line (instead of "Normal"). Using the INC and DEC keys, set an initial value that is 10 – 20% higher than the value of normal flight, which you have just read. Do not select a value considerably higher than the normal flight value, because in that case the pitch control will behave very differently from the control characteristic you are accustomed to. After switching over, this may lead to the pilot over controlling during the landing flare, causing the model to climb, and the rotor RPM to decrease, leading to the helicopter drop some distance to the ground. Later on, after a couple of autorotations have been practiced, this value can be further adjusted to suit.

Terminate input by pressing the ENTER key.



b.) Minimum Pitch Adjustment For Autorotation

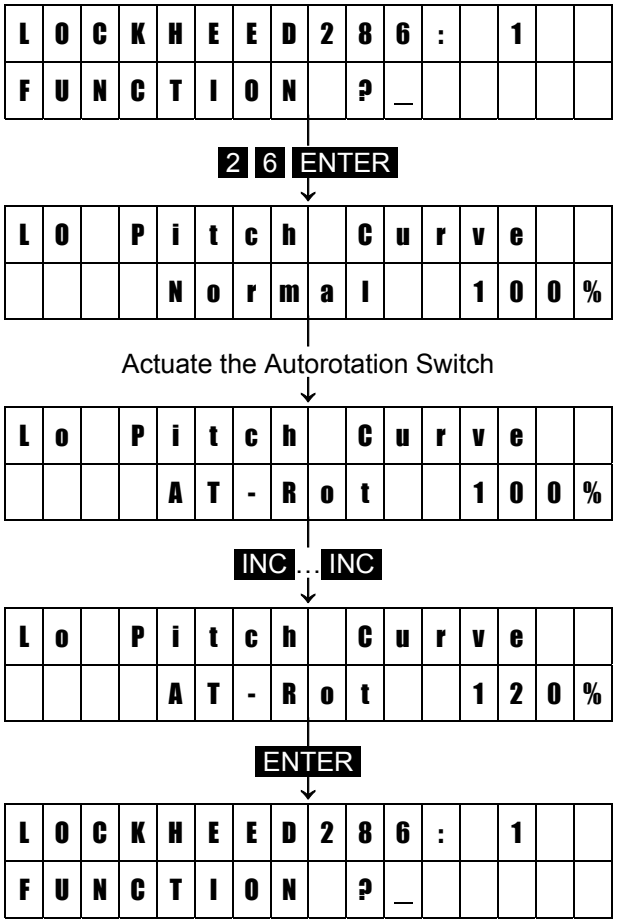
The minimum pitch adjustment may, but need to not necessarily, be different from the Normal power-on adjustment. This depends of the pilots habits in normal flight. For flight in autorotation you must adjust the minimum pitch so that, under any circumstance, the model make the transition from forward flight at medium speed to a 60 – 70° descent at minimum pitch. If you, as the majority of helicopter pilots do, use this type of adjustments for power-on flying then you can simply transfer the power-on value. If, on the other hand, you are used to having a model descend at a flatter angle, you will have to set the minimum pitch value correspondingly higher for autorotation.

NOTE: It is often, erroneously, assumed that flight in autorotation should in principle be flown with the collective pitch stick at the lower stop. This is dangerous, however, because no reserve will be available to allow correction for pitch / roll changes or angle of approach via the pitch control stick without the rotor head RPM dropping unacceptably. The optimum position of the collective pitch stick for normal descent in autorotation is half way between the hover position (neutral stick position) and the lower stop. The length of the approach can then be reduced by pulling back on the pitch stick and simultaneously reducing the collective pitch. Also, the glide can be stretched by pushing the pitch stick slightly and increasing collective pitch very carefully, but this requires a lot of practice.

To set minimum pitch:

2 7 ENTER

Again, read the value for “Normal” flight and then switch to autorotation. Set the value as described above for maximum pitch and terminate input by pressing the ENTER key.



c.) Tail Rotor Neutral Position

In normal flight, the tail rotor is adjusted so as to compensate for engine torque when the model is hovering, so even with this basic setting a certain amount of thrust will be generated. This thrust is the altered by the tail rotor control and the various mixers for torque compensation and re-adjusted by tail rotor trim to take care of the prevailing weather conditions, engine RPM in flight and other external factors.

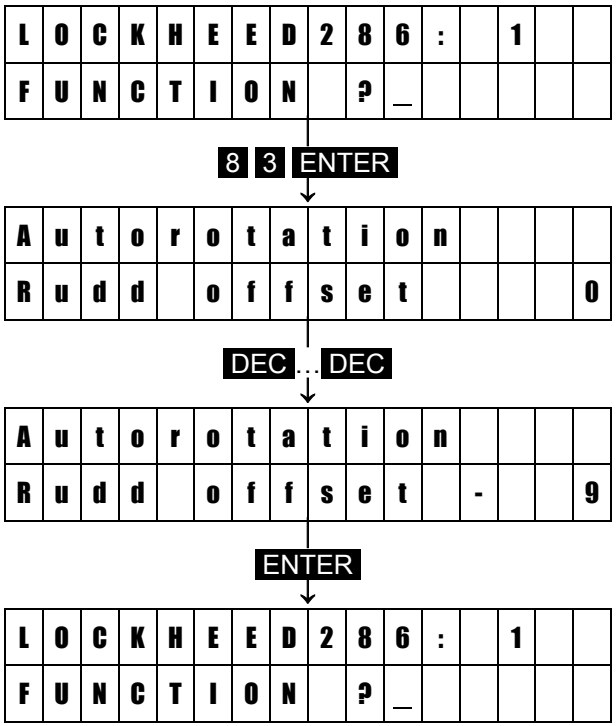
In autorotation , the situation is completely different, with the rotor no longer driven by the engine no torque is generated and therefore no compensation will be required by the tail rotor. As a result, all mixers concerned with the tail rotor are switched off. Even the basic setting of the tail rotor has to be different for autorotation, as no thrust will be required due to the absence of torque, and the trim corrections required for power-on flight do not apply to the autorotation mode. As a result, the tail rotor neutral position in autorotation is only determined by Code 83. The tail rotor trim including stored values are switched off. For adjustment of neutral position, input:

8 3 ENTER

Actuate the autorotation switch so that “Rudd offset” appears in the display. To perform adjustments the receiver of the model must be switched on. Position to tail rotor in the horizontal attitude, fold the two tail rotor blades downwards, thus making the blade pitch angle clearly visible. Now adjust the blade angle to 0° using the INC and DEC keys, which is easy to check as the two tail rotor blades when viewed from behind should be parallel to each other. This is approximately the correct adjustment. Depending on friction and gearbox induced resistance, the fuselage my rotate in the direction of the main rotor rotation. This friction can be compensated for by adjusting the tail rotor blade angle away from the neutral position to some extent. Precision adjustments will have to be established in flight.

In any case, the value to be adjusted here will lie between 0° and some value opposite in direction to the value normal flight.

Terminate input by pressing the ENTER key.



3. Compensation of Load Fluctuations caused by Tail Rotor Control

When you increase tail rotor thrust using the tail rotor control stick, for HEIM helicopters in the left hand direction, the higher thrust requires more engine power too. If the carburettor opening is not adjusted to suit the higher power required by the tail rotor, the energy will be extracted from the main rotor, the RPM of which will be reduced. The effect of this can clearly be observed when executing manoeuvres and in other flight situations requiring large tail rotor deflection over a prolonged period of time, such as ascending pirouettes, steep nose-up circling, circling with the tail always facing the pilot (nose-out), etc, but also in a normal hover manoeuvre flown in strong crosswinds.

The mc-18 transmitter permits compensating for the increased power required by the tail rotor by opening the throttle a little wider using a mixer (Code 87), when tail rotor thrust is increased by the tail rotor control. One might will arrive at the conclusion that engine output would need to be reduced when steering in the opposite direction to prevent an increase in RPM. This, however, is impractical for, with current helicopters, tail rotor thrust is not only reduced and rotation is executed with engine-induced torque, but additionally tail rotor control is even reversed up to an angle of attack region which corresponds to the angle of attack in hovering flight on the opposite side, thus requiring the same power again. For that reason, compensation takes place to that side requiring higher power only.

