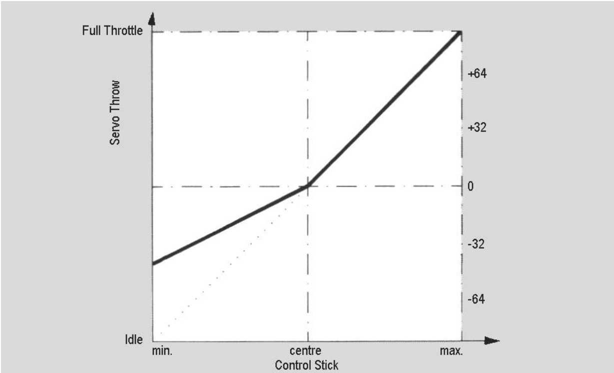
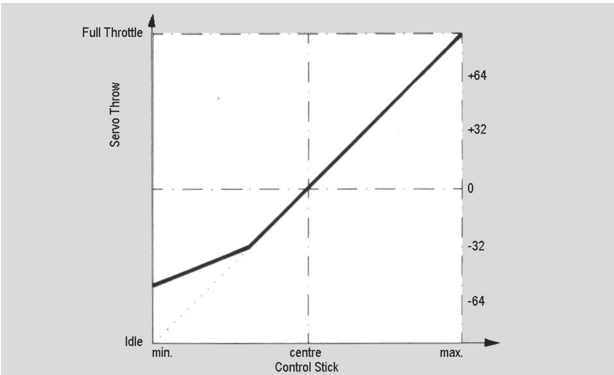
Examples of Throttle Pre-set (Idle Up) Adjustments

1. G = 50%, Point = 0



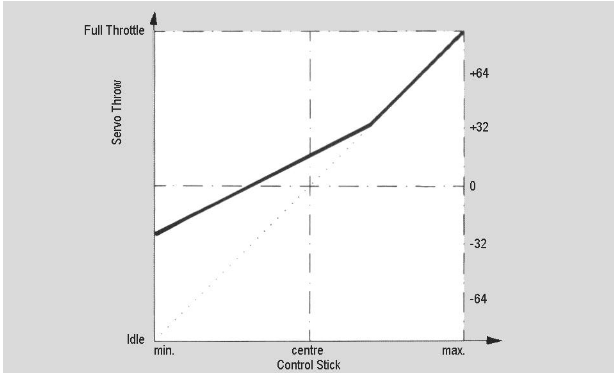
This diagram shows adjustments often encountered in practical use. The hover point has been selected as "point". A "G" of 50% results in the throttle servo being markedly slaved by the throttle / pitch control below the hover point.

2. G = 50%, Point = -32



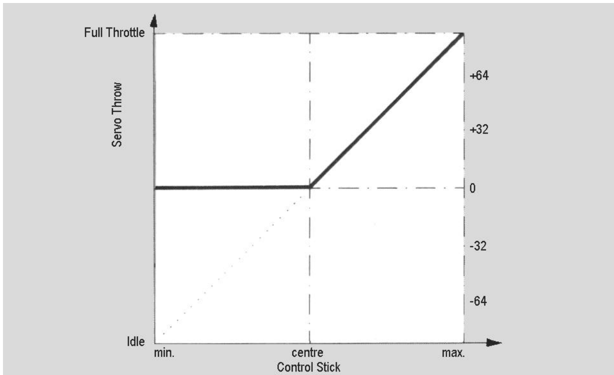
Here "G" has been left unchanged, while the take-over point has been moved farther down (-32). The diagram makes clear that the initial value for the carburettor opening has been lowered, due to "G" being retained at 50%.The slope of the curve in the lower region remains unchanged.

3. G = 50%, Point = +32



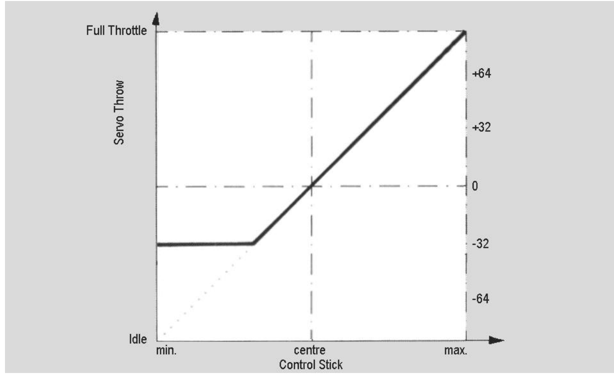
For this example, the take-over point has been moved upward, while "G" remains unchanged. The diagram illustrates that throttle preset now affects the hover flight region, a condition which should normally be avoided.

