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Handbuch PROFI mc 3030 französisch Best.-Nr./réf. 85 9955

# Manual for the PROFI mc 3030

MULTIPLEX®

**MULTIPLEX** ***Modelltechnik GmbH • Neuer Weg 15 • D-75223 Niefern • Germany***

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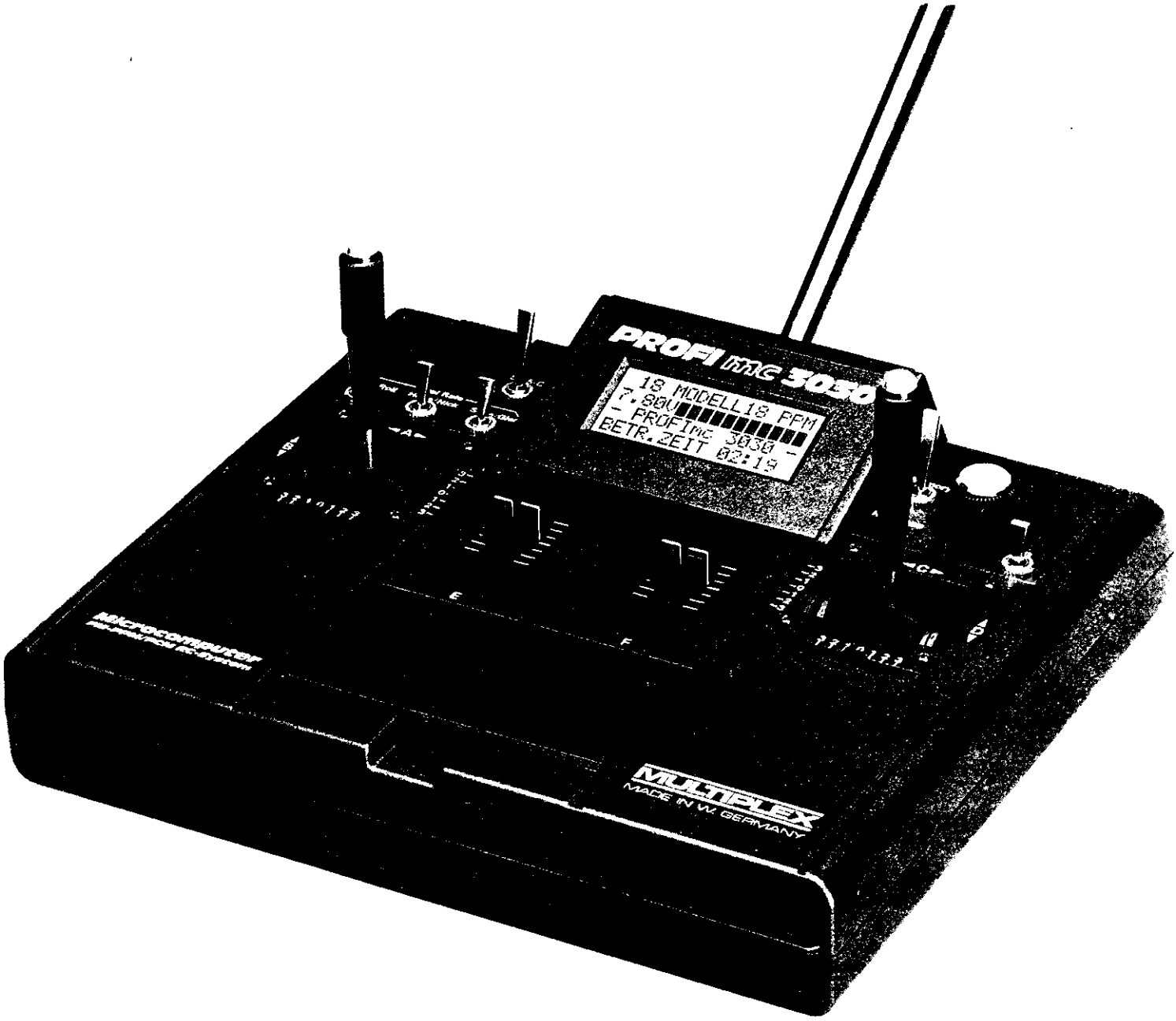
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## Welcome to the PROFI mc 3030

In purchasing the PROFI mc 3030 you have acquired a product of the highest quality, with all the advantages of being "Made in Germany". We thank you for your faith in our company.

As in all top-class radio control systems the capabilities of the equipment are concentrated in the transmitter, which offers a tremendous wealth of features and facilities. The transmitter also embodies an entirely new method of setting up and controlling these features, designed specifically to make these advantages easier for the modeller to understand and use.

This new philosophy is based on three elements: "the device guides the user", by means of a "menu system" and "clear, easily understood messages".

With this in mind, you could be forgiven for asking *"so why do we need such a fat manual?"* And indeed, you may find such a weighty tome rather frightening.

Well, first of all, the PROFI mc 3030 is capable of much more than you can imagine - and we would hate to hide anything from you. Secondly, we have put a lot of effort into making this a manual that any modeller can understand - everything is explained in full.

In spite of this, we have to admit that the familiar "80/20" rule still applies: with only a 20% knowledge of the transmitter, you will be able to exploit 80% of its facilities. And you will soon find out that you only need this manual for the odd special case.

Nevertheless, we would ask you please to read right through this book at least once, and thoroughly. Do this, and you can be sure that you know enough to use the system sensibly. You will also acquire some idea of the vast range of possibilities which the system opens up, even if you have no use for them at present.

**We hope and trust that you will have many years of pleasure and success with your PROFI mc 3030.**

# About this manual

If you have some prior experience, and want to "get down to it" as quickly as possible, please turn to the Section entitled "Quickstart", which precedes the main text of the manual.

The remainder of the book is divided into two main parts.

**The first part:**

describes and explains the transmitter and its wide-ranging facilities.

This part of the manual is designed and organised in a logical, tutorial-style sequence, so that it makes sense to read it right through while you become familiar with the equipment; at the same time it serves as an excellent reference source for later.

Initially the text discusses the hardware, then the main screens which you will encounter on the LCD display.

Although the menu system makes the transmitter just about perfect for the "DIY programmer", a series of ready-made "programs" (as they used to be called) is supplied as standard, and these are described and explained next.

After this the learning curve becomes somewhat steeper (don't worry, it's not as bad as it sounds) as we cover the transmitter's facilities in depth. First you will learn about the procedures and facilities which are needed most frequently. After that we deal with those which crop up less often, and some which only the advanced modeller is ever likely to use.

Please don't think that you have to know and understand everything about the transmitter right from the start. If you come across something that does not seem to apply to you, skip it for now, and read it later on, perhaps when you find that you really do need it.

If you are an old hand at this sort of thing, please be sure to read with particular care the Sections which are concerned with memories, switching memories "in flight", and the "Gx" and "SI" switches. These are the facilities which are not available with any other radio control set.

**The second part:**

deals with the receiving system: consisting basically of the receiver, the servos and the battery. As there are no substantial differences in this area from earlier radio systems, this part has been kept rather more brief.

However, if you are a beginner to the world of model radio control technology, it is important for you to read this part very carefully, absorb the information, and observe our recommendations as far as possible.

The manual includes an appendix which explains some of the technical terms which crop up most often in discussions of model aircraft control systems.

**If you are a beginner, the next suggestion is aimed squarely at you:**

No matter how fat, a single manual on radio control equipment can never provide you with all the knowledge you need in order to operate the more complex and demanding models successfully. So: read all the magazines and books you can get hold of - there are plenty of them about.

And one more thing: please join a club, if at all possible. There you will meet people with similar interests, who will be only too pleased to pass on the benefit of their experience.

---

# The legal side

Nothing too onerous here, but there are a few regulations which we have to heed.

You must have a licence to operate a radio control system - and in fact you need a licence just to own one. The PROFI mc 3030 is a type-approved system, so you will have no problem obtaining a licence.

If you intend operating the system in the 40 MHz band, the "General Licence" supplied with the set is all you need. Carry it with you when using the set, as it must be produced on demand if an official of the Post Office demands to see it.

You must notify the appropriate authority if you intend using a system in the 35 MHz band. Please apply for your licence on the form supplied with the system; you have to fill out the form with your personal details.

Systems operating in the 35 MHz band may only be used to control model aircraft.

**Important:**

The transmitter may only be used with the following RF modules:

Order No. **4 5668**
DBP licence No. MF-142/83 (27 MHz band)
Order No. **4 5672**
DBP licence No. MF-142/83 (40 MHz band)
Order No. **4 5671**
DBP licence No. FE-78/83 (35 MHz band).

It is not legal to use the system with other (older) RF modules.

We strongly recommend (although sadly it is not obligatory) that you take out third-party insurance for your models, or add an appropriate extension to your personal insurance policy.

The operation of working models - especially of model aircraft - carries inherent risks which ought to be covered. And even though you may be comprehensively insured, it is still vital that you operate your model with safety in mind at all times.

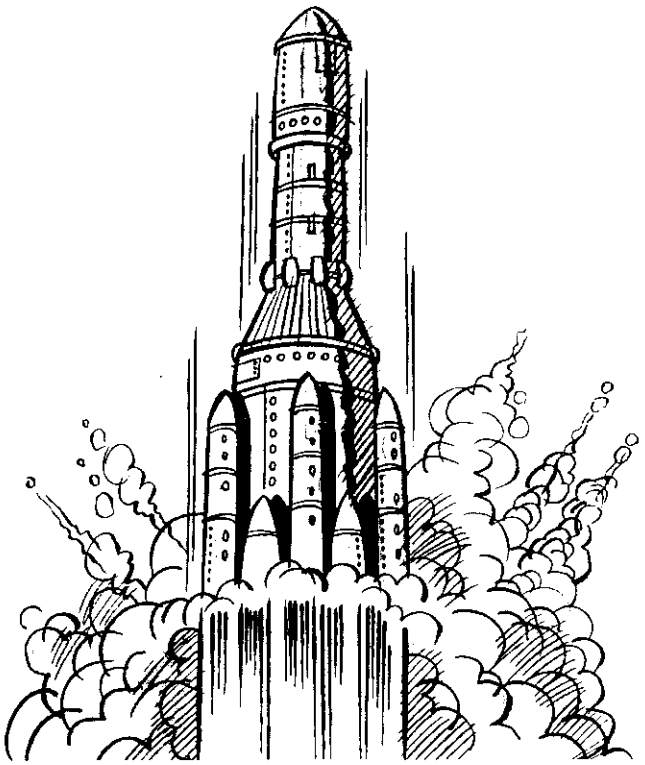
**Very important:** as in the case of a private car, your licence and your insurance are invalid if you carry out modifications to your radio control equipment. The operating licence applies exclusively to series-approved equipment and any approved expansion units.

For model aircraft above the legal weight limit it is necessary to obtain an exemption certificate before you fly.

We strongly recommend that you join a model flying club. Many clubs are affiliated to one of the national governing bodies, and insurance is often an integral part of membership.

Quite apart from these benefits, a club can offer you help, answer your questions, and help you to solve the myriad problems which you are bound to encounter.

# "Quickstart"



After purchasing a new radio control system most modellers want to see it in action as quickly as possible - to find out whether it works, if nothing else. If this description fits, then this section is for you. It provides brief instructions, with little in the way of explanation, on how to get started with your PROFI mc 3030.

**1.** Charge the transmitter and receiver batteries as described on pages 9 and 84. If you are in a real hurry, and have access to a MULTIPLEX automatic rapid charger, then you can use that.

**2.** Connect the components of the receiving system, as shown on page 81.

**3.** Check that the RF module is plugged into the transmitter, and that the transmitter crystal (blue) is plugged into it. The receiver must be fitted with the receiver crystal (same Channel No.); for a single superhet receiver this has a yellow tag, for a double superhet receiver a clear plastic holder.

**4.** Switch on the transmitter. The LCD display will now show a screen similar to this:

```
01 -EMPTY-- PPM9
8.24V▮▮▮▮▮▮▮▮▮▮
OP.TIME   01:24
PROFI mc3030 3.0
```

The top line shows the memory No., the name of the "current" model (or EMPTY), and the transmission mode (PPM7, PPM9, or PCM) used for that model. The second line shows the transmitter's operating voltage; first in digital form, then in the form of a "bar graph".

Line 3 displays the cumulative operating period, and line 4 shows the type designation of the transmitter.