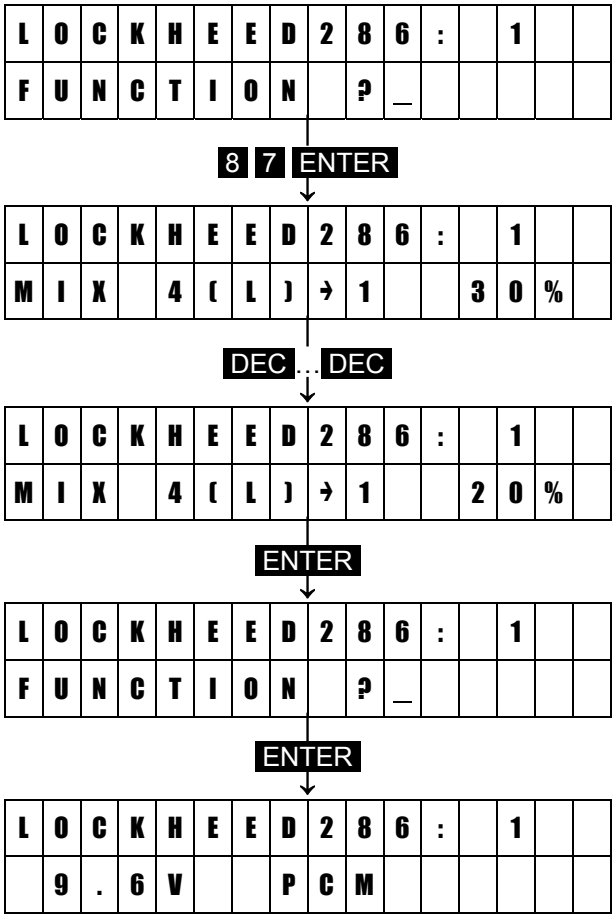
So input:

8 7 ENTER

Using the INC and DEC keys, respectively, adjust the value to approximately 20%. The exact value must be established in flight by performing pirouettes and left-hand circles with the nose facing the pilot (HEIM helicopters) and then readjusting the value with Code 87 so that the RPM doesn't drop or increase.

Terminate input by pressing the ENTER key.

By pressing the ENTER key again, you leave the command mode.



III. Additional Expansion Options for the Expert

Once you have programmed your model as in the first two examples, and as a pilot have learned to fully exploit their inherent possibilities, you can now make use of further options offered by the PROFI-ULTRASOFT-Module. The examples for the use of the options described below are no longer arranged in logical order, they should be considered and applied singly if required, and modified to suit the application.

Be sure to heed the following advice, it is in your interest:

Activation of additional options will make little sense if you have not learned to master your model using the adjustments described for normal flight, performing aerobatics and landing in autorotation. This is because a prerequisite for the intelligent use and adjustment of these options is a high degree of pilot skill. In some cases, the effect of imperfect adjustments may prove worse than omitting that option altogether!

Helicopter Programming Examples

1. PROFITRIM-Module

The PROFITRIM-Module can be installed into the transmitter as an option. In the helicopter programs the module permits adjusting up to eight parameters directly from the external controls without having to call up the options concerned in the program. Use of the PROFITRIM-Module has two aspects: firstly, there is the possibility of changing the main adjustments of the helicopter in one single operation, and secondly is the inherent feature of rotary controls in that they can't be incorporated into the storage, their adjustments having been performed mechanically by the pilot and as a result they are not subject to control by the electronics. In order to permit the user to take advantage of the benefits it offers without having to accept any disadvantages, the PROFITRIM-Module has been made so that items can be deactivated in a number of ways.

The essential idea behind the PROFITRIM-Module concept is to provide the possibility of setting up a new model in a short time by providing immediate access to the primary adjustments (even in flight under some circumstances) and to adjust them so the in-flight established values can be subsequently transferred in to the program, followed by turning off the PROFITRIM-Module. It also gives the competition pilot the chance to change adjustments, made necessary by varying external conditions, without permanently changing the basic set-up of the model. Both application options are supported by the PROFITRIM-Module as it offers two different options for switching the module on and off, which can be used singly or in combination.

Let's start by using the PROFITRIM-Module from trimming and test flying a new model. Afterwards we shall prepare it as a corrective option for the contest flyer.

a.) Test Flying a New Model with PROFITRIM

The PROFITRIM-Module features four trimmers for maximum pitch, minimum pitch, hover pitch and hover throttle.

Program your model as before in the first examples. Input the values of those options as correctly as possible for which you now have additional trimmers.

Reset them to the neutral positions so you'll be able to use them, then activate them using Code 91:

ENTER 9 1 ENTER

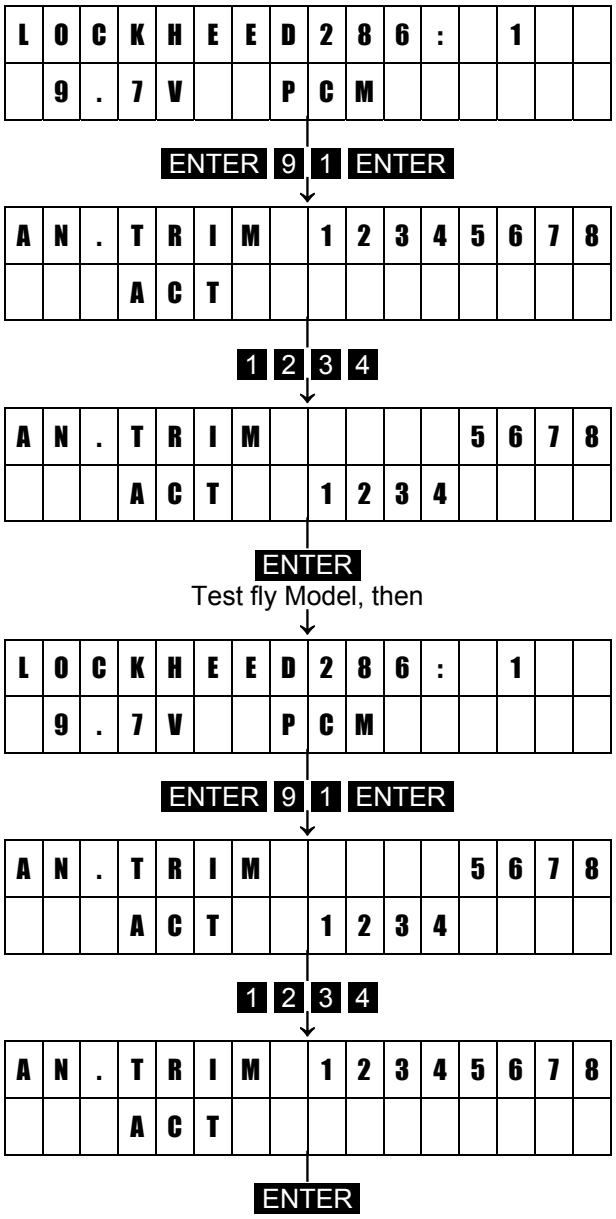
The display now indicates the inactive trimmers in the upper line and the active ones on the lower line. As only the four trimmers of the basic unit are at your disposal you may now activate these four trimmers. This is performed by pressing the associated buttons 1…4. To active all of the trimmers, input:

1 2 3 4

The figures concerned will move from the upper line to the lower line. Terminate input by pressing the ENTER key and test fly your mode, adjusting the pitch and throttle values via the corresponding trimmers in the process. When satisfied with the adjustments, transfer the established adjustments into the program so they'll be available unchanged when changing models. On deactivation of a trimmer, using Code 91, the value adjusted will be automatically transferred into the program. So input:

ENTER 9 1 ENTER 1 2 3 4 ENTER

The in-flight established values are now retained under the corresponding Code number and the trimmers are switched off again.



b.) Switchable PROFITRIM-Module for Contest Flying

Let's assume your model has been set-up perfectly in the course of test flying and it's program has been completed. In course of a contest or some other event, you may observe the model behaving in an unusual manner. Possible causes are changing weather conditions, engine not running as usual, flying site at a higher altitude (different atmospheric pressure), leaking silencer or something else. In short something that should not occur, yet do (and this may include a pilot's shaky nerves).