4. G = 100%, Point = 0



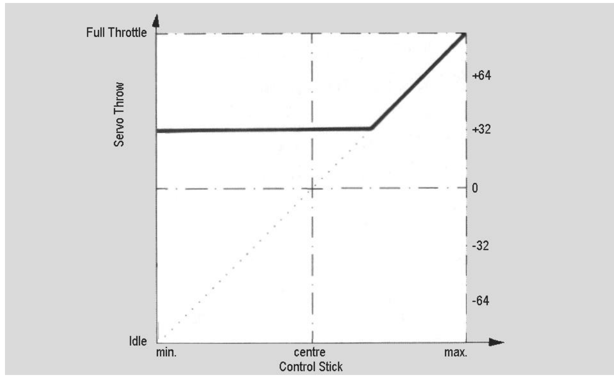
In this example, the take-over point is returned to the hover flight point again (point = 0). With "G" set at 100%, a genuine power on approach effect results, which is to say that the servo will hold a constant value below the take-over point, while being slaved in the normal way by the throttle / pitch 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

m	c	1	8	/	U		M	O	D	E	L			4	
M	I	X		S	W	A	S	H	➔	1			2	9	%

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

m	c	1	8	/	U		M	O	D	E	L			4	
M	I	X		4	(	L	)	➔	1			3	0	%	

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

G	Y	R	O		C	T	R	L		1	0	0			
					s	e	n	s			7	0	%		

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.

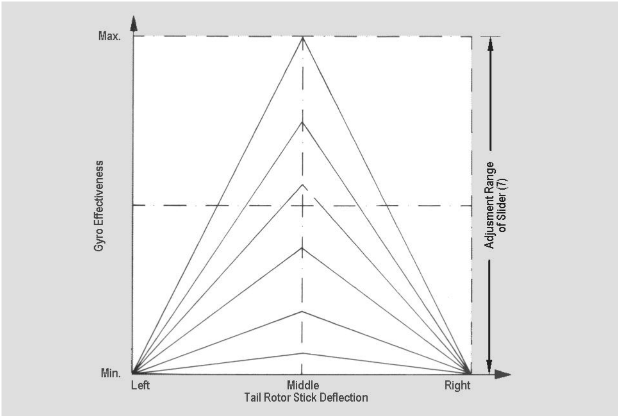
In order to permit achieving optimum stabilisation in any situation gyro effectiveness can be adjusted by the transmitter. Slider (7) serves that purpose in conjunction with the two adjust regulators for the gyro. In the upper end position of the slider, only regulator 2 will be effective; the latter 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.

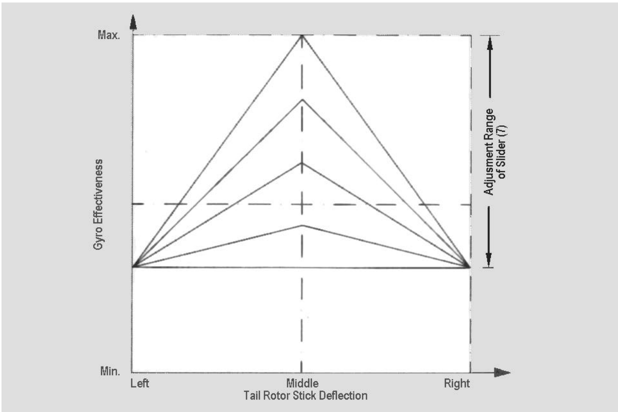
Examples:

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



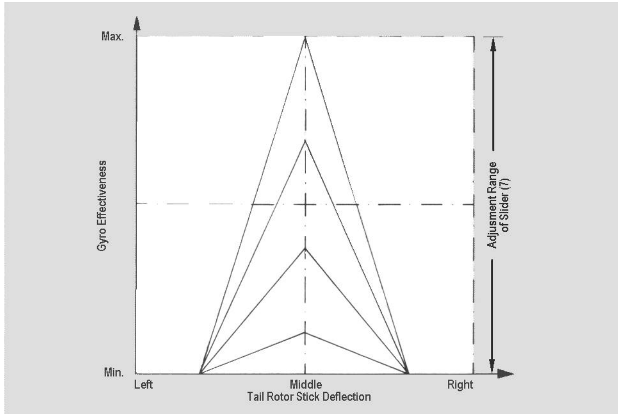
Gyro effectiveness can be infinitely variably adjusted from 0 up to maximum by slider 7. Actuation of the tail rotor control results in linear fading of gyro effectiveness with value 0 reached at the control stick end points.