**The top line of the display may not be exactly as shown; this depends on whether your dealer has prepared the transmitter for you in advance.**

**5.** As supplied, the transmitter's memories 1 - 5 are vacant; memories 6 - 15 contain "ready-made programs".

If your dealer has not already done so (in which case you only need to switch on), you now have to select one of these "programs". Or - better - copy one of them into one of the vacant memories. Then you can experiment with it without worrying about changing anything in the original, which may well be extremely useful to you soon.

**To copy a "program", you have to do two things:**

1. If you do not see memory No. 01 at top left in the display, you will need to change to that memory (i.e. to 01).

2. Then you will copy one of the "ready-made programs" into this memory.

**This is how you do it:**

**6.** If you see memory No. 01 at top left in the display, skip this stage and go straight to point 7. If not, you must first switch to this memory.

Press keys [M] [◣] [◣] in succession. The transmitter will confirm each key press with a bleep. Your display will now look like this:

```
01 EMPTY  PPM9
----------------
CHANGE TO FILE
NO. ▙01:-EMPTY--
```

What you see in the top and bottom lines depends on what, if anything, your dealer has done for you beforehand; in any case it does not interest us now. However, lines 2 and 3 should look as shown in the illustration above. If that is not so, then you have made a mistake. In this case press the [M] key repeatedly until you see the starting screen, and try again.

We will assume that it has worked correctly. Now press the [◣] key. The number in line 4 starts to flash. Now press the [+] or [-] key until the number 01 appears. It should also be flashing.

Now press the [M] key four times; you are finished, and will see the starting display again, except that now memory number 01 will be displayed:

```
01 -EMPTY-- PPM9
8.24V▮▮▮▮▮▮▮▮▮▮
OP.TIME   01.25
PROFI mc3030 3.0
```

If you see a model name after 01, instead of EMPTY, don't worry - it's all in order.

**7.** Now it is time to **copy a "ready-made program"** into this memory.

Depending on your particular interests, select one of these two:

"FIESTA" (glider) from memory No. 6,

or

"BIG LIFT" (powered model) from memory No. 10,

or

"HELI-BOY" (Schlueter-type helicopter) from memory No. 13.

As helicopters make greater demands on the radio system, they are not so suitable for a quick start with the new system. Unless, that is, you have plenty of experience with computer-based radio control systems.

**You will now copy one of these two models into memory No. 1, as follows:**

Press these keys in succession: [M] [◣] [◩]. The transmitter will confirm each key press with a bleep.

The screen should now look like this:

```
-- FILE COPY --
F MODE:FULLY
FR. 01:-EMPTY--¶
TO  01:-EMPTY--◢
```

(Here again, it makes no difference if there is a model name after the No. 01, instead of "EMPTY".)

If the display is different, you have either forgotten one of the keys, or you have pressed a wrong key. In this case press the [M] key repeatedly until you arrive back at the starting screen. Try the procedure again.

Press the [◣] key. The number 01 in line 3 (after "FR." = from) will start to flash. Now press the [+] key repeatedly until the number 06 (for "FIESTA") or 10 (for "BIG LIFT") appears, and flashes. The display will show the corresponding name after the number.

You have now "told" the transmitter what you want to copy.

We already know where you want to copy it: that is shown in line 4: "to 01".

Press the [M] key. Now nothing will be flashing, and line 4 will look either like this:

```
TO  01:FIESTA  ◢
```

or (depending on your choice) like this:

```
TO  01:BIGLIFT ◢
```

hat's the job done. Now press the [M] key three times, and you are back where you started.

**8. You could meet a slight problem at this stage:**

All the models stored in memory are for the "PPM" transmission mode.

If you have purchased your PROFI mc 3030 with a PCM receiver, you must now switch to the correct transmission mode.

To do this, press these keys in succession [M] [◪] [◪] [◪], and you will see this display:

```
01 BIGLIFT  PPM9
----------------
MODULATION:PPM9◢
----------------
```

Press the [◪] key, and "PPM9" will flash. Now press the [R] key, and "PPM9" will turn into "PCM".

Press the [M] key four times, and you will be back to the starting screen. The job is done.

**9.** If you now switch the transmitter off and on again (it's not necessary, but do it nevertheless), you will see that it has remembered the new settings. Unless and until you switch to a different model, you will always find the transmitter set to this model and this transmission mode when you switch on.

**Now you are ready to try the system out.** However, before you start worrying about why the system is not working, check the transmission mode. This is always shown in the first line of the display, on the right.

Three modes are possible:

1) PPM 7 = for all PPM receivers which cannot decode 9 channels. If you possess such a receiver (e.g. red 4/6 channel receiver) with the transmitter set to PPM 9, the first two servo output channels will not work correctly.

2) PPM 9 = for all PPM receivers, except those mentioned in 1).

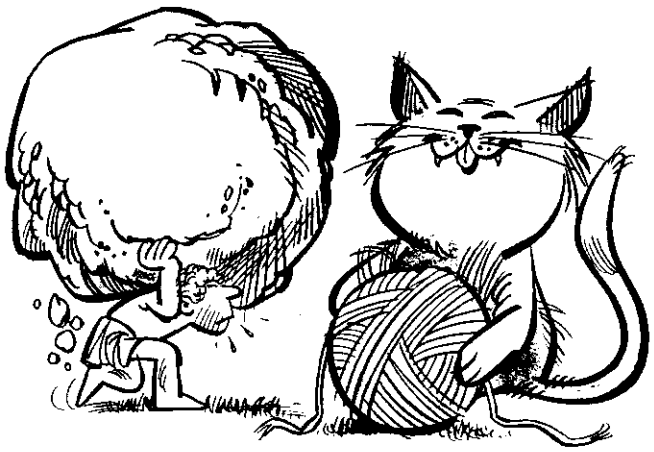
3) PCM = all MULTIPLEX PCM receivers.

If necessary, switch to the transmission mode as described above.

The next step is to have a look at pages 20 to 24 to get an idea of all the things you can do with the model (or program) that you have selected.

However, before you can put the system to serious use, you will need to activate the throttle ratchet, and set up the transmitter for throttle-left or throttle-right, depending on your preference. See pages 8 and 19 for details.

# 1. The transmitter



***Hard... or soft...***
***No question:*** **this is "hardware"**

## Transmitter front face - notes on operation

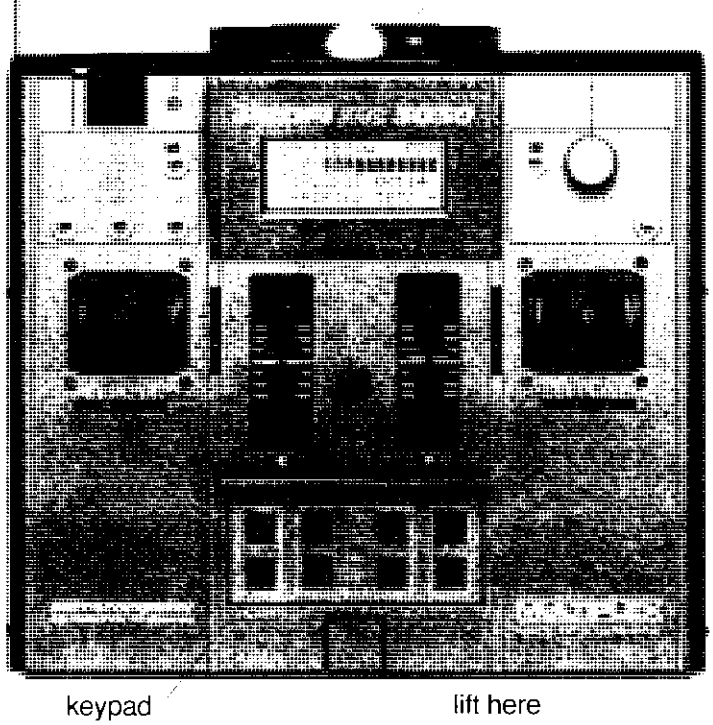



Fig. 1

**Power indicator**
Just to the right of the ON/OFF switch is an LED which glows when the transmitter is switched on. If the reserve battery system, Order No. 7 5710, is installed, the LED **flashes** when the transmitter is being powered by the reserve battery.

**Charge socket**
The charge socket is on the left face of the transmitter, close to the top. Naturally the transmitter charge lead is plugged in here; the socket is also used for the Teacher/Pupil lead, for the Diagnosis lead, the transfer lead and the rev-counter sensor.

**Aerial socket tension screw**
This screw is used to adjust the friction of the swivelling aerial socket. Rotate it clockwise to increase the friction, but take care not to over-tighten the screw, as this might damage the swivel. If necessary, tighten the screw to the point where the (fully extended) aerial just holds its position reliably. Make any adjustments in very small steps, check the effect, and adjust again if necessary. Over-tightening the screw can damage the swivel bearing.

**Slider control "markers"** (Fig. 2)
The sliders are fitted with a new form of marker - an extra slider. This is a highly practical feature, as it enables you to shift the slider to a previously set position by feel alone: for example, to a particular flap position. Simply squeeze the slider and the marker together between thumb and forefinger until they coincide.

Please note: in each case the "outboard" slider (the one nearest the stick unit) is the actual slider control: the "inboard" ones are the markers. The markers are fitted with a fine ratchet which can be disengaged for adjustment purposes. To do this push the marker slider outwards - towards the actual slider control - then move it to the correct position. Do not force it along the ratchet - the ratchet will last longer if you treat it gently!

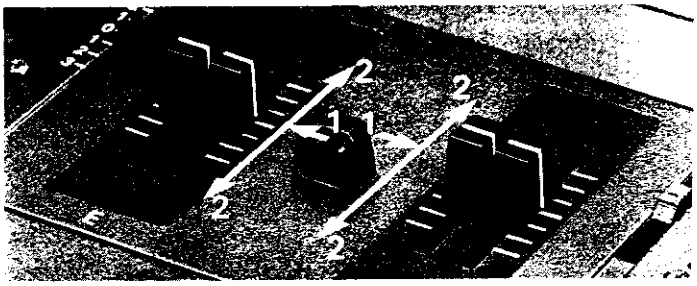


Fig. 2

**Transmitter control symbols**
All of the controls are designated by a letter; for example **B** is the forward/aft plane of the left-hand stick unit. and **C** is right/left on the right-hand stick. These letters are a useful shorthand method of referring to the controls. These letter symbols are used all the time in this text, and you will use them whenever you use the transmitter.

**Stick unit trims** (Fig. 3)
Basically the trims - apart from the throttle/spoiler stick - work on the "Centre-Trim" principle. This means that the end-point values are unchanged when the centre position of a stick function is shifted electronically (by moving the associated trim lever).

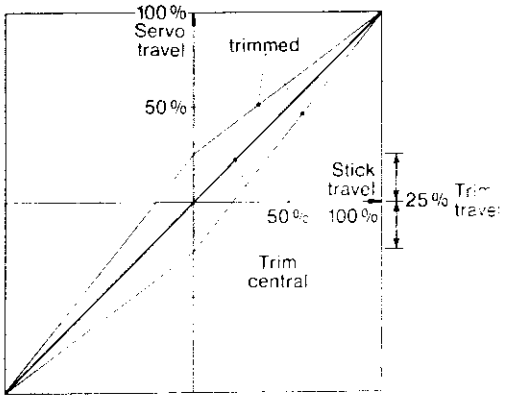



Fig. 3

The throttle/spoiler stick incorporates the idle trim feature: this means that the trim slider only works at one end of the stick arc (idle); at the other end-point (full throttle) the trim has no effect. Please turn to page 41 for details of how to set up the idle trim facility.

**"Digi"-Adjustor**

The Digi-Adjustor has the same function as the ⊞ and ⊟ keys on the keypad, and is automatically connected in parallel with these keys, whenever that serves a useful purpose. Turning the knob to the right by one click-stop has the same effect as pressing the ⊞ key once; turning it to the left by one click is the same as pressing the ⊟ key once.

This adjustor has no "zero" or centre point, and no end-points! Don't worry - there is no possibility that you might "overwind" it. Once you reach the end of a particular adjustment range, it ceases to have any effect.

**When to use it:** Whenever you wish to adjust any function over a considerable range. However, its main purpose is for making adjustments to the model when it is in flight, e.g. for adjusting aileron differential during test flying.

**The switch bays**

On either side of the LCD screen, at the top of the transmitter front face, are two wells, each of which can accept 6 switches or similar accessories. They are numbered 1 to 12 as shown in Fig. 4. As supplied, the transmitter has four switches on the left and two switches plus the Digi-Adjustor on the right. You can fit extra units by installing the well inserts which are supplied with the set: see page 75. Legend stickers are also supplied, including some blank ones which you can inscribe yourself.