Whatever the reason may be, you won't be able to find the cause right away, but you must get your model into the air. On the other hand you do not want to destroy your laboriously reached, otherwise optimal adjustment, because at home later you will naturally find the leaky muffler and will seal, replace the chafed through pressure oil hose or simply fit the cover cap, so that your engine runs as previously with the old adjustment. But you must now fly only once and need to modify some adjustment. As an experienced helicopter pilot you foresaw, fortunately, such situations and took appropriate precautions:

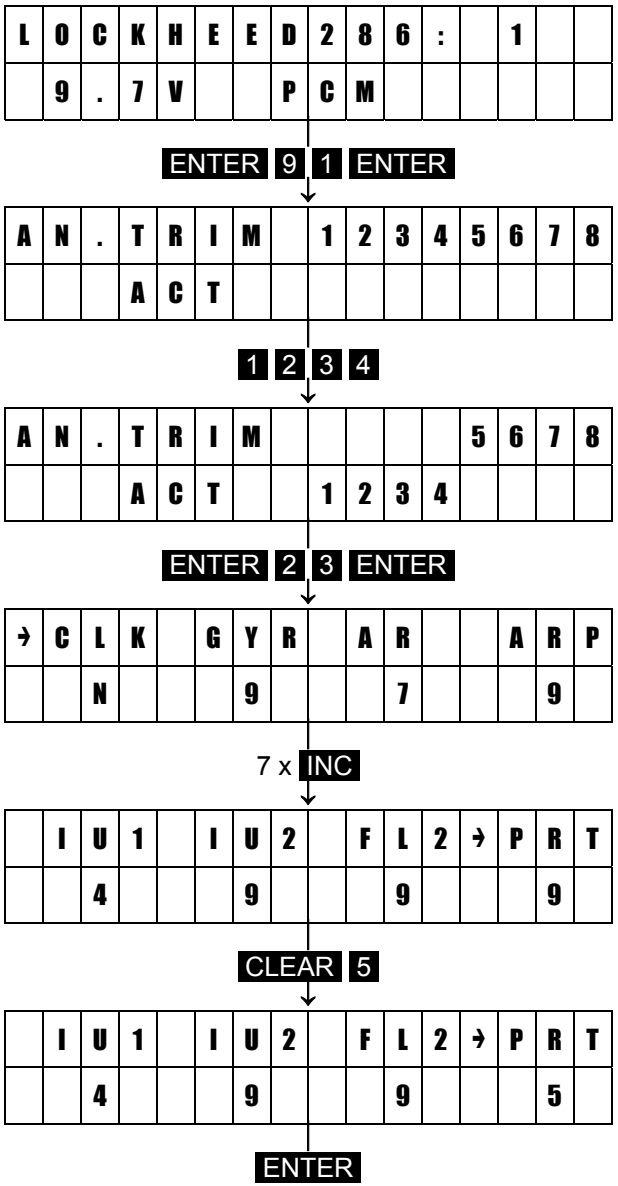
After your model had finished flown, and all automatic trim control systems in central position, the trimmers is activated using code 91:

ENTER 9 1 ENTER 1 2 3 4 ENTER

You have already mounted the locking external safety switch (Part No. 4147/1) and connected it to socket 5. Using Code 23 it is assigned to the PROFITRIM-Module ("PRT"), so that you can switch the module off at any time if necessary with this switch, and afterwards switch it on again without there being any changes to your programming. In addition you input:

ENTER 2 3 ENTER 7x INC CLEAR 5 CLEAR

Due to this precaution you can now switch on the PROFITRIM-Module and modify the adjustments in such a way that you can thereby fly. Later you simply switch it off again.



2. Switching between two adjustments: (Hover or Aerobatic)

The next example is interesting for the FAI competition flier, those flying a program consecutively of both accurate hovering flight figures and dynamic, spaciously flown aerobatics figures. Naturally one can fly the same adjustment for the model, but in the competition with generally high skill level often small advantages or handicaps, which can separate one from the many.

Thus it has proved favourable, for the hovering flight figures, if the wind permits it, to fly with low main rotor RPM, and this RPM should already be stable before taking off. However, for aerobatics a relatively high main rotor RPM, in order to have sufficient control effect in the fast forward flight and avoid flow separation at the backward-moving rotor blade.

Since during the competition no possibility exists to trim-up again for the other operating speed, and which would in all other respects be also very difficult. Both adjustments are to be achieved and stored beforehand with plenty of time, so that later you can switch back and forward between both adjustments. The one adjustment is the Normal adjustment, the other one the Alternative adjustment. Whether one has the aerobatics or the hovering flight adjustment as standard mode must be decided upon for yourself. In our example we want to use the aerobatics adjustment as standard, and the hovering flight adjustment as alternative adjustment capable of being activated by operating the switch.

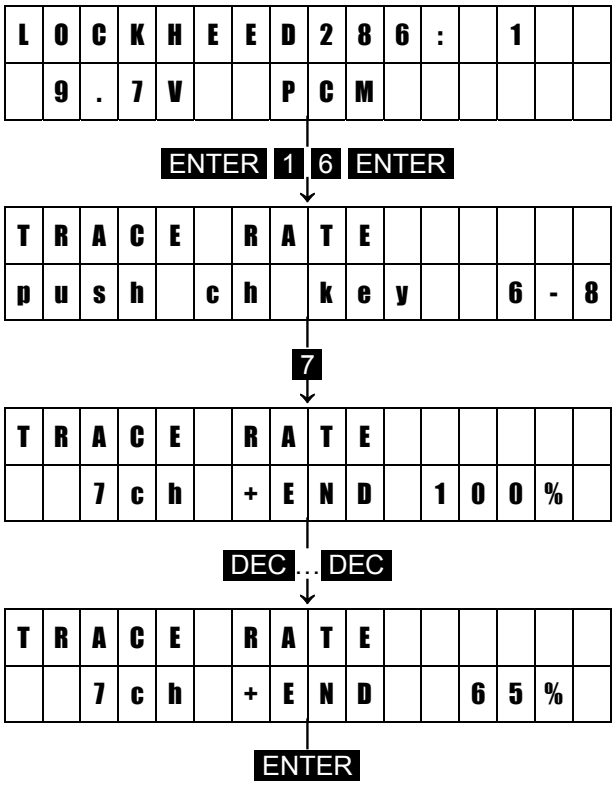
a.) Normal adjustment (Aerobatics)

Set-up your model, in the way the preceding section described, whereby you perhaps now select a somewhat higher main rotor RPM than before when set-up for hovering flight. Set-up the throttle and pitch adjustment, so that the model hovers again with the collective pitch stick in the central position. Likewise, reduce the pitch maximum accordingly, so that the main rotor RPM does not drop if one gives full pitch, and adjust the remaining settings to the higher RPM. We then estimate the gyroscope effect and set the adjustment with sliding control (CH 7). Shift this up to the upper limit (for max. gyroscope effect) and reduce the effect of this sliding control with Code 16 (Operating Element Adjustment). Input:

ENTER 1 6 ENTER 7

Reduce the displayed value of 100% using the DEC key to approximately 60 – 70% and accept the input with the ENTER key. You must now adjust the settings for the gyroscope further, with minimal gyroscope effect required, in order to achieve the same effect as beforehand. Then fly extensively with this adjustment, in order to optimise it, i.e. the tail of the model must not begin to oscillate in any flight situation, because of over-regulation by the gyroscope.

With everything adjusted, you can now make the adjustments for the alternative flight mode.



b.) Alternative Adjustment (Hovering flight)

First you must determine a switch (and have naturally installed and attach it) with which you will switch between aerobatics (Normal) adjustment and the alternative adjustment. In this example that is to be switch 8. You assign now this switch using Code 23 accordingly:

ENTER 2 3 ENTER

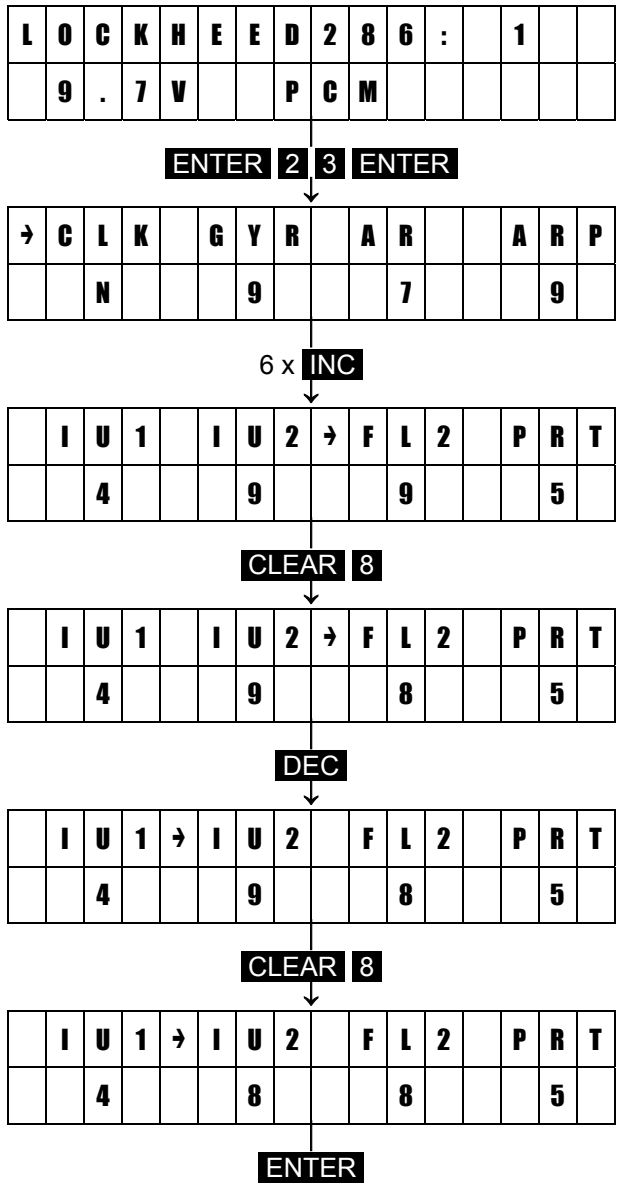
With the INC key, you move the arrow so it is before the “FL2” caption, and assign it to switch 8:

CLEAR 8

With this switch it is now possible to swap to collective pitch and gas settings for hovering flight as well as for maximum and minimum pitch in the appropriate menus, in each case set for the second flight mode. Additionally we wanted to activate another type of gas pre-selection (idle-up) for the hovering flight figures. Remember: for normal flying operation the gas pre-selection was set-up in such a way that in steep descending flight the main rotor RPM does not rise nor drop. The result is a model which is on the ground with an increased idling speed from this adjustment, but which does not achieve the hovering flight with the collective pitch fully back. This is also correct only for the moderate competition hovering flight figures, with which take-off is evaluated, for it does not handle descending flights from larger heights. With model the at the full hovering flight RPM which is attained on the ground, so that when taking off stable conditions prevail. For such purposes the PROFITRIM module possesses a second gas pre-selection, to which a switch can be connected, and then gas pre-selection 1 overridden. We will use this second gas pre-selection now for the hovering flight adjustment. It is activated, for good reason, with the same switch that switches between aerobatics and hovering flight adjustment, here that is switch 8. Since you are still in the adjusting menu for the switch allocations (code 23), move you the arrow with back a step DEC to before “IU2”, and assign switch 8:

CLEAR 8

Conclude the input with ENTER.

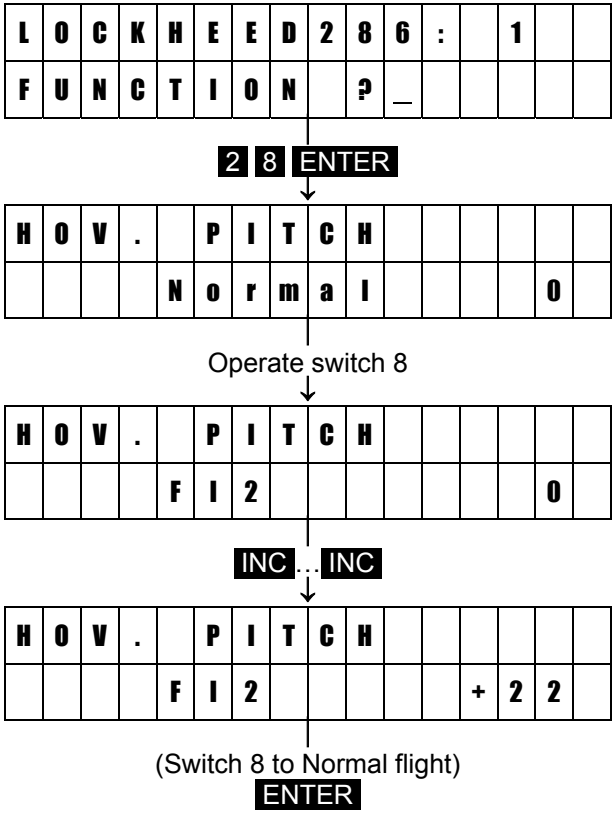


Helicopter Programming Examples

Now you input the values for the alternative adjustment. Those are, first hovering flight pitch (code 28), hovering flight throttle (code 84), maximum pitch (code 26) and minimum pitch (code 27). These values can now be pre-set only approximately, with final tuning taking place again in flight. Input thus:

2 8 ENTER

Read the adjusted value for the aerobatics adjustment (display “Normal”), then operate switch 8, so that in the display appears “FL2”, and adjust the value here as appropriate, approximately 20% higher than the aerobatic figure. Conclude the input with ENTER.

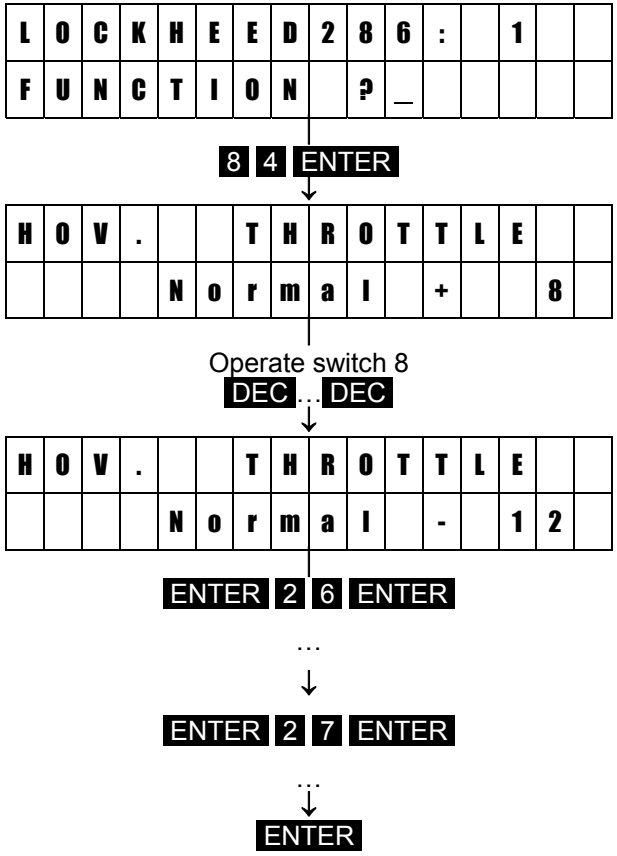


Place set the hovering flight throttle with:

8 4 ENTER

Again with the switch in the aerobatics position (display “Normal”), read the value then to switch to “FL2”. Input here a value that is approximately 20% lower than the read from the aerobatic setting. Conclude also this input with ENTER.

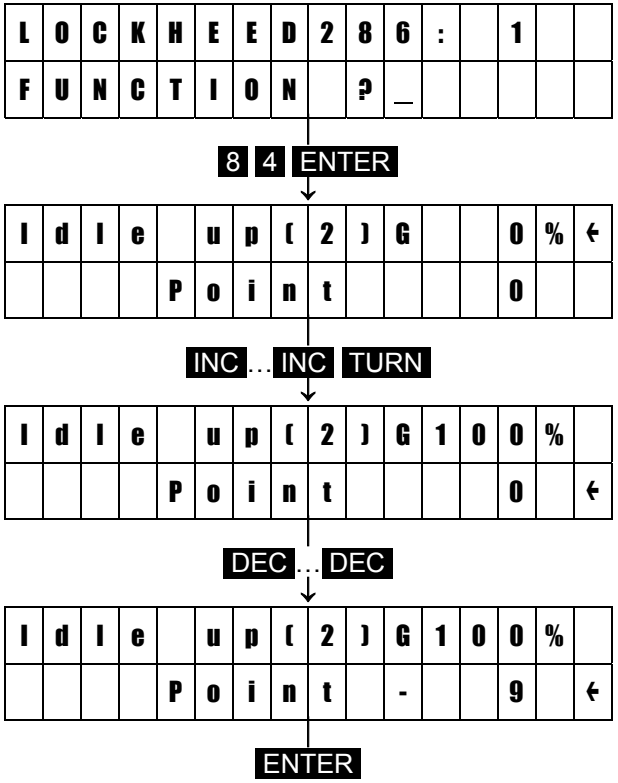
Proceed forwards with the alternative adjustment for maximum pitch (code 26) and likewise place here a value approximately 20% higher than in the aerobatics adjustment. Finally with code 28 (minimum pitch) you set an appropriate value, which is approximately 20% lower than the value of the aerobatics adjustment. Now test this adjustment practically, and amend so that you achieve the point of hovering flight with the collective pitch stick in the central position at the desired, low number RPM (tuning Hover Throttle/pitch). Adapt the pitch maximum value in such a way that this RPM also remains constant with fully pitch. Proceed here very carefully, since these adjustments must correct be for the next steps. At the end you would have to be able switch between both adjustments during the hovering flight, with switch 8, whereby only the RPM changes, the model however with the same stick position remains in the hover.