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



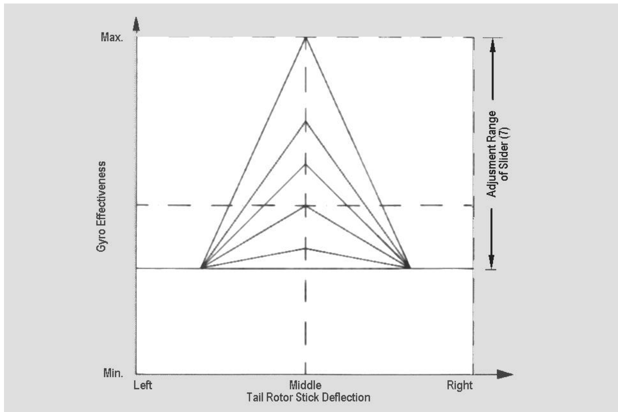
The gyro effectiveness can be varied between the two adjusted values by slider 7, but can not be reduced to 0. Automatic fading by the code 67 mixer is also effective only down to the value set be regulator 1.

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



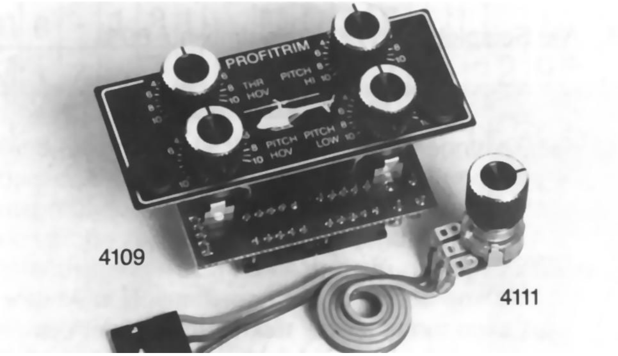
Unlike example 1, complete fading has occurred by 60% of tail rotor control stick deflection.

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).

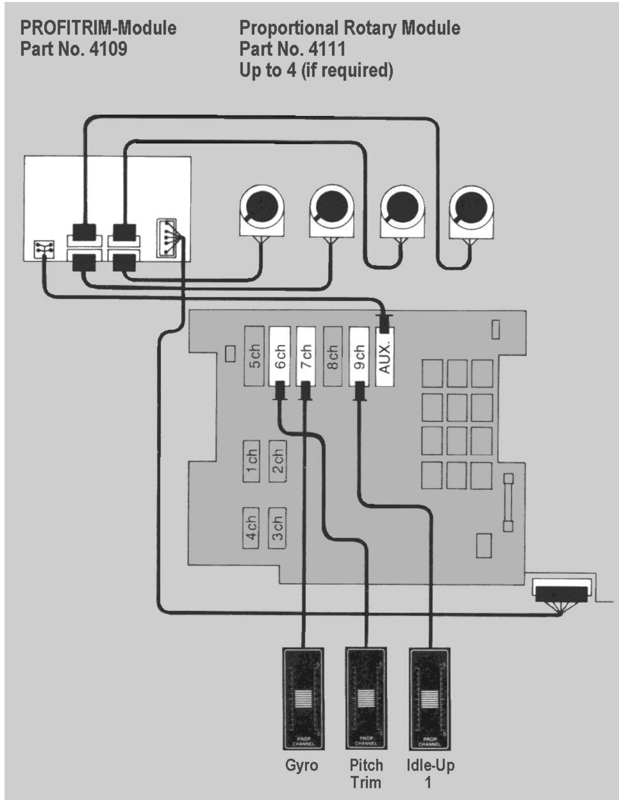
The adjustments established in flight in this way, can be transferred into the program later on (Code 91), so they will be available unchanged when changing models.

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

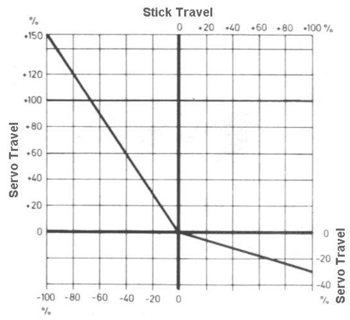
Adjusting Servo Travel

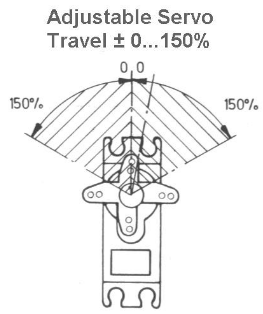
T	H	R	O	W		A	D	J	U	S	T				
p	u	s	h		c	h		k	e	y			1	-	9

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 switc h) 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