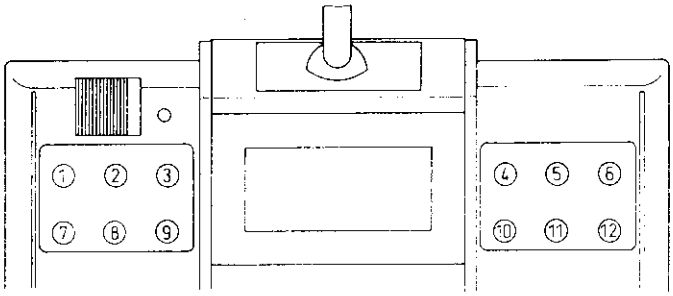



Fig. 4

## Opening and closing the transmitter Changing the RF module

**Opening the case**

Hold the transmitter as shown in Fig. 5. Press the latch buttons down with your thumbs, then fold the back panel down towards you. Always close the keypad flap before opening the transmitter.

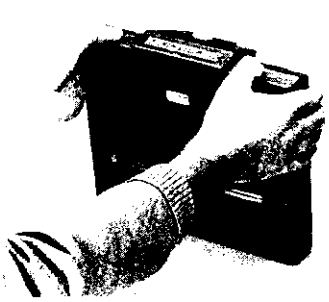


Fig. 5

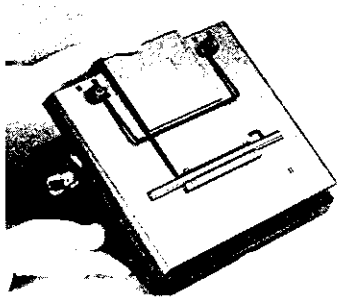


Fig. 6

**Closing the case**

This is best carried out as shown in Fig. 6. Hold the transmitter front as shown. Engage the lugs at the bottom of the back panel, then fold the back panel up until the latches snap home. If the latches do not immediately engage, press in slightly at the sides.

Before closing the transmitter always check that no wires are trapped; especially around the stick units and over the well for the keypad flap: there is no clearance at all at this point!

If the cables are organised logically inside the transmitter, there should be no danger of wires becoming caught up or jammed. Nevertheless - always check one last time before closing the back!

**Changing the RF module; changing crystals**

Grasp the module at the recessed points (Fig. 7), then pull it up and out of its holder.

The crystal is plugged into the side of the RF module (Fig. 8). Pull out the crystal by its plastic tag. When plugging in a crystal make sure that both pins engage correctly in the socket in the module.



Fig. 7

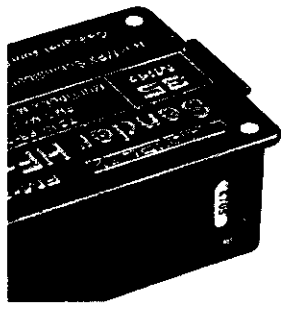


Fig. 8

Before plugging the module in again, bend the plastic tag over to one side.

When refitting the module do not press down in the centre of the unit, but around the finger recess position. This will help to ensure that it is fitted squarely, thereby avoiding damage to the contacts.

## Transmitter back panel

**Inside**

On both sides there are holders for a spare pair of crystals and a replacement fuse. Please note the specially formed holder for double superhet receiver crystals and their correct position in the holder (Fig. 9).

**Outside**

There is a well in the outside of the back panel which accommodates the transmitter aerial for transport. The support bar can be set to three different positions: folded in flush, at right-angles to form a back support, and upright as a carrying handle. Please refer to Figs. 10 to 12.

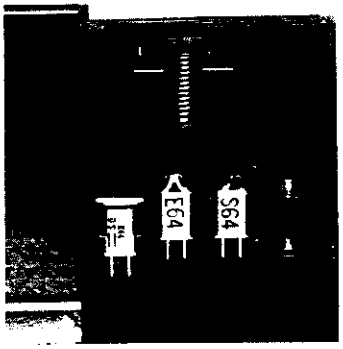



Fig. 9
Don't lever them - slide them

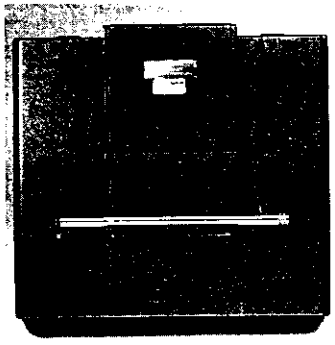


Fig. 10



Fig. 11

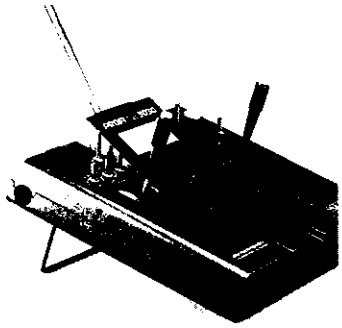


Fig. 12

## Inside the transmitter

### Fuse

Take a look at Fig. 13. The basic purpose of the fuse is to protect the transmitter against excessive currents during rapid charging. If the fuse burns out, replace it with the same type (5 x 20 mm, 2 Ampere, quick-acting - standard commercial item). Charge currents higher than 2 A may cause damage to the transmitter electronics!

### Cable compartment

The leads from the various switches are stowed away inside the cable compartment (Fig. 14).

To open the compartment push one of the spring latches to one side and lift the cover off.

Pass the wires from each connector into the compartment through the nearest opening. Lead them out again through the openings on the side nearest the RF module. Part of the "excess" cable length can be accommodated inside the compartment. Any spare cable is best left at the switch position.

Always arrange the wires carefully and neatly, to avoid the cables forming a mass of unruly "spaghetti" around the stick units or close to the keypad cover well.

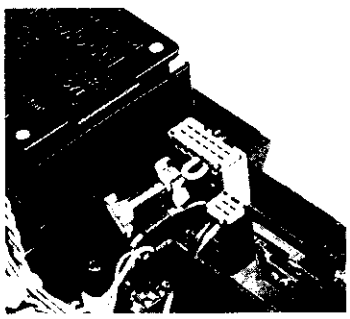


Fig. 13

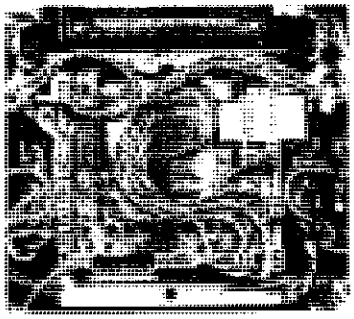


Fig. 14

### The connectors

Three sides of the main electronics circuit board are exposed, each fitted with connectors for the "peripherals", i.e. stick units, switches and so on. See Fig. 15.

Starting from the left, these are:

**DE**

Digi-Adjustor. If you plug this in the "wrong" way round, the ⊞ and ⊟ functions will be reversed.

**MNT**

MULTINAUT. Only for connecting a MULTINAUT control module (for model boats - the same MULTINAUT system is used in the COMBI 90).

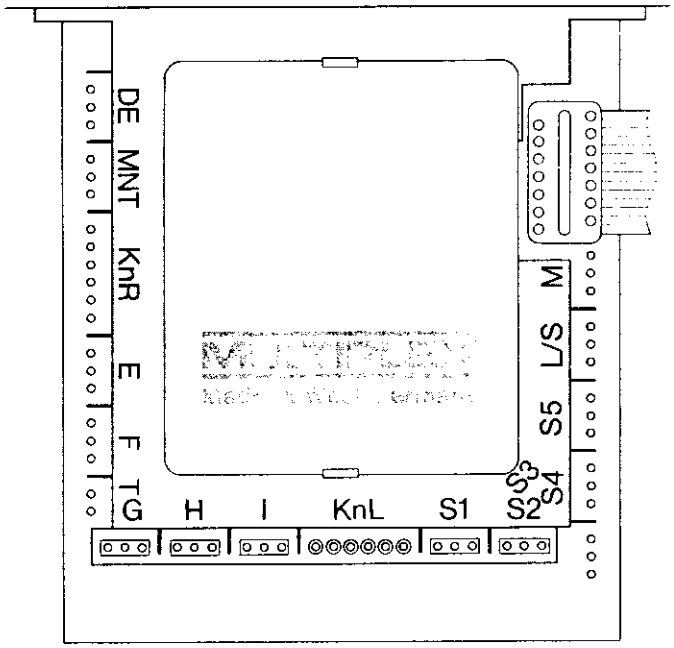



Fig. 15

**KnR**

Right-hand stick unit.

**E**

Control "E". This is normally the left-hand slider control.

**F**

Control "F". This is normally the right-hand slider control.

**T**

Keypad. Can be plugged in either way round.

**G**

Control "G". Normally this is a switched channel. Plug it in the opposite way round and the direction of operation of the switched channel is reversed.

**H, I**

Controls "H" and "I". These are reserve inputs for special purposes. Not used in the standard version.

**KnL**

Left-hand stick unit.

**S1 to S5**

Inputs for the change-over/coupling switches S1 to S5. More on this on page 14.

**L/S**

Teacher/Pupil switch. If you install a switch for Teacher/Pupil operation (the buddy box system), it must be plugged in here.

**M**

Memory switch. If a switch is installed for this purpose, it must be plugged in here. Plug it in the "wrong" way round and the selected memories are interchanged.

**Note:** When connecting auxiliary controls and switches please refer to the explanation of the "TEST Controls" menu on page 77.

## Activating the stick ratchet

As supplied, both vertical axes of the dual-axis stick units are self-neutralising.

Most modellers will want to remove the self-neutralising action from one stick (the "throttle" stick), and activate the ratchet instead.

### Removing the neutralising spring

Open the transmitter. Select the stick from which you want to remove the neutralising spring, and set it to the position shown in Fig. 16. Disengage the neutralising spring using tweezers or pointed-nose pliers. Remove the spring, and the neutralising arm will come away too. Keep these components carefully - one day you may need them again.

The stick is now non-neutralising in one plane, but the ratchet is not yet active. Many pilots like the throttle stick like this; especially for the collective pitch / throttle stick arrangement used with helicopters.

### Activating the ratchet

At the base of the stick unit you will see a screwhead (Fig. 17). Undo this screw about 4 complete turns, counter-clockwise. This releases the ratchet spring fitted to the stick unit, and activates the ratchet.



Fig. 16

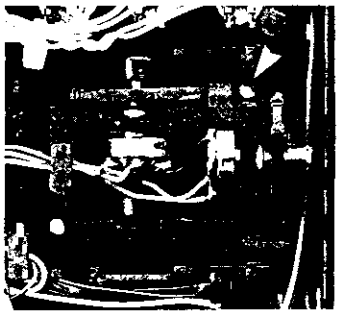
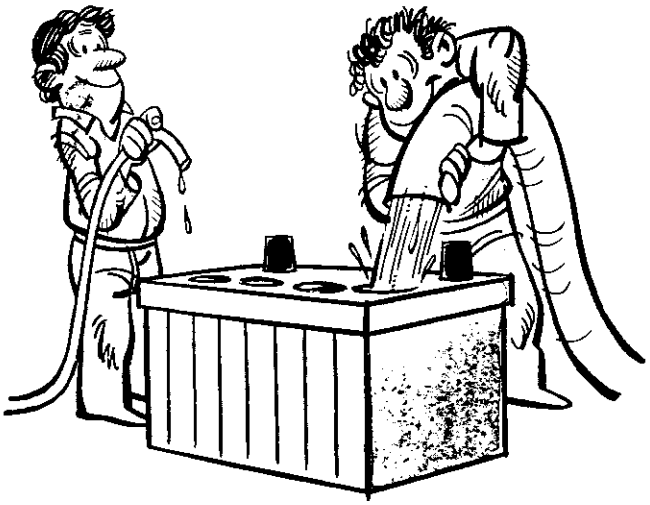


Fig. 17

# Charging the transmitter battery



The transmitter is fitted with a 6-cell sintered-cell battery of 1700 mAh capacity, which provides an unusually long operating period of more than eight hours from a single charge. The EUROPA-Edition is fitted with a 1350 mAh battery, giving about 5 hours' operation.

**Note:** these values were measured using perfectly charged batteries, and lasted until the batteries were completely discharged (transmitter no longer working).

Charge up your transmitter pack as soon as the battery monitor warns you. Depending on your chosen method of charging, the monitor will trip after 5 - 6 hours' operation.