If functioning perfectly you can program the gas pre-selection for the hovering flight adjustment:

8 5 ENTER

Operate switch 8 so that gas pre-selection 2 is displayed. Input 100% for G, then move the arrow with TURN to the point adjustment, and you input a value here of approximately 10. With this adjustment you obtain a so-called idle-up effect, i.e., if you move the collective pitch stick from the hovering flight position downward, the gas servo stops closely just below the carburettor opening for the hovering flight, so that after the landing with fully taken back pitch the full RPM is almost preserved. If, however, the RPM on the ground should increase during this adjustment, then you need to reduce the value for G accordingly, until this effect disappears.



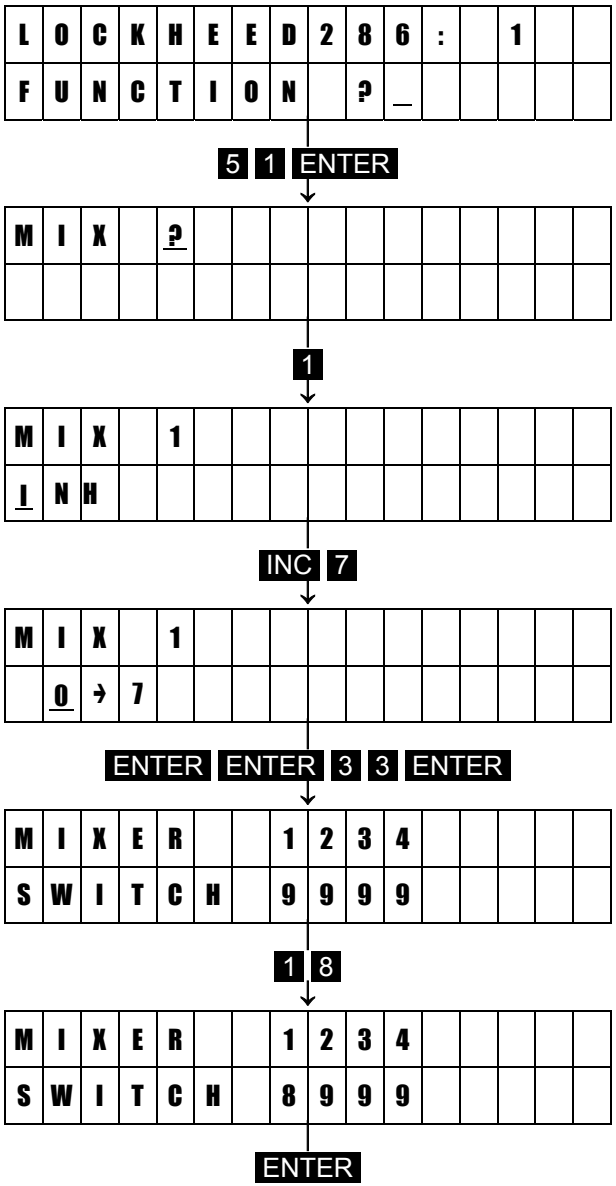
Helicopter Programming Examples

If the hover RPM you have selected is much lower than the one chosen for the aerobatic adjustments, chances that the gyro effectiveness which you had adjusted for the high aerobatics RPM will be a bit low because the tail rotor power had decreased with the lower RPM. This, however, can be expected and therefore you have provided for some reserve for the aerobatic adjustments with Code 16 (adapting the signal generator), which we will now make used of. Of course you could have reduced gyro effectiveness using the slider, and after switching you'd be able to use the same slider increase the gyro effectiveness again, but this would neither be convenient or reproducible. We therefore let this change be performed automatically and to do this we use one of the freely programmable mixers. This mixer will be programmed so that it adds a constant value to the one adjusted by slider 7 when it is turned on, using switch 8 again. The slider may now occupy a position at the upper stop as it's adjustment range has already been reduced using Code 16, so as to permit increasing gyro effectiveness with the mixer even in that case. To activate mixer 1:

5 1 ENTER 1 INC 7 ENTER ENTER

In this way, you have allocated the mixer inlet to a dummy mixer (phantom channel), which generates a constant value and switches the outlet of the mixer to channel 7, influencing the gyro. Allocate switch 8 to the mixer by:

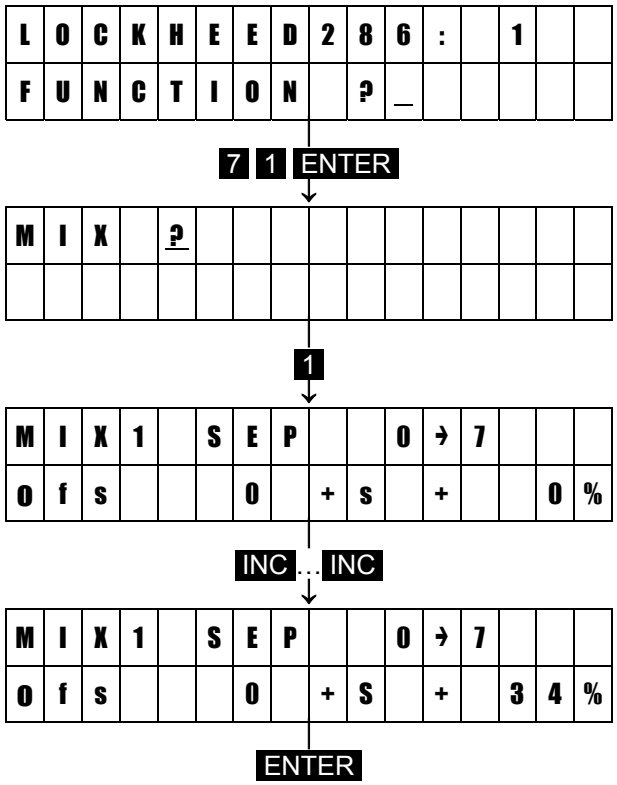
3 3 ENTER 1 8 ENTER



The only thing left to be done now is to input the amount by which the gyro effectiveness is to be increased when the mixer is turned on. This is performed with Code 71 (asymmetrical mix), because the mixer, when turned on, is to increase gyro effectiveness but must not decrease it when turned off. So move switch 8 to the hover position and input:

7 1 ENTER 1

Start by setting a value of approximately 30% using the INC key and conclude the input by pressing the ENTER key. That's now set the difference in gyro effectiveness between hover and aerobatic modes. This value can also only be established correctly in flight so that helicopter doesn't oscillate about the vertical axis even in the hover, when the slider is positioned at the upper stop (maximum gyro effectiveness).



If you have made all the adjustments correctly up to now, you should be able to switch back and forward between the two adjustments when in the hover, with only the RPM changing, while the model with the same stick position keeps hovering with optimum stabilisation from the gyro. Depending on the type of helicopter, it may be necessary to alter the tail rotor trim when switching over. The model when travelling forward at high speed may be over compensated, which in turn has to be corrected by trimming to starboard. After switching to hover adjustments the model will then try and rotate clockwise about the vertical axis. This trim deviation can also be corrected automatically using one of the freely programmable mixers (3 of them are still available in this example). So program mixer 2 so that it will be active with the “hover” switch on and affect the tail rotor trim, but won’t do so when the switch is in the “aerobatics” position. To achieve this, input:

5 1 ENTER 2 INC 4 ENTER ENTER

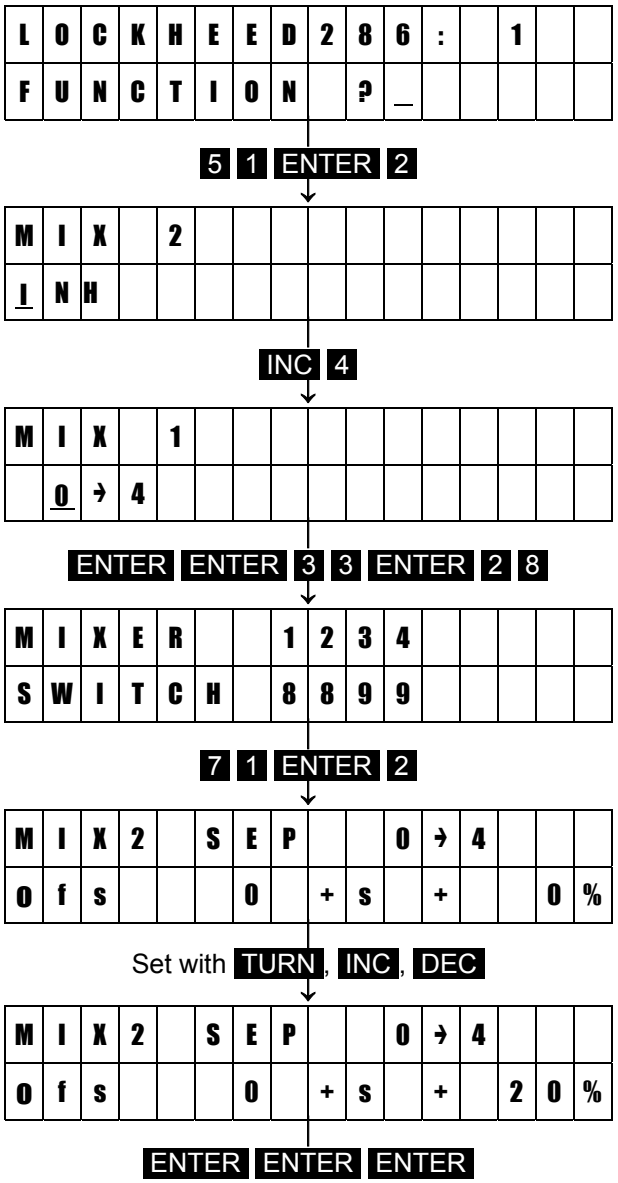
Mix a constant value into the tail rotor channel.

3 3 ENTER 2 8 ENTER

Allocate switch 8 again:

7 1 ENTER 2

You can now adjust the required trim change using the INC and DEC keys, and if necessary the TURN key to reverse the mix direction. Conclude the input by pressing the ENTER key.



Helicopter Programming Examples

3. Automatic Autorotation Changeover

During competitions landings in autorotation are normally performed with the model flying downwind, approaches at a greater height and transitions into a moderately steep descent. The engine is the cut off, with the model continuing to descend in a normal manner. A 180° turn is performed, with the model finally settling down gently , in autorotation, on the intended landing spot (if done correctly).

With initiation of autorotation on the one hand require increased attention by the pilot for correct timing as well as precision control of his model, and on the other hand any correction of the direction of flight and the angle of approach impairing the score at contests. Shutting-off the engine manually will always pose a problem with the necessity to swap controls, which even with a control stick mounted kick button tends to divert the attention of the pilot.

For that reason, the PROFI-ULTRASOFT-Module provides automatic changeover in addition to the normal, manual, autorotation switch. On approach, at normal pitch, the autorotation pre-select switch is operated. Descent is the initiated by reducing pitch, whereby changeover (engine cut-off, activation of autorotation adjustments) occurs automatically on dropping below a preset pitch value, permitting the pilot to concentrate fully on controlling the model. Activation of the automatic mode by a separate switch offers the advantage that in an emergency the engine can be shutdown using the normal autorotation switch at any time, e.g. in the case of tail rotor failure.

To permit the use of an automatic mode, a switch has to be installed and connected, in this example to socket 3. The autorotation switch is determined by Code 23:

ENTER 2 3 ENTER INC INC INC

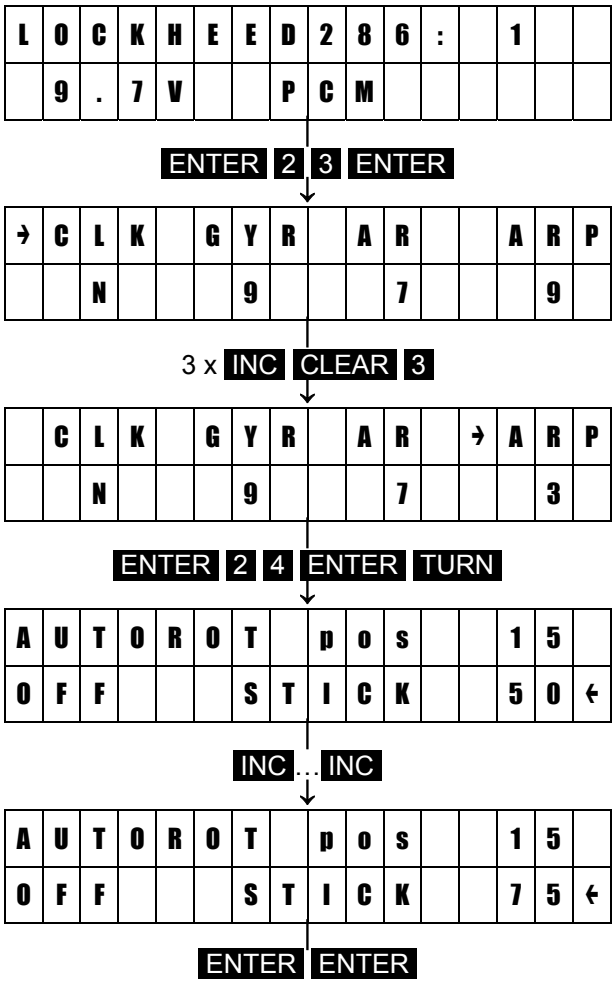
The arrow is now positioned to the left of the “ARP” caption, and switch 3 will be allocated by:

CLEAR 3 ENTER

You must now adjust the threshold point on the collective pitch control stick that you want autorotation changeover:

2 4 ENTER TURN

Move the collective pitch control stick to the full pitch position and actuate the autorotation preset (ARP) switch (3). The lower line of the display changes from “OFF” to “stdby”. When you now move the collective pitch control stick slowly in the direction of minimum pitch the display will change from “stdby” to “activ”, indicating that autorotation changeover has been actuated. This point is adjusted by the value to the right of “Pitch”, with 50 indicating a point right near the lower stop of the stick, while 100 refers to a point right below the hover point. Adjust to a value that suits your requirements and terminate input with the ENTER key.



4. Flare Compensation

It is a unique feature of the HEIM mechanics that the swashplate will tilt forward slightly on reduction of pitch below the hover point. It is caused by the design of the compensating see-saw controlling pitching about the transverse axis and executing an arc shaped movement when doing so. Some helicopter pilots believe this forward tilt of the swashplate is meant to dampen a pitching up tendency of the model when in a fast descent, with the collective pitch markedly. This is a debatable assumption which is not positively supported in practice. The majority of pilots flying the HEIM helicopters believe the tilting of the swashplate to be a undesirable technical deficiency which has to be removed, and to achieve in some cases considerable mechanical efforts have been taken.

This effect is a feature of standard HEIM mechanics only. With swashplates with 3 or 4-point linkage hook-up the swashplate will move in a linear manner, without tilting.

To resolve this phenomenon the PROFI-ULTRASOFT-Module provides several solutions for a variety of goals:

1) Elimination of undesirable swashplate tilt on activation of collective pitch control in the case of standard HEIM mechanics.

2) Amplification and adjustment of the tilting movement of the standard HEIM mechanics.

3) Generation of swashplate tilt in models featuring symmetric 3 or 4-point swashplate connection.

The solution is practically the same for cases 1 and 2 where one of the freely programmable mixers is used. In this example it will be mixer No 4. As no reason exists why this mixer should be turned off once it has been adjusted correctly, no external switch will be allocated to the mixer. The mixer will remain permanently turned on. Call Code 33 (mixer switch):

ENTER 3 3 ENTER

To turn mixer 4 on permanently, allocate the phantom switch “9” to it, where this has not already been achieved during a reset:

4 9 ENTER

Now determine the functions to be linked by the mixer using Code 51. In the example function 1 (throttle / collective pitch) is to affect channel 3 (pitch):