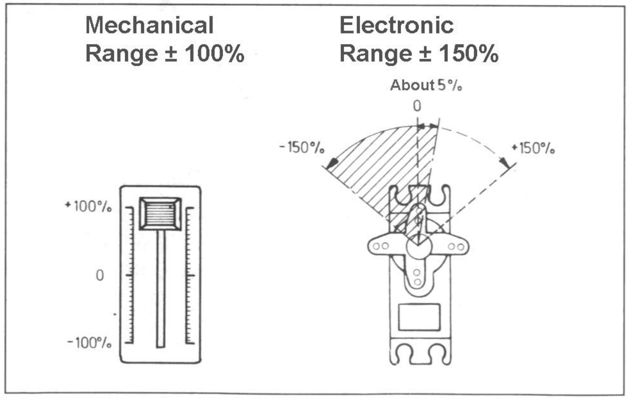
Changing Control Travel

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 19
Servo Travel Restrict

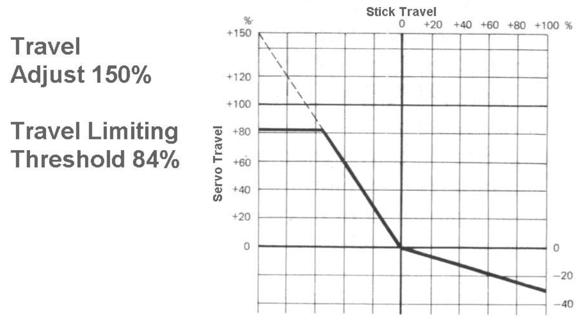
Limiting Servo Travel

T	H	R	O	W		L	I	M	I	T					
p	u	s	h		c	h		k	e	y			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

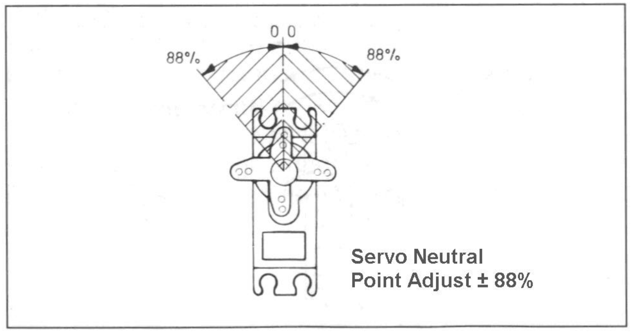
Adjusting the Servo Neutral Position

S	U	B		T	R	I	M								
p	u	s	h		c	h		k	e	y			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

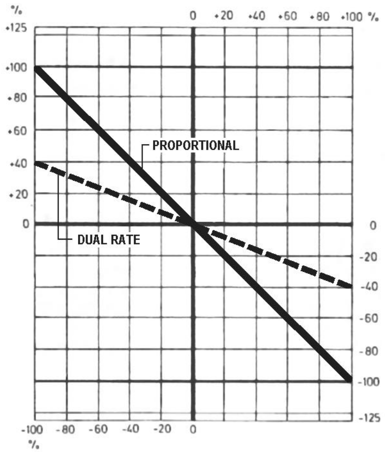
The dual-rate function permits in-flight switching of control characteristics, with the range of adjustment being variable between 0 – 125% of the normal range for each of the two switch positions. The switched must have been allocated beforehand using code 34.

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.

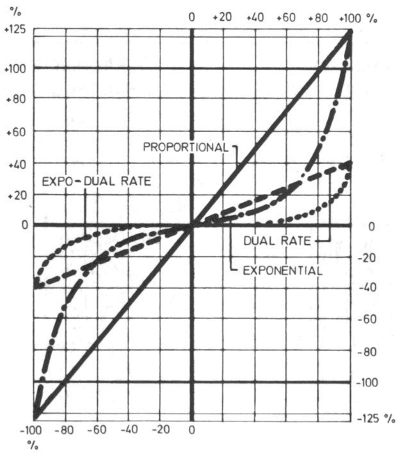
After calling code 14 the desired control functions can be selected via keys 1…4:

- 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.



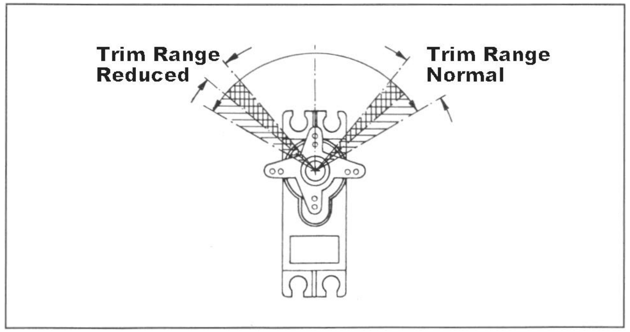
Code 35
Trim Reduction
Reducing Trim Range

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 becaus e 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, th at 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