Compared with earlier transmitters, recharging must be carried out at a higher rate, and/or for a longer period, in accordance with the high battery capacity.

**Slow charging**

The charge current should be about 170 - 200 mA. At 200 mA a full charge is achieved in about twelve hours. At the 170 mA rate it does no harm to continue charging beyond the twelve hours, as there is no danger of over-charging.

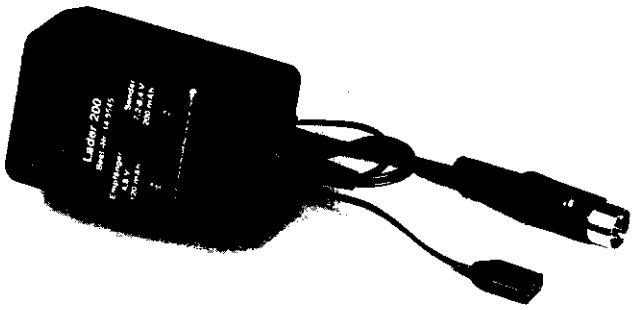


Fig. 18

Older types of charger are often unable to supply a current of around 200 mA, or only under certain circumstances, and for this reason we recommend the new MULTIPLEX charger, Order No. 14 5545, which is specially designed for the requirements of the PROFI mc 3030.

The MULTIPLEX Combi-Charger, Order No. 14 5540, can be used to charge the battery in a makeshift fashion: select the 100 mA outlet and charge for at least 24 hours. At this current you can leave the transmitter connected to the charger constantly; it is not possible to damage the battery or the transmitter at such a low current.

Be sure to switch the transmitter off before recharging. Then connect the transmitter (charge socket) to the charger using the charge lead supplied.

**Red plug = + (positive) socket on the charger, blue plug = - (negative) socket.**

**Rapid charging**

The transmitter can be rapid-charged in only 1 to 2 hours. **However, to do this safely you must use the MULTIPLEX Automatic Rapid Charger, Order No. 9 2505.**

**If you use a different rapid charger, or a different charging process, there is a danger of damaging the battery and the transmitter. We would not be able to repair the unit under guarantee under such circumstances.**

If you possess a charger which is not compatible with the protective circuitry of your new transmitter, please contact our Customer Service department.

For rapid-charging select an output current of 1 - 2 A. Provided that you are using the recommended charger, you do not need to concern yourself with the battery's initial state of charge. At the 2 A rate, and with a completely discharged battery, the charge period is about one hour; in any case the charger switches itself off when the battery is fully charged.

**Caution: the charge rate must not exceed 2 A. At higher currents the transmitter fuse will burn out. Do not be tempted to install a higher rated fuse, as you risk damaging the transmitter.**

**If you damage the transmitter by exceeding the recommended charge current, we will decline to repair it under guarantee.**

**Note:**

A brand new battery cannot exploit its full capacity right from the outset. In fact, it only achieves full capacity after a few charge/discharge cycles (5 to 10). Please bear this in mind when you start using the equipment, as the full operating period will not be available at first.

If you need full battery capacity at once, we recommend that you charge the transmitter, leave it switched on until the battery is **completely discharged**, then recharge it **fully**. Repeat this cycle several times.

# The keypad and the menu system




The first part of this Section explains how the keypad is used.

After this you will find a brief introduction to how the "device guides the user" through menus.

The Section is concluded with a brief explanation of the transmitter's menu structure.

## The keypad

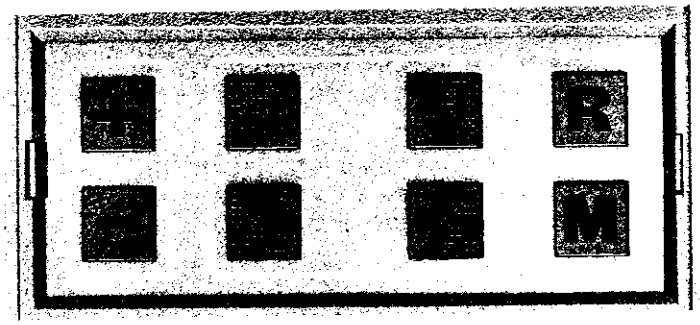



Fig. 19

These eight keys, used in conjunction with the LCD screen, give you complete access to all the selection and adjustment functions. The keys are in three groups, and it is easy to remember what they do.

Very briefly, the keys have the following functions:

**The Ⓜ key**

This is the "**Menu**" key. You use it first to move from the "Status" display into the "Menu tree". Within the menu tree the Ⓜ key is always used to conclude any procedure, and to move back into the preceding menu. Regardless of where you are in the menu tree, you can **return** to the Status display at any time by pressing this key one or more times.

**The Ⓡ key**

R stands for **R**everse - that's all there is to say. This key is used to reverse a servo, or switch something off or on. More on this in the explanation of the individual menus.

**The ⊞ and ⊟ keys**

These keys are also more or less self-explanatory. If something is to be increased or reduced, then you do it with these two keys. You can also use them to "leaf through" lists of options at many places in the various menus.

Examples of using the ⊞ and ⊟ keys:

Adjusting servo travel

Adjusting a mixer input value

Switching to a different memory

Moving on to the next transmitter control when testing etc.

**One special feature here:** where it is of practical use, these keys feature an auto-repeat function. If you press the key briefly, its action occurs once. If you hold it pressed down, the action is repeated automatically. You simply need to press the key and watch the display, then release it when the required value is reached. If you "overshoot", press the opposite key to go back again. For instance, if you wish to change a mixer input from 0 to 70, this is somewhat easier than tapping the ⊞ key 70 times.

Whenever it makes sense, the **Digi-Adjustor** (see page 6) is connected in parallel with these two keys. You can then choose whether the keys or the rotary knob is the more convenient to use.

**The ◹◪◩◹ keys**

These are the "selector" or "arrow" keys. The rectangular arrangement is deliberate: when you are at a particular menu (wait a moment - we're nearly there!) you will see triangular symbols, or selector tags, in the display, which correspond to these keys. They are always in approximately the same "corner" of the screen. If you press one of these keys, you select that point in the display which is adjacent to the corresponding symbol.

We don't want you to get complacent, so here are two (slight) complications:

1. If there are only two possible selections in a particular menu, only two selector tags are displayed, and only the corresponding two keys are "active". If you press one of the other keys, nothing happens.

2. Within any of the "Adjustment" menus the arrow keys are also used to "release" or "activate" particular points. The "free" or "active" point then starts flashing. Don't worry if this is not clear - it's all much easier to do than to describe.

**A brief recap:**

**Symbol in the display = key with same symbol. The key is "in the same corner" as the symbol in the display. When you press one of the keys, you select the point in the menu which is adjacent to the same symbol in the display.**

**Now for a quick practice session:**

(We assume here that you have copied "BIG LIFT" into memory 01, as described in "Quickstart", and that this is still the current memory.)

Switch the transmitter on, and you will see the Status display. Press the [M] key. You are now in the "root" menu - Menu 1:

```
-- ADJUSTMENTS--
SERVO  CONTROL
---- MENU 1 ----
FILES     MENU2
```

Press the [◩] key, and you are at the "Servo adjustment" menu:

```
01 BIGLIFT  PPM9
- SERVO ADJUST -
TRVL+REV LIMIT
CENTRE     TEST
```

Press [M] to return to the root menu 1. Try pressing the [◩] key: you arrive at root menu 2:

```
01 BIGLIFT  PPM9
---- MENU 2 ----
TIMER    ASSIGN
OP.TIME  MENU3
```

Press the [◩] key again, and you are at root menu 3:

```
01 BIGLIFT  PPM9
---- MENU 1 ----
PUPIL       RPM
TEACH. PCM/PPM
```

If you press the [◹] key, you land up at the rev. counter - just as you would (we hope) expect, as that is what the display promises:

```
01 BIGLIFT  PPM9
- REV. COUNTER -
 BLADES:      1
 RPM   :    000
```

As we have no use for this at the moment, press the [M] key repeatedly until you arrive back at the Status display. You now know how the selector keys and the [M] key work. We will get to the other keys later.

## The Menu System: makes choosing easy

In the "Keypad" section which you have just read, you learned virtually all there is to know about navigating your way from one menu to another. Now we explain the principles behind the system.

In the world of "real" computers the development of the "menu-based user interface" has been one of the most important steps in masking the stony, unflinching face of the computer, and making it acceptable and accessible to the ordinary mortal.

The basic system works like this:

**The computer provides a list of options in the form of a menu, which shows everything that it is ready to carry out at any one moment. From the options on offer the user selects what he wants.**

Since the computer usually has a vast array of capabilities, it is generally the case that the particular option you want cannot be selected in a single step. After all, if the computer were to offer just one, extremely lengthy list of options, then it would be difficult to see what was on offer, and sort out what you want. It would be very difficult to make sense of a restaurant menu with 50 different dishes on one page.

Keeping to the restaurant analogy, the sensible restaurateur spreads his menu over several pages, grouping all the meat dishes in one section, all the fish in another, and so on. If you have a hankering for a veal cutlet, you would look it up like this: main courses - meat dishes - "veal". A real menu usually has no contents page. If what you are looking for is not on page 1 ("Menu 1"), then - assuming that it is not something really exotic - you might hope to find it on page 2 ("Menu 2").

**The menu system of the PROFI mc 3030 works in exactly this way.**

Take a look at the diagram on page 12, which represents the options offered by the PROFI mc 3030 in a slightly simplified form.

In your last experiment you learned that the [M] key takes you directly from the Status display to the menu proper, i.e. to **Root Menu 1.**

By selecting **"SERVO" (top left)** you move to the "Servo adjustment" menu, where you can set up many options, if you wish.

By selecting **"CONTROL" (top right)** you move to the **"Transmitter Controls"** menu, where there are also several possible options for you to choose.

Select **"MEMORY"** at **bottom left**, and you find a menu which copes with everything to do with memories.

For the moment, the **"bottom right"** option hides everything else which the transmitter has to offer, via **Menu 2.** You might like to think of this option as "more" or "contd.".

In **Root Menu 2** things continue in the same way:

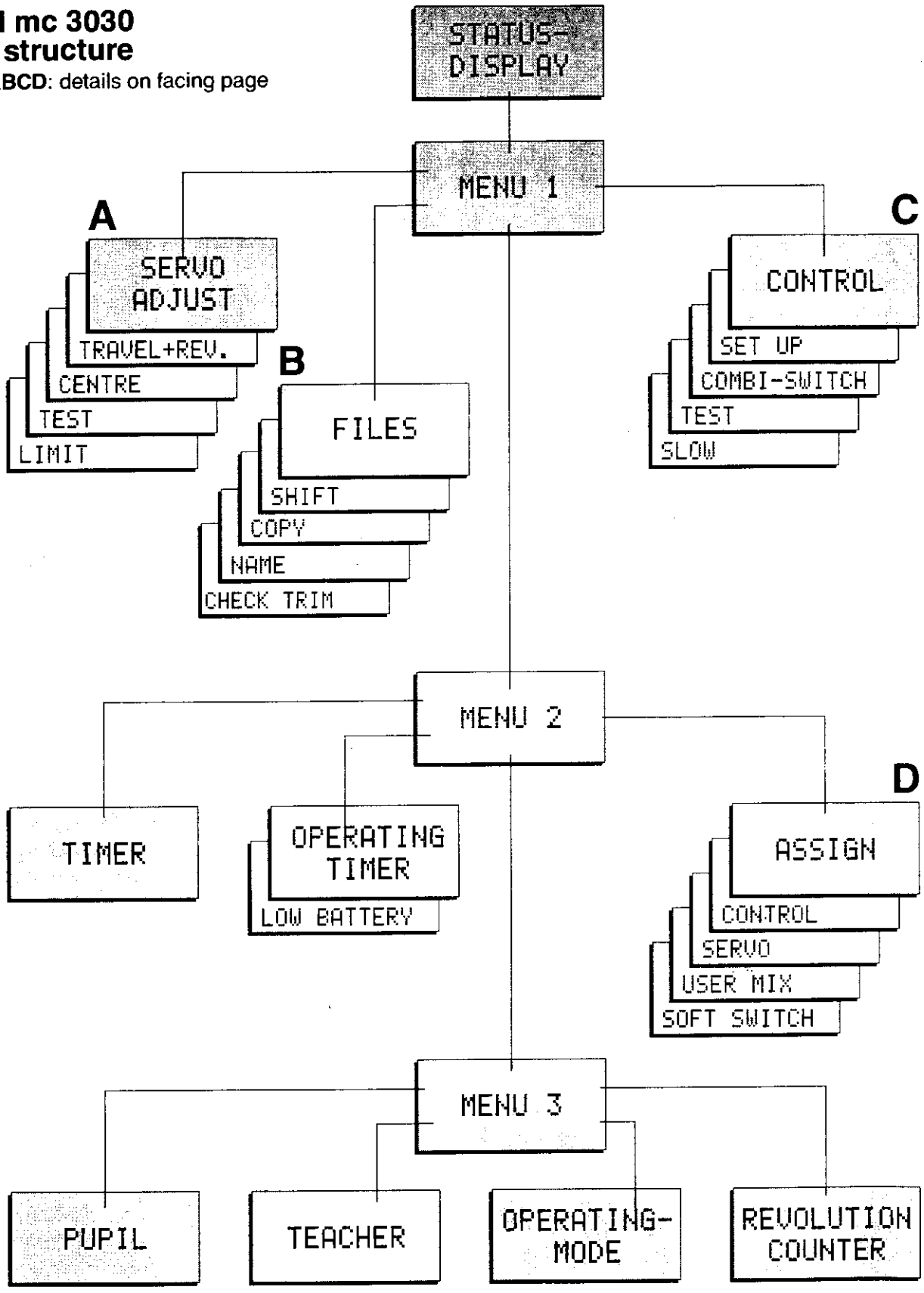
```
01 BIGLIFT  PPM9
---- MENU 2 ----
TIMER    ASSIGN
OP.TIME  MENU3
```

On the left you get to the stopwatch and the operating period timer; on the right to "Assign" and "Menu 3".