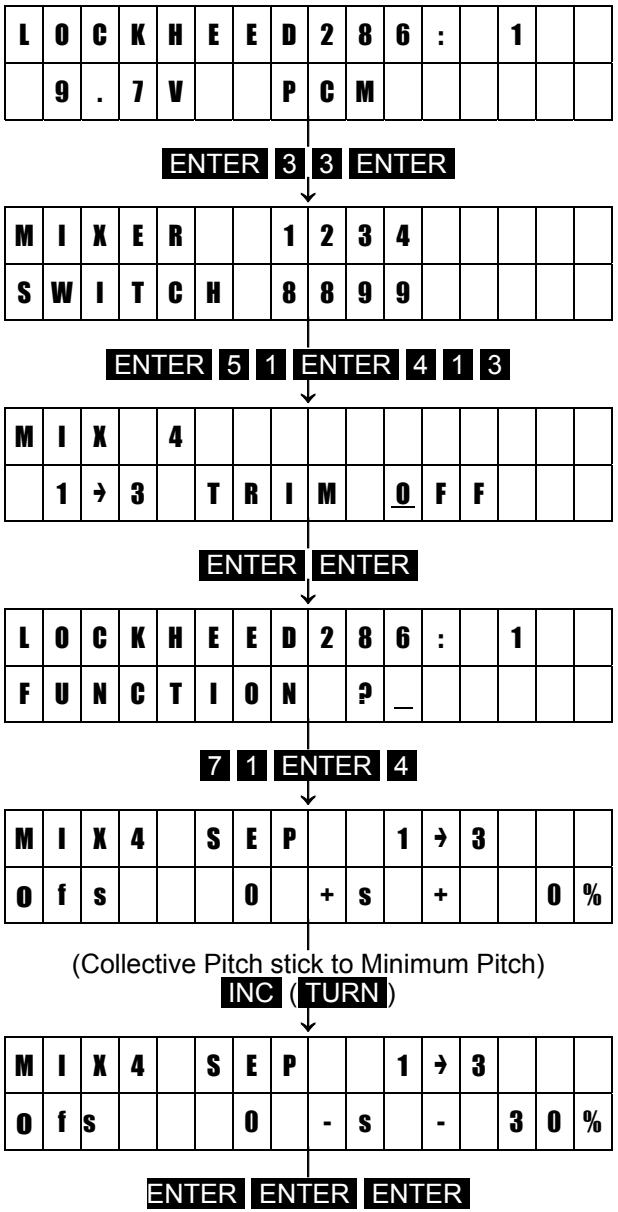
5 1 ENTER 4 1 3 ENTER ENTER

Mix quota and direction are adjusted via Code 71 (asymmetric mix):

7 1 ENTER 4

Program the mixer offset onto the neutral position of the collective pitch stick (hover position) by moving the stick to the corresponding station and pressing the STORE key.

Now shift the stick to the minimum pitch position and adjust the mix quota and direction using the TURN key so that the swashplate tilt can be compensated for, amplified or reduced, as desired. Terminate input by pressing ENTER ENTER ENTER.

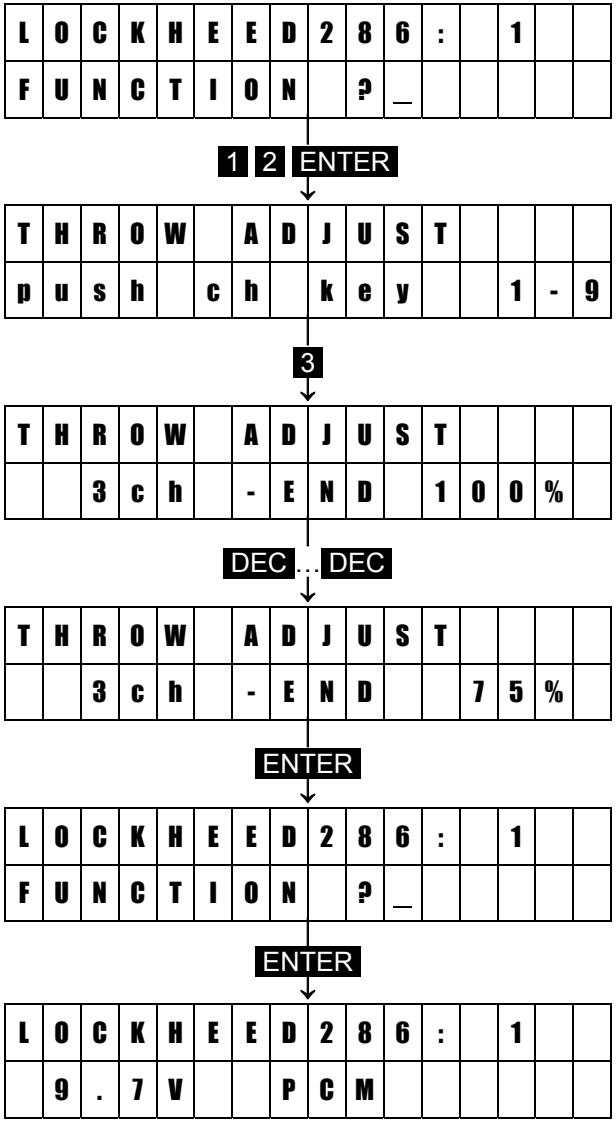


Helicopter Programming Examples

Several options for providing swashplate tilt exist in the case of symmetrical 3-point (120°) hook-up. One may, as described overleaf, use a mixer and control the aft servo as required, this type of set-up corresponds exactly to one described there. A simpler method though is reduce the throw of the aft servo from below the centre position. This produces the same effect, therefore call Code 12:

1 2 ENTER 3

Now move the collective pitch stick to the minimum position and reduce the indicated value using the DEC key until the desired swashplate tilt is obtained on operation of the collective pitch control. Terminate input by pressing the ENTER key.



General Changes compared to the MULTISOFT-Module 128K

Model selection and Trim Storage

Trim data storage is no longer performed automatically on changing fro one model to another (Code 56), it must now be performed using Code 59 by the operator.

Calling a certain model with Code 56 can either be performed directly by entering the model number concerned as before, or by stepping through the list of models using the INC and DEC keys. In both cases the name of the model that has been called appears in the lower line of the display. The relevant model program can then e activated by pressing ENTER, or another model chosen by entering the number or stepping through the list once more. Alternatively, it can be deleted by pressing the CLEAR key.

Analogue Data Adjustment

The function of the INC and DEC keys can be taken over by a proportional rotary module (Part No. 4111) wired to connection “AUX”, or by a proportional module (Part No. 4152).

Calling functions is performed as before, with one exception: at stations where adjustments are to be made using the INC and DEC keys, the control has to be activated with key 9. Adjustments can then be made using the proportional control with the indicated value corresponding to the current position of the control. In the case where adjustment range of the proportional control proves inadequate to obtain the desired value, turn to control off with the INC or DEC key on reaching the end point, reset it to a new position, and turn it on again with key 9. This procedure can be repeated as necessary.

With the PROFITRIM-Module installed the lower right trimmer assumes the function described above. It’s normal function is automatically interrupted in this case.

Overview of Function Codes Mode

This mode of operation allows an overview of the function codes by pressing the LIST-DM key, then forwards with the INC key and backward with the DEC key. Once the desired code number has been has been found, it is selected by pressing the ENTER key. Adjustments can then be made using the INC and DEC, CLEAR and the 1…9 keys.

The overview is left by pressing the CLEAR key, whilst a new code is displayed, with code number and title of that code in the lower line of the display.

Operating Elements

The operating elements (e.g. slider-type control, channel switch) which are plugged into connections “5ch”…”7ch” may be allocated to other functions and reversed without having to change their connections. Furthermore, one operating element can be used to simultaneously affect several function inputs.

External Switches

External switches are no longer determined by their plug connections, but are allocated by programming. To achieve this Code 23 (function switch), Code 33 (mixer switch) and Code 34 (dual rate / exponential switch) are available. The only switches excluded are those for the automatic manoeuvre and the switch for the countdown timer, which still have dedicated permanent plug connections.

External switches may be allocated to any desired number of functions. For helicopter programs, they can also be programmed for use as the operating elements for channels 7, 8 and 9. In this role, they are processed the same as a two position channel switch module without neutral position.

Changeover of MULTISOFT / PROFI-HELISOFT / SUPERSOFT

Adjustments established with the MULTISOFT-Module can also be operated under a PROFI-ULTRASOFT-Module and, if desired, supplemented by new functions as the relevant changes are made automatically. Only the switch allocation (Codes 23, 33 and 34) if used and the model name (Code 32) will have to entered from new. Model types which are no longer contained, such as the older Helicopter types, will continue functioning nevertheless.