Because of the similarity to a tree - albeit one growing upside-down! - this type of menu arrangement is often known as a "menu tree", or - more technically, as a menu structure. The core of the structure is formed by the Root Menus 1 to 3.

# PROFI mc 3030
# menu structure

Menus **ABCD**: details on facing page

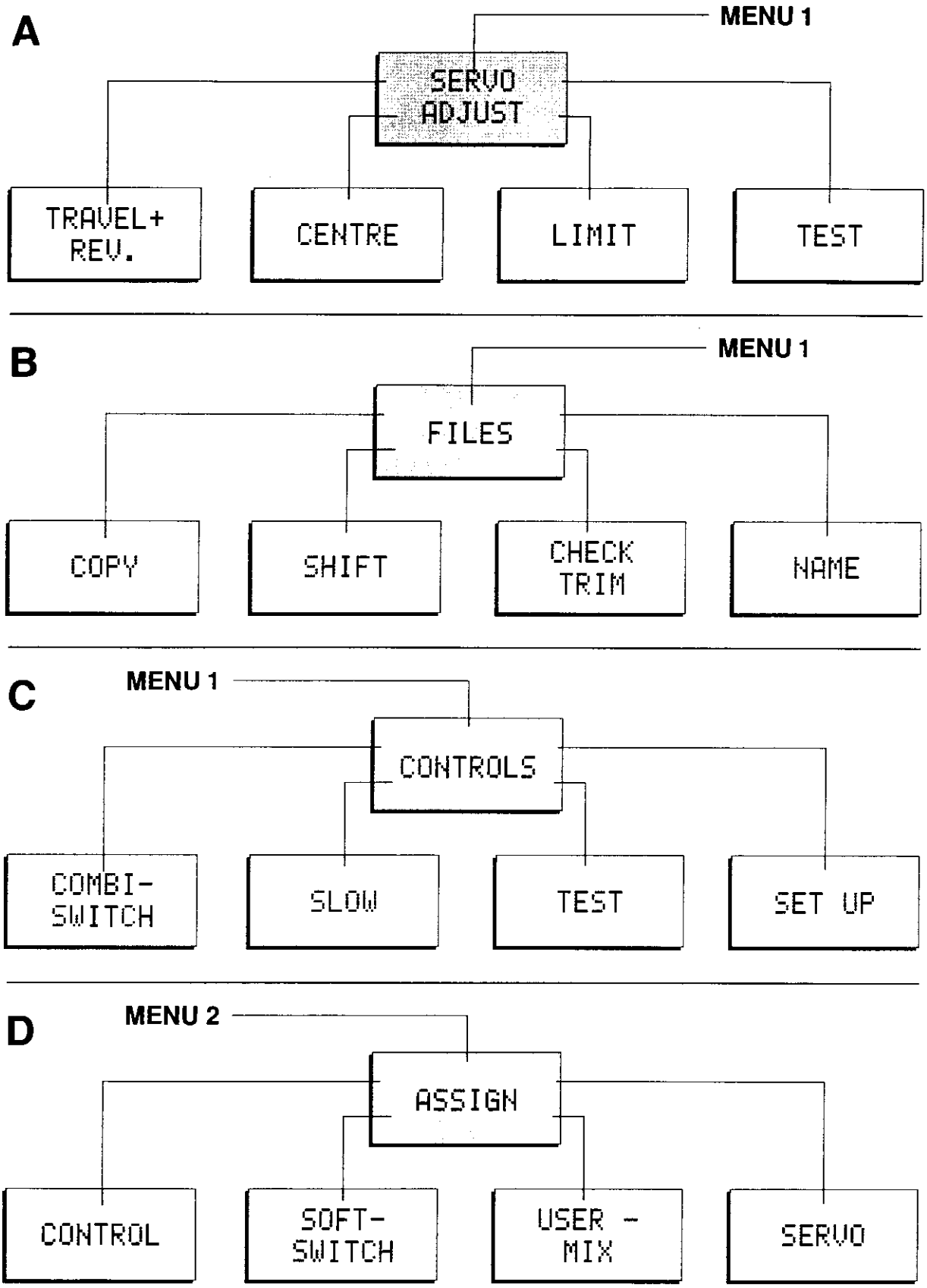



Have a look at the diagram above. You will see, for example, that there are four more menus hidden behind the "Memory" menu.

This is intended to show that there are four "dead ends" which are accessible from the "Memory" menu; in this case they are "Copy", "Shift", "Name" (enter, change), and "Trim" (check, match).

The same applies to three of the other branches of the tree. To avoid confusing the main diagrams, these "sub-menus" are shown in detail on page 13.

Using this branching system you can always reach your destination, i.e. get to the point where you want to adjust or assign something, just by pressing a few keys.




**As you know, once you are within the menu tree, you always move further on by pressing one of the selector keys.**

**You always return with the Ⓜ key.**

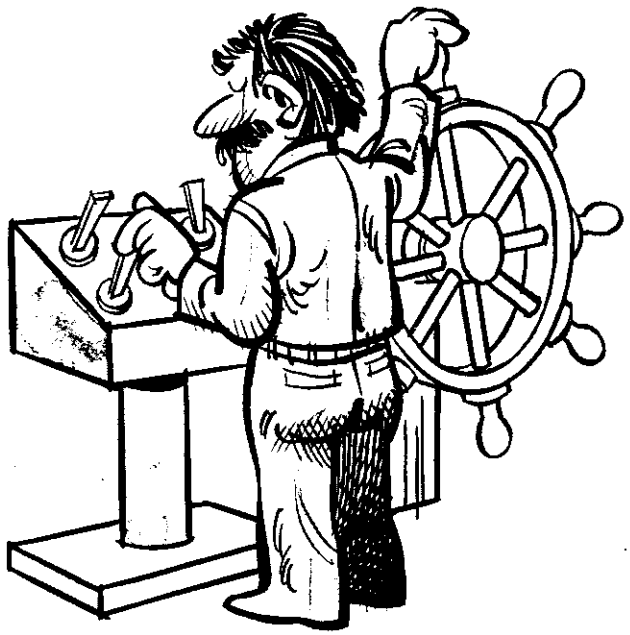
**The overall result:**

You don't need to learn any codes or confusing computer terminology. In fact, you will find that you don't even need the tree diagram after a while, as the plain English texts guide you easily through the menus. Our sole purpose in explaining the principle is to ensure that you have some idea of what you are doing when you press the various keys.

And anyway, a little understanding never hurt anyone.

The menu tree is arranged in such a way that it is quicker to get to the commonly used functions than to the rest. If you happen to need the rev counter every time you fly, then you are, alas, the exception which proves the rule.

# Transmitter controls and switches



This section is necessarily somewhat dry and theoretical, and you can skip it for the moment if you wish. However, sooner or later you will need to absorb some of this information, particularly when installing auxiliary switches or other expansion units.

As we have already seen on page 7, where the internal connectors are described, there are several different types of connector.

First there are the connectors which have one purpose only: Digi-Adjustor (DE), MULTINAUT (MNT), Keypad (T) and Memory Switch (M). There is not much to say about these sockets - each unit must be connected in the correct place.

Next comes the group of "letter inputs": A to I.

**These are connectors for the transmitter controls.** Here a brief explanation is necessary: the inputs A, B, C, D are not shown individually; they are grouped together as "KnL" (left-hand stick = A, B) and "KnR" (right-hand stick = C, D). The stick units must also be connected to the correct sockets (KnL and KnR).

The remaining inputs are marked S1 to S5 and L/S. This is where **"change-over switches"** and **"coupling switches"** are connected.

**What are transmitter controls?**

Well, in coarse terms, these are all the "movable elements" on your transmitter, which you use to operate something on your model. They include the two stick units, the sliders, and also, for example, the switch which you use to release the aero-tow mechanism.

So what are change-over switches and coupling switches?

These switches are usually used not to actually move something on the model, but, for example, to switch between different pre-set values (such as Dual Rates) or to activate coupled controls (e.g. Combi-Switch, or a flap/elevator coupling switch).

**Two "extras" for the expert:**

The switch "SI" is a special-purpose feature which does not fit into our neat scheme. It is a 3-stage switch, and should really be included as a "transmitter control", as it is connected to input "I". However, it can be used in a similar way to one of the change-over or coupling switches; especially in combination with the "Fixed Value" option, of which more anon.

There is also a software switch (i.e. it does not exist in hardware form) called "Gx".

An explanation of these special features would only confuse matters at this point. Please see page 76 in the Section entitled "For experts".

**Now we come to one further difference, and a possible source of confusion.**

According to what we have just said, a switch can be either a transmitter control or a change-over or coupling switch, depending on where it is connected inside the transmitter. But this is only partly true:

Change-over switches and coupling switches have a 2-core connecting lead. A switch with a 3-core lead cannot be used for this purpose.

Switches which act as transmitter controls may have either a 2-core or a 3-core lead. For a simple ON/OFF switch (2-position) the lead is 2-core. For a 3-stage switch it must be 3-core.

Why? When you plug in a switch, the transmitter control input "sees" whatever the unit is as a potentiometer. So the input sees a switch as a crude pot, which can only be set to its end- point values.

**And one more note**

In line with what we have just said, it is perfectly possible to connect switches (preferably 3-position switches) to inputs E and F instead of the standard sliders. This can be a useful feature for special models which require many switched channels.

On the other hand inputs G, H, I can also be used with further pots instead of switches.

Most users of the PROFI mc 3030 will hardly ever need these features. Our intention in presenting this brief excursion into the "realm of the unused features" is just to give you an idea of the flexibility and versatility of your new system.

**What this all means in practice:**

When you assign or adjust transmitter controls, you will always find yourself dealing with the "letter" abbreviations. When you are assigning change-over switches or coupling switches, you will be dealing with S1 to S5 and L/S. When fitting auxiliary switches you must bear in mind the number of wires in the cable.

# Special-purpose menus



## The "Operations" or "Status" display

(Here again we will assume that you have copied "BIG LIFT" into memory 01, as described under "Quickstart" - and that you have not switched to a different memory. Of course, what we are going to say next applies to every other model memory.)

When you switch the transmitter on, the Status display will appear on the LCD screen. It provides a summary of the most important things you need to know for controlling your model:




The top line:

**01** = number of the "current" memory. This is always the memory (or "list") which was in use last time you operated the system. This usually means: the model that you last flew.

**BIG LIFT** = Name of the model in English. That's easier than remembering a number, isn't it?

**PPM** = Transmitter's current transmission mode (modulation). Also the same as the last time you used the set.

**The second line:**

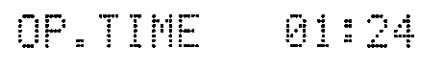



**8.24 V** = transmitter battery voltage. The digital value is very accurate, but unfortunately not easy to assimilate at first glance - a drawback of all digital displays. Immediately after a full charge the voltage is about 8.2 -8.4 V.

At 6.9 Volts the battery monitor trips, and the battery should be recharged.

Next to the digital display is a "bar" consisting of up to 11 "boxes". This is an analogue version of the digital voltage display; it is easier to understand at a glance, but it is not so accurate. Consider it as a rough indicator of battery voltage. The battery discharges steadily while you are using the transmitter, and at the same time the boxes are gradually erased from right to left; i.e. the bar becomes shorter. Because of manufacturing tolerances, and the inherently approximate nature of the bar, the display is not as accurate and reliable as the digital display, but it gives you a useful idea of how things are going.

**The third line:**




A very useful feature:

**The operating period display**

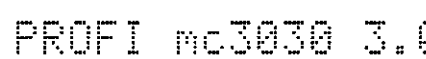
At any time you can see how long the transmitter has been in use since the last time the timer was reset to zero (you can do that at any time - see page 16 for further details).

The timer is cumulative, and it makes no difference how often you switch the transmitter on and off; the operating period timer stops counting when you switch off, and continues when you switch on again.

In practice the best way of managing the timer is as follows: set it to zero every time you recharge the battery.

The display shows **hours : minutes.**

**Bottom line:**




This line of the display will normally show the transmitter type designation "PROFI mc 3030", but there are exceptions:

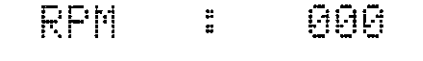
You can ask the MULTIPLEX Service Department to program in your name. This is designed as a security feature, and to prevent confusion over ownership, so you cannot change it yourself.

If you have activated the transmitter's stopwatch, this line automatically shows the stopwatch display:



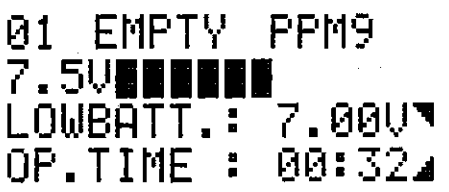

Please refer to page 16 for further details of the stopwatch.

But there is one function which always takes precedence: if you connect the **rev counter** (optional accessory, Order No. 7 5970) to the transmitter, this line of the display shows the rev count. For more details please see page 18.



## How to use the operating period timer

There is not much to say about this timer; all you can do to it is reset it to zero. To do this (starting from the Status display) press [M][◪][◹]. You will now be at the operating period timer menu:




Press the [◪] key; the value displayed will change to 00:00, and you are done.

Return to the Status display with [M][M][M][M].

The operating period display is in the form **hours : minutes.**

There is nothing else to worry about concerning this timer. When the transmitter is switched off, it records the last displayed time and starts again from the recorded value next time you switch on.

**When should I reset the display?**

The timer can count up to 99 hours 59 minutes, then it starts again from zero. That's by no means long enough to measure the lifetime of the transmitter, although it might be enough for "occasional flyers" to count their flying time per season.

It makes most sense to reset the timer to zero every time you give the transmitter battery a full charge. The transmitter's operating period from a full charge is around 5.5 hours, so the display gives you quite an accurate idea of how much longer you can fly. But please only consider this value as a guide. Slight differences in batteries and in the transmitter's current consumption can result in variations of up to +/- 20%. Your best bet is to carry out a practical experiment to determine how long your own transmitter actually lasts.

---

## How to use the stopwatch

To use the integral stopwatch you have to do two things:

**1.** You must "tell" the transmitter what you want to use to control the stopwatch. This is usually one of the switches S1 to S5, although the Teacher/Pupil switch can also be used.

However, it is also possible to start and stop the timer automatically, via a particular control function; for example, with the "motor on/off" switch in an electric-powered model. If you wish to make use of this facility, please read the section entitled "The Gx switch" on page 77.

**2.** You have to define the starting value, which also determines the mode of timing (count up or down).

The transmitter will then record the settings you have made in the "list" (or "program") for that model; the stopwatch will then always be available automatically when you select that model. You only have to enter these settings once.

**3.** In addition you can select whether your stopwatch is automatically reset to zero (00:00) when you start it.

**1. Defining the operating switch**

**The hardware definition**

From the mechanical point of view you have to decide between a simple ON/OFF switch with 2 fixed end-points (e.g. the Dual Rates switches) and a momentary switch (e.g. the stick end press-button, or the momentary switch, Order No. 7 5710, which is available as an optional extra).

If you use a 2-stage switch the timer runs for as long as the switch is set to "ON". If you use a momentary switch, the timer starts when you first press the button, and stops next time you press it.

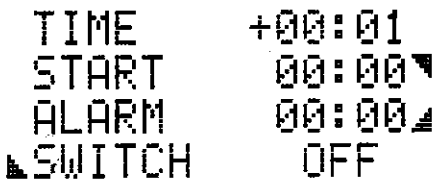
Pick the type of switch which seems most natural to you. If you opt for the 2-stage switch, you can use either one of the standard switches (S1 to S3, S5). Of course, the one you choose can no longer be used for its original function, but there are plenty of modellers who would never dream of using all three Dual Rates switches (S1 to S3), or who never use a Combi-Switch (S5), so they would have an obvious choice.

If you want to use a momentary switch then you will have to purchase one. The stick end press-button has to be installed by the MULTIPLEX Service Department. In this case we recommend that you plug the switch connector into "S4".

**The "software" definition**

This is carried out at the **"TIMER"** menu.

From the Status Menu press the keys [M][◪][◩]. You will see this:




Only the bottom line is of interest to us at the moment.

Press the [◹] key. The word "OFF" starts to flash, and you can now change it. Press the [R] key and "OFF" will be replaced by "ON".

If you press the [R] key repeatedly, you will see that ON and OFF alternate. At the same time the timer will run as long as "ON" is shown. This is one method of using the timer if you do not wish, or are unable, to dedicate a switch specifically to the timer. As this only works when you are at the "TIMER" Menu, this mode of operation is unsuitable for most applications.

In the following section we assume that you have fitted an extra switch for the timer, and that it is connected to "S4".

Leave the line at "ON" and press the [+] key.

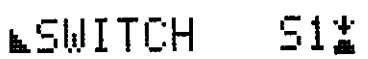
"ON" is now replaced by "S1". Press the [+] key again, and you see "S2", and so on.

Keep pressing until you see "S4".



If you have selected a 2-stage switch, this is the correct setting and you can move to the next section.

If you are using a momentary switch, keep pressing the ⊞ key. After "S5", "LS", "GI", "SI" you will see "S1". The button symbol after "S1" indicates that you can now select the momentary button switch:




Keep pressing the ⊞ key until "S4" is displayed. That is your setting for a momentary switch connected to "S4".

If you need to reverse the direction of action of the switch S4, you do not need to reverse the switch or plug physically; instead simply press the Ⓡ key once. The input field must be active ("S4" flashing) before this works.

That completes the switch definition process.

**2. Defining the mode of operation**

There are three options here:

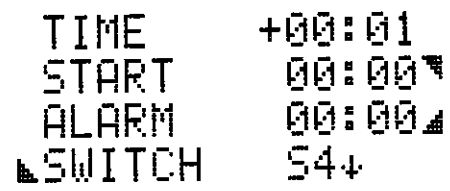
1. Normal stopwatch (starting value 00:00, counting up).

2. Countdown stopwatch. In this case you have to enter a starting value, from which the countdown runs. When it reaches 00:00 the actual timing process is finished. This mode of operation is especially useful for competition flying.

3. Count-up or count-down stopwatch (as 1. and 2. above), with cumulative timing (timer does not reset to zero).

**1. "Normal" stopwatch mode**

We assume that you are still at the "TIMER" menu:




For this mode of operation you have to set the starting value to 00:00.

If you do not see the word "START" in the second line, this is how you get it: press the ◥ key twice, then Ⓡ once.

If you do not see "00:00" in the "Start" line, this is how you get it: if you have just switched to Start, the minutes field will be flashing; if not you must press the ◥ key, and the "minutes" position will start flashing. Press the ⊞ or ⊟ keys, or rotate the Digi-Adjustor, to reset the value to "00". Now press the ◥ key again, and the "seconds" will flash. Reset the seconds to zero in the same way.

That's it! Press the Ⓜ key three times to return to the Status display. You will see in the bottom line TIME +00:00. You can now try the stopwatch out to see how it works.

Incidentally the upward arrow only indicates that the timer is working in the "count up" mode.

**2. Countdown stopwatch mode**

The timer counts backwards from a "pre-set" value towards zero. After a selectable "alarm" period the stopwatch alerts you in the following manner:

When you reach the alarm time the transmitter beeps;

After each full minute (if any) before zero it beeps again;

Then every 10 seconds;

Then every second ..... 3 - 2 - 1 - 0; one last, longer beep, and it's over.

After passing through zero, the timer continues counting "upwards", because everybody wants to know how many seconds "late" you were in landing your model. Setting up the stopwatch to work in this mode is hardly more difficult than for the "normal" mode.

First the start time:

For example. you wish this to start 2 1/2 minutes before "zero". Press the ◥ key; the minutes at "Start" begin to flash. You will know what to do next: set this value to "02" using the ⊞ or ⊟ keys, or the Digi-Adjustor. Then set the seconds: press the ◥ key again, the seconds value flashes, and you can set it to "30".

**Entering the alarm time:**




You enter the alarm period in line three:

Let us imagine that you want the alarm to sound 1 minute before zero. Press the ◪ key, and the minutes value in the "Alarm" line starts to flash. As already described, set this to "01", then set the seconds to "00" in the same way.

Press Ⓜ three times to return to the Status display. A downward-pointing arrow before the time reminds you that the stopwatch is set to the "countdown" mode.

For many applications it can be useful to be able to stop the timer and later start it again without resetting it to zero; for example: to determine the length of a motor run.

To do this, press the ◥ key twice; the minutes field flashes. If you now press Ⓡ once you reverse the mode of operation. The word "RESET" now appears in the display. Set the timer using the ◪ key, and return to the Status display with the Ⓜ key.

**One further note**

If you do not need the timer again, for any reason, simply move to the "TIMER" Menu and switch it to "OFF", as already described. This action does not lose the values you have entered. If you switch the timer "ON" again later, all the previous settings will reappear. All stopwatch settings apply only to the model in whose "list" the timer and all its settings are entered (the storing process occurs automatically). Thus you can enter and store different settings for every model, if you wish: varying according to the model and the way you use it.

## How to use the rev counter

If you want to measure the rotational speed of a model engine, a helicopter rotor, or anything else, you will need the rev counter sensor, Order No. 7 5970, which is an optional accessory. It is plugged into the transmitter's charge socket.

When the rev counter sensor is plugged in, the transmitter automatically shows the rev count in the bottom line of the screen. The Status display will look like this:

```
RPM    :    000
```

All you need to do now is to enter the number of propeller or rotor blades, to get a correct display of the speed.

**Follow this procedure:**

Press the keys M◪◪◹ to arrive at the "**REV COUNTER**" Menu. You will see this screen:

```
01 BIGLIFT  PPM9
- REV.COUNTER -
 BLADES:     1
 RPM    :   000
```

Press ◹. The displayed blade number starts flashing.

Set the correct number of blades with ⊞ or ⊟. That's it done.

Press M five times to return to the Status Display.

**A few further hints:**

As you have an "intelligent" transmitter, it records the number of blades in the "current" model list. If you want to use the rev counter another time on the same model, you do not need to set the number of blades again. However, try as we might, we could not make it clever enough to notice that you changed the 2-bladed prop for a 3-bladed one in the meantime . . .

The "1" option for the number of blades is not as silly as it may appear. For one thing, single-bladed propellers do exist (they are a rare breed, but not yet extinct); for another you can use this setting to measure the rotational speed of a shaft:

To do this you need to mark the shaft in some way, e.g. with tape or paint. The mark should contrast as strongly as possible with the shaft.

The rev count display always shows the speed in rpm (revolutions per minute). The range is up to 25,400 rpm, regardless of the number of blades. Resolution (accuracy) is to 100 rpm.

---

## How to switch between the transmission modes PPM7, PPM9 and PCM

The transmitter can be used with both PPM receivers (e.g. "UNI 9") and with PCM units (e.g. "PCM DS").

You have to set the transmission mode to match the type of receiver you wish to use.

This is how you do it:

From the Status Display press M◪◪◪ to arrive at the "**PPM/PCM**" display.