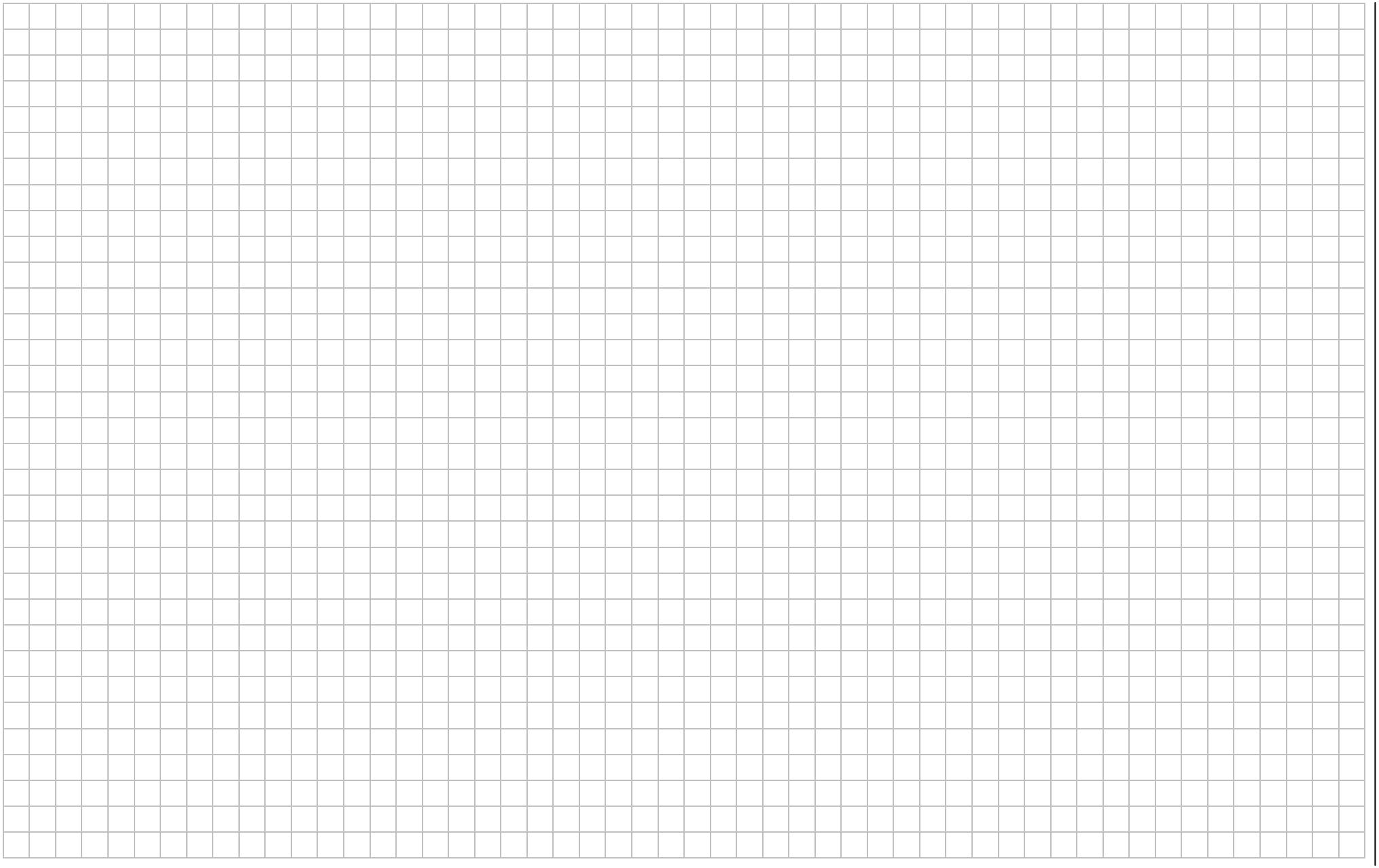
Model adjustments performed with the PROFI-HELISOFT-Module or the SUPERSOFT-Module have to be deleted using Code 56 in all circumstances and the re-entered afterwards.

As a result of the combination of the MUTLISOFT-Module, SUPERSOFT-Module and PROFI-HELISOFT-Module some changes to the code numbers of the SUPERSOFT and PROFI-HELISOFT had to be made.

The table below compares the old and the new input codes of the Helicopter section and includes new options.

Code PROFI-ULTRASOFT	Subject	Code PROFI-HELISOFT
67	Rotor Rotation Clockwise / Anticlockwise	45
68	Swashplate Type	58
69	Swashplate Mixer	62
21	Collective Pitch Stick Direction	21
24	Autorotation Switch-over	26
25	Set-up for Inverted Flight	65
26	Maximum Pitch Set-up	68
27	Minimum Pitch Set-up	69
28	Hover Pitch Set-up	67
29	Throttle Trim Allocation	-
75	Swashplate → Tail Rotor Mix	-
81	Static Torque Compensation	46
82	Dynamic Torque Compensation	47
83	Positions Tail Rotor in Autorotation	42
84	Set-up for Hover Throttle	27
85	Set-up Throttle Presets	28
86	Swashplate → Throttle Mix	31
87	Tail Rotor → Throttle Mix	41
89	Set-up Gyro	74
91	PROFITRIM On / Off	81
92	Switch Slow-Down on Start-Up	-
93	Virtual Swashplate Rotation	-

For Your Notes



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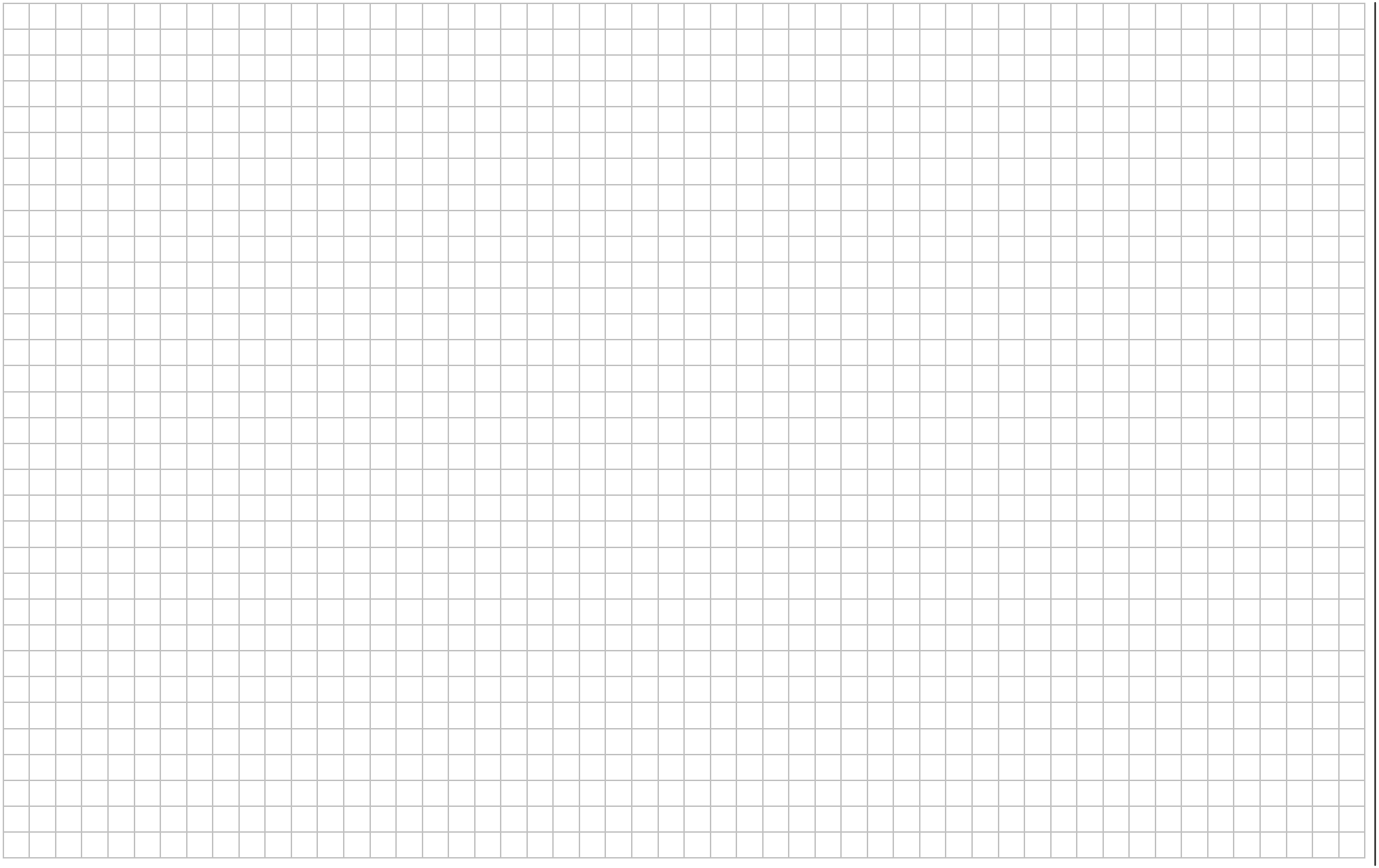

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Printed in Germany – 6/89

Translated to English in England – 12/2001