You will see this:

```
01 BIGLIFT  PPM9
----------------
MODULATION:PPM9◢
----------------
```

Press the ◪ key. "PPM7", "PPM9" (or "PCM") will start to flash.

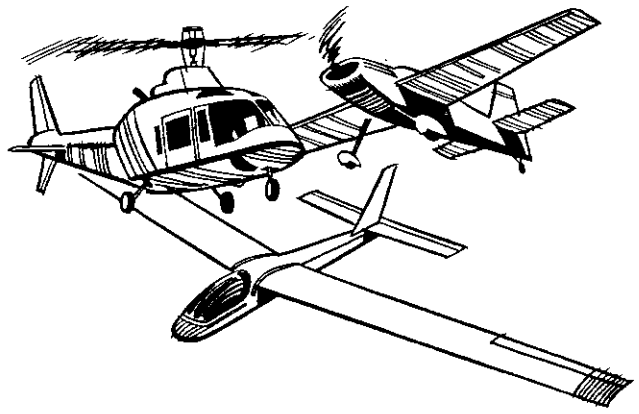
Press the R key. PPM will change to PCM (or vice versa). That's all there is to it. Use the ⊞ or ⊟ key to change from PPM 7 to PPM 9 and back.

Press M five times to get back to the Status Display.

It is only necessary to switch to PPM 7 if you wish to use a receiver which cannot decode 9 channels (e.g. 4/6 channel receivers built in 1979). If you attempt to use this type of receiver with the transmitter set to PPM 9, the servos attached to outputs 1 + 2 will not work correctly.

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# *Pre-programmed models*
## *("ready made lists")*



In the transmitter's standard form, memories No. 6 to No. 15 contain "ready programmed" model lists (or programs). These example programs embrace a high percentage of the models which are actually flown by practising modellers.

You can use any of these example lists just by switching to the appropriate memory, as described on page 50. Before you fly your model, you may well have to alter the direction of servo rotation, and that is described on page 34.

You may like to use these examples as the starting point for your own lists. If you do not want to change the "original", first copy it into an empty memory (as described on page 48) and then make modifications to the copy.

**The following example lists are available as standard:**

**Memory No. 6:**
"FIESTA" – a typical simple glider

**Memory No. 7:**
"SALTO" – a typical glider with V-tail and "flaperons"

**Memory No. 8:**
"F3B" – a typical F3B class glider with "aileron brakes"

**Memory No. 9:**
"CORTINA" – a typical tailless glider

**Memory No. 10:**
"BIG LIFT" – a typical simple powered model

**Memory No. 11:**
"RC1/F3A" – a typical powered aerobatic model

**Memory No. 12:**
"MIRAGE" – a typical delta model

**Memory No. 13:**
"HELI BOY" – a typical helicopter with "Schlueter" rotor head

**Memory No. 14:**
"RANGER" – a typical helicopter with "Heim" rotor head

**Memory No. 15:**
"BK 117" – a typical helicopter with "120 degree" rotor head linkage using virtual swashplate

**In all the examples it is assumed that the transmitter is set up as follows:**

Rudder (or tail rotor) and elevator (pitch-axis) on the right-hand stick

Throttle (or spoilers or collective pitch) and aileron (or roll) on the left-hand stick

**If you use a different transmitter mode, here are brief instructions on how to change the settings:**

**Interchanging aileron (roll) and rudder (tail rotor):**

**1.** From the Status Display press [M][◪][◹][◪]. You are now at the "Assign controls" Menu:

```
- ASSIGN CTRL. -
CONTROL      A
IS     AILERON
```

**2.** Assign control A to the rudder, as follows: press [◹][⊞][⊞]. Result:

```
CONTROL      A
IS     RUDDER
```

**3.** Assign control C to the ailerons, as follows: press [◪][⊞][⊞], then [◹][⊟][⊟]. Result:

```
CONTROL      C
IS     AILERON
```

**4.** Return to the Status Display: press [M][M][M][M]. That's it finished.

**Interchanging throttle (spoiler/collective pitch) and elevator (pitch-axis):**

**1.** Move to the "Assign controls" menu with [M][◪][◹][◪], as described above.

**2.** Assign control B to the elevator (pitch-axis), as follows: press [◪][⊞], then [◹], and then [⊞] repeatedly until ELEVATOR (or PITCH-AXIS) appears. Result:

```
CONTROL      B
IS   ELEVATOR
```

**3.** Assign control D to throttle (spoiler/collective pitch), as follows: press [◪][⊞][⊞], then [◹], then [⊞] repeatedly until THROT (or SPOILER or COLL. PITCH) appears. Result:

```
CONTROL      D
IS    THROTTLE
```

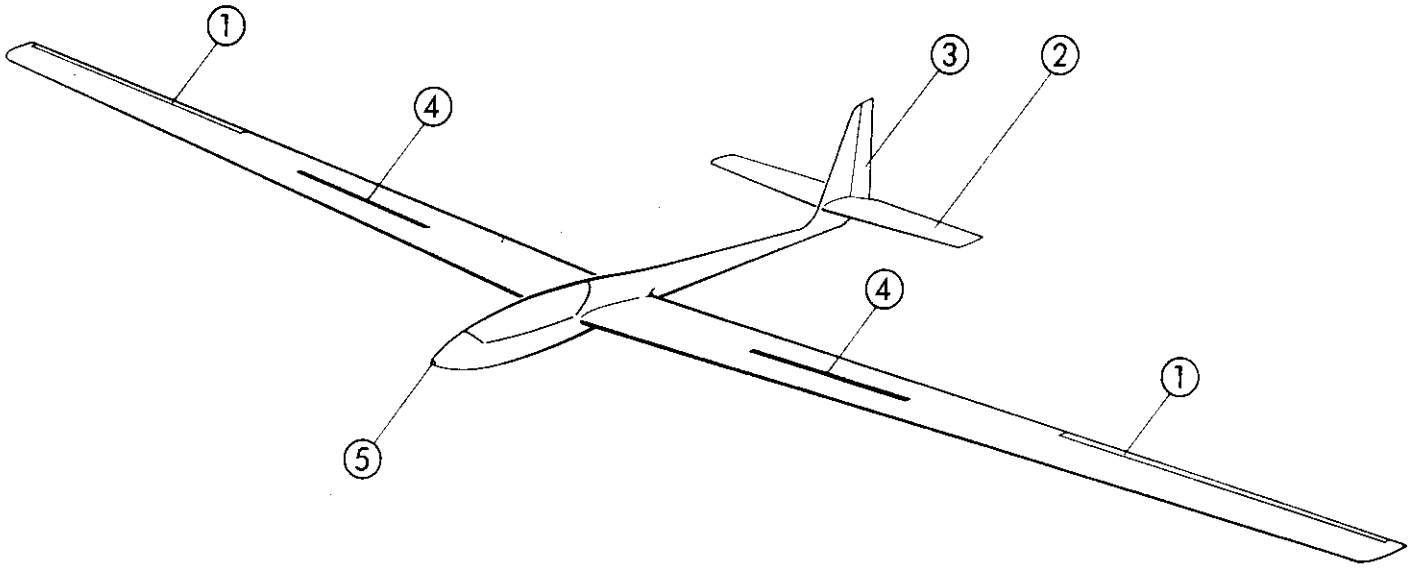
**4.** Return to the Status Display by pressing [M] five times.

The procedure for assigning the transmitter controls is described in detail on page 30.

# Example: "FIESTA"

**Memory No.: 6**

The "FIESTA" is an example of a simple model glider. The ailerons are controlled by a single servo (mechanical differential). The airbrakes are operated with the left-hand stick. "Combi-Switch" supported. An aero-tow coupling, or radio-controlled towhook, if fitted, is operated by a switched channel. A mixer is featured to provide pitch trim compensation when airbrakes are extended. However, the mixing input is set to zero as standard, and the user has to set the value if he needs the feature.




**Summary:**

| Channel | A | B | C | D | E | F | G |
|---|---|---|---|---|---|---|---|
| controls | Aileron | Spoiler | Rudder | Elevator | – – – | – – – | Aero-tow |

| Servo No | 1 | 2 | 3 | 4 | 5 | |
|---|---|---|---|---|---|---|
| Function | AILERON | ELEVATOR | RUDDER | SPOILER | TOWHOOK | |
| Mixer | – – – | ELE + | – – – | – – – | – – – | |
| 1st inp. | AILERON | ELEVATOR | RUDDER | SPOILER | TOWHOOK | |
| 2nd inp. | – – – | SPOILER | – – – | – – – | – – – | |

**Note:** the "FLAP" input of the "ELEVATOR" mixer must be set to 0;
the "SPOILER" input can be set to any value by the user.

**Switches:** S5 = Combi-Switch

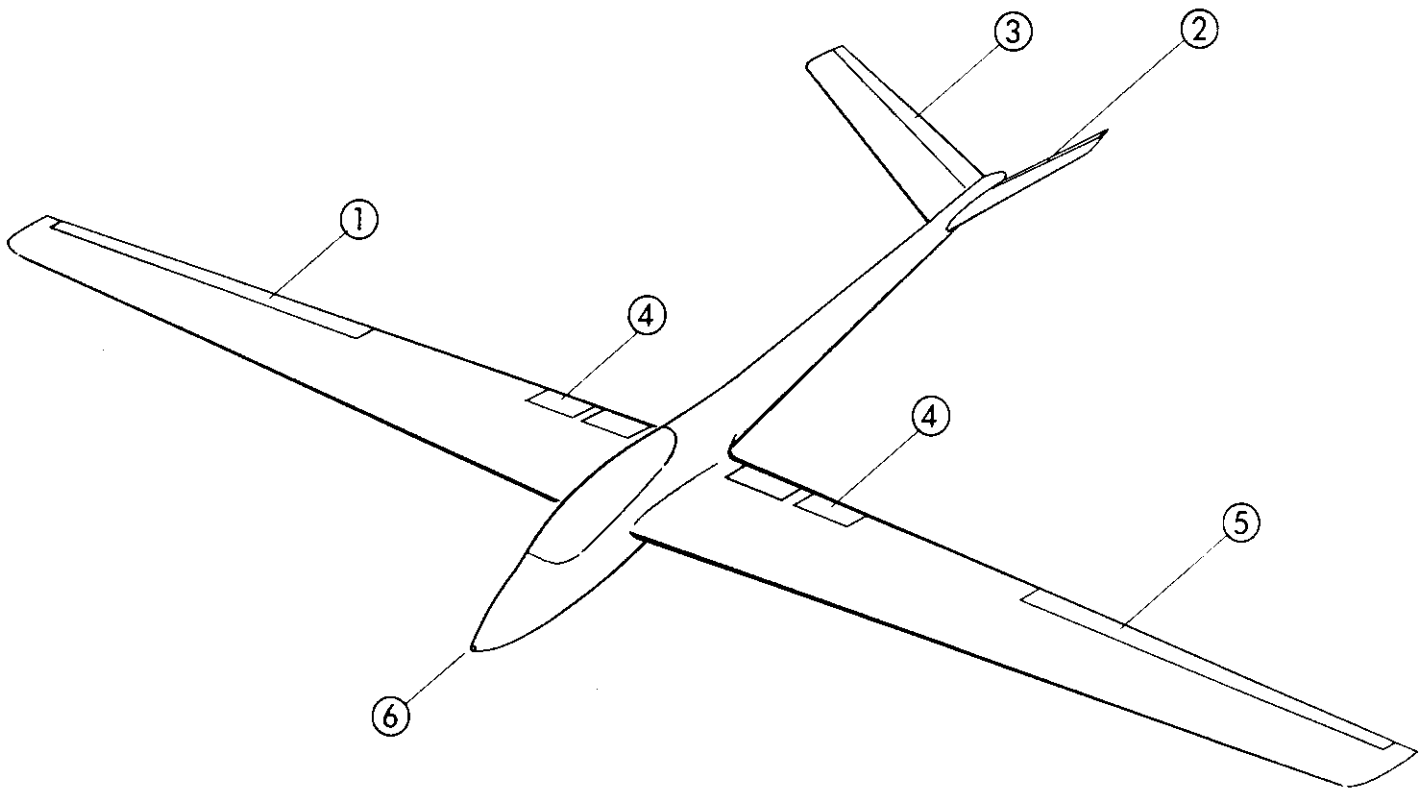
**Adjustments:** Combi-Switch: Aileron → rudder, following rate 100%.
All servos: travel 100%, centre 0%.

**Possible modifications:** Combi-Switch rudder → aileron, switched off
Airbrake operation via slider instead of stick

# Example: "SALTO"

**Memory No.: 7**

The "Salto" is an example of a model with a V-tail. At the inboard end of each wing are 2 rotating trailing edge spoilers, which are used to lose height and to control the landing approach. The ailerons are operated by two servos, with "electronic" differential. They are also set up as "flaperons", i.e. they can be moved in the same direction to act as camber-changing flaps. As flaperons which do not reach to the wing root have inherent aerodynamic disadvantages, the "flap input" should be kept small, and they should only be used for aerobatics to improve manoeuvrability. For this reason the flap input can be switched off by means of the switch S3. The flaps and the spoilers are mixed with the elevator, to provide automatic pitch trim compensation.




**Summary:**

| Channel | A | B | C | D | E | F | G |
|---|---|---|---|---|---|---|---|
| controls | Aileron | Spoiler | Rudder | Elevator | – – – | Flap | Aero-tow |

| Servo No | 1 | 2 | 3 | 4 | 5 | 6 | |
|---|---|---|---|---|---|---|---|
| Function | Flaperon | V-tail | V-tail | Spoiler | Flaperon | Towhook | |
| Mixer | FLAPERON | V-TAIL+ | V-TAIL+ | – – – | FLAPERON | – – – | |
| 1st inp. | AILERON | RUDDER | RUDDER | SPOILER | AILERON | TOWHOOK | |
| 2nd inp. | FLAP | ELEVATOR | ELEVATOR | – – – | FLAP | – – – | |
| 3rd inp. | – – – | SPOILER | SPOILER | – – – | – – – | – – – | |
| 4th inp, | – – – | FLAP | FLAP | – – – | – – – | – – – | |

**Switches:** S1, S2 for Dual Rates on AILERON, ELEVATOR; S3 switches the flap input to the ailerons

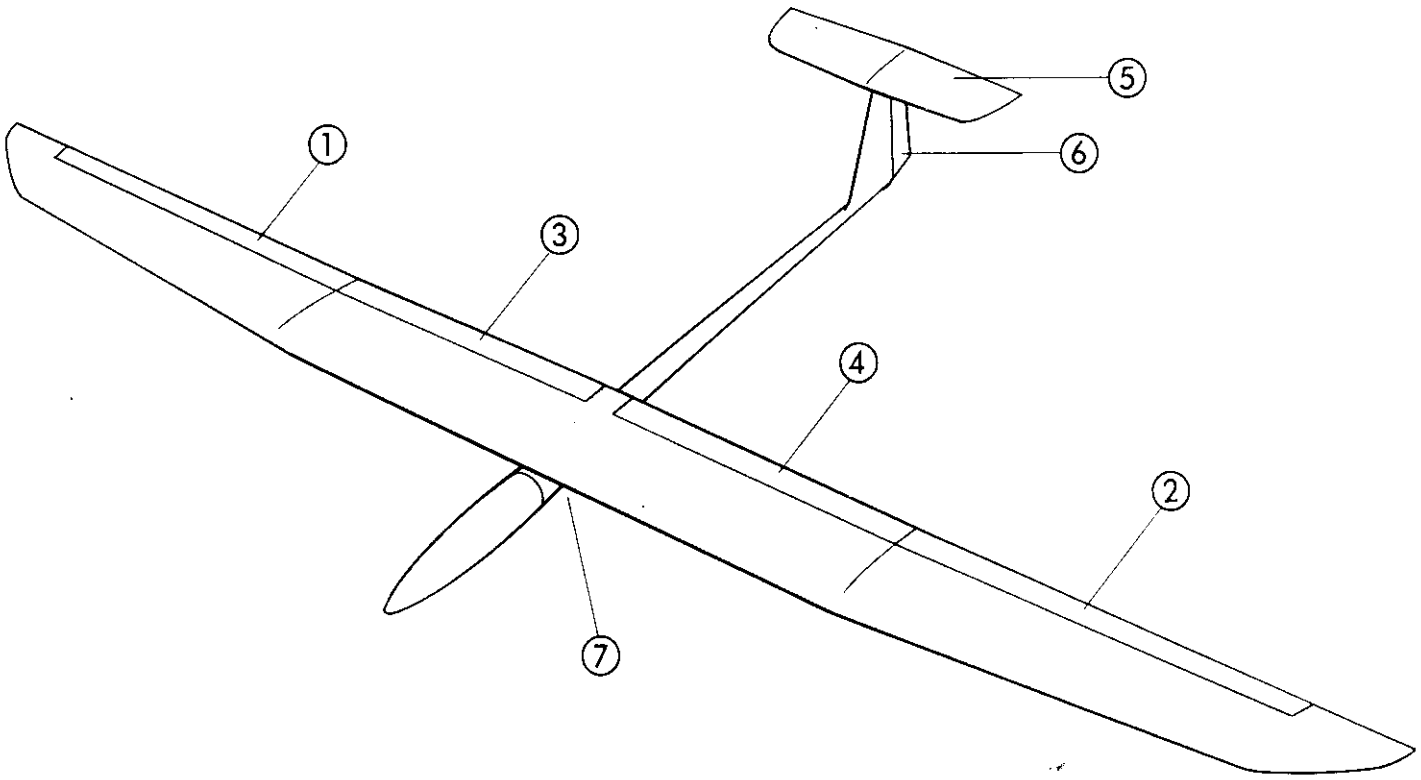
**Note:** when adjusting the mixing inputs it can be very useful to switch off any mixing inputs which are not needed for the moment

**Possible modifications:** Control of the FLAP input via stick instead of slider
Use of Combi-Switch (controlled via S5).

# Example model: "F3B"

**Memory No.: 8**

The picture shows a typical F3B class competition model. The control system is quite complex. Each aileron and each flap is operated by its own servo. This makes "Quadro" and "aileron brake" (crow) control systems possible. In normal flight the ailerons support the camber-changing flaps, and vice versa; for landing the flaps are deflected fully down and the ailerons fully up ("aileron brake" function). Elevator compensation is mixed in with the camber-changing flap movement and the aileron brake system to compensate for pitch trim changes. Flap movement can be mixed in to support elevator movement. A radio-controlled towhook (towhook and aero-tow release treated as the same for control purposes) is an optional addition.




**Summary:**

| Channel | A | B | C | D | E | F | G |
|---|---|---|---|---|---|---|---|
| controls | Aileron | Spoiler | Rudder | Elevator | --- | Flap | Aero-tow |

| Servo No | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
|---|---|---|---|---|---|---|---|
| Function | R. ail. | L. ail. | R. flap | L. flap | Elev | Rudder | Tow |
| Mixer | CROW | CROW | CROW | CROW | ELEV+ | --- | --- |
| 1st inp. | AILERON | AILERON | AILERON | AILERON | ELEVATOR | RUDDER | --- |
| 2nd inp. | FLAP | FLAP | FLAP | FLAP | FLAP | --- | --- |
| 3rd inp. | SPOILER | SPOILER | SPOILER | SPOILER | SPOILER | --- | --- |
| 4th inp. | ELEVATOR | ELEVATOR | ELEVATOR | --- | --- | --- | --- |

**Note:** when adjusting the mixing inputs it can be very useful to switch off any inputs which are not needed for the moment

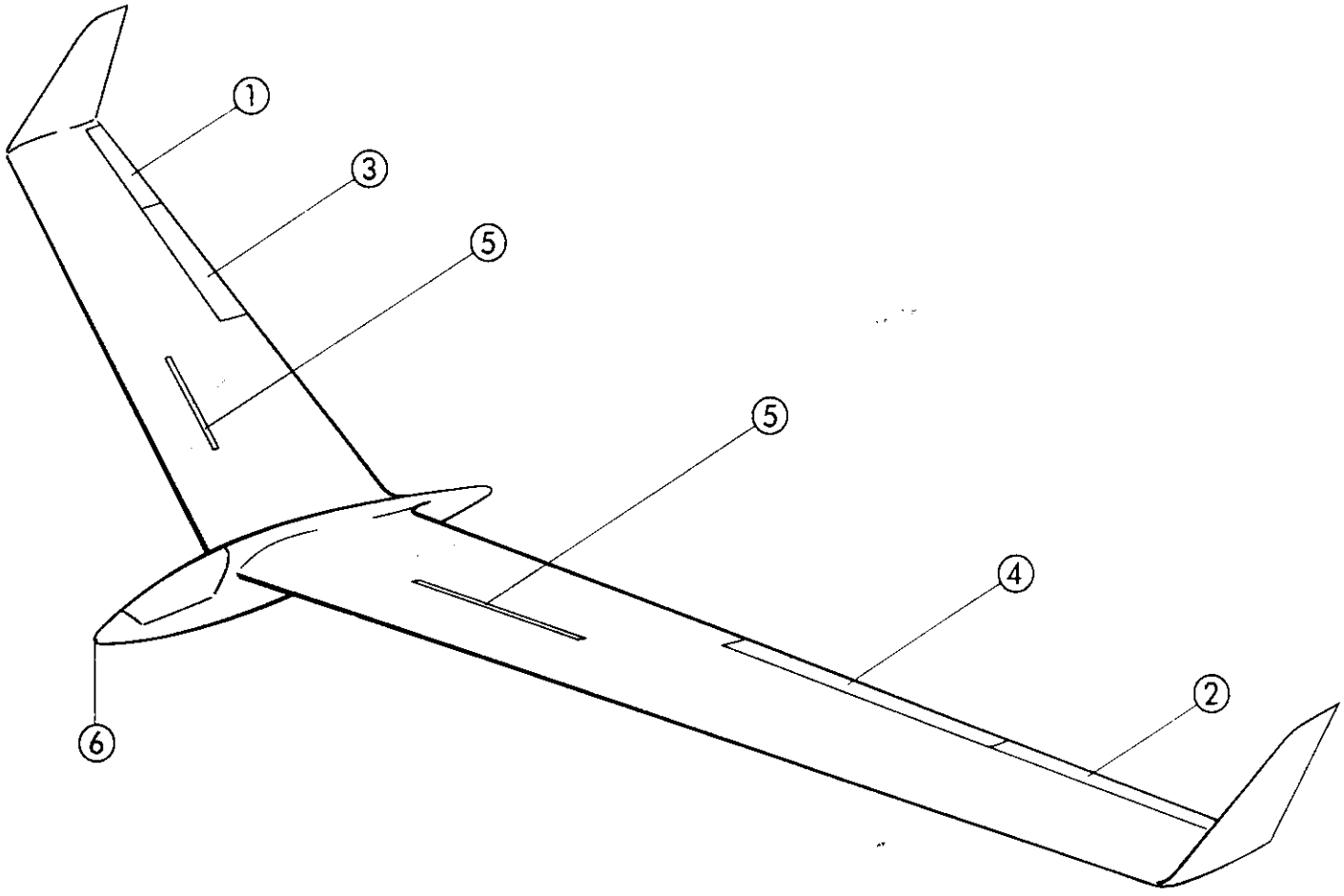
**Possible modifications:** Control of the FLAP input via stick instead of slider
Flap control with one servo only; in this case they cannot support the aileron function.

# Example model: "CORTINA"

**Memory No.: 9**

"Cortina" is a typical example of a modern tailless glider. Control is achieved with two control surfaces per wing panel, each surface working as combined elevator and aileron (elevons). This arrangement makes it possible to achieve favourable lift distribution in all flight situations.

The mixing ratios for elevator and aileron are different for the inboard and outboard elevons. A separate servo is required for each elevon. Airbrakes are included for height dumping and landing approach control. The aerotow coupling is actuated via a switched channel.




**Summary:**

| Channel | A | B | C | D | E | F | G |
|---|---|---|---|---|---|---|---|
| controls | Aileron | Spoiler | – – – | Elevator | – – – | – – – | Aero-tow |

| Servo No | 1 | 2 | 3 | 4 | 5 | 6 |
|---|---|---|---|---|---|---|
| Function | Elevon R, out | Elevon L, out | Elevon R, in | Elevon L, in | Spoiler | Aero-tow |
| Mixer | DELTA | DELTA | DELTA | DELTA | – – – | – – – |
| 1st inp. | AILERON | AILERON | AILERON | AILERON | SPOILER | TOWHOOK |
| 2nd inp. | ELEVATOR | ELEVATOR | ELEVATOR | ELEVATOR | – – – | – – – |

**Possible modifications:** Control of airbrakes via slider instead of stick. Use of a freely definable mixer instead of the "DELTA" mixer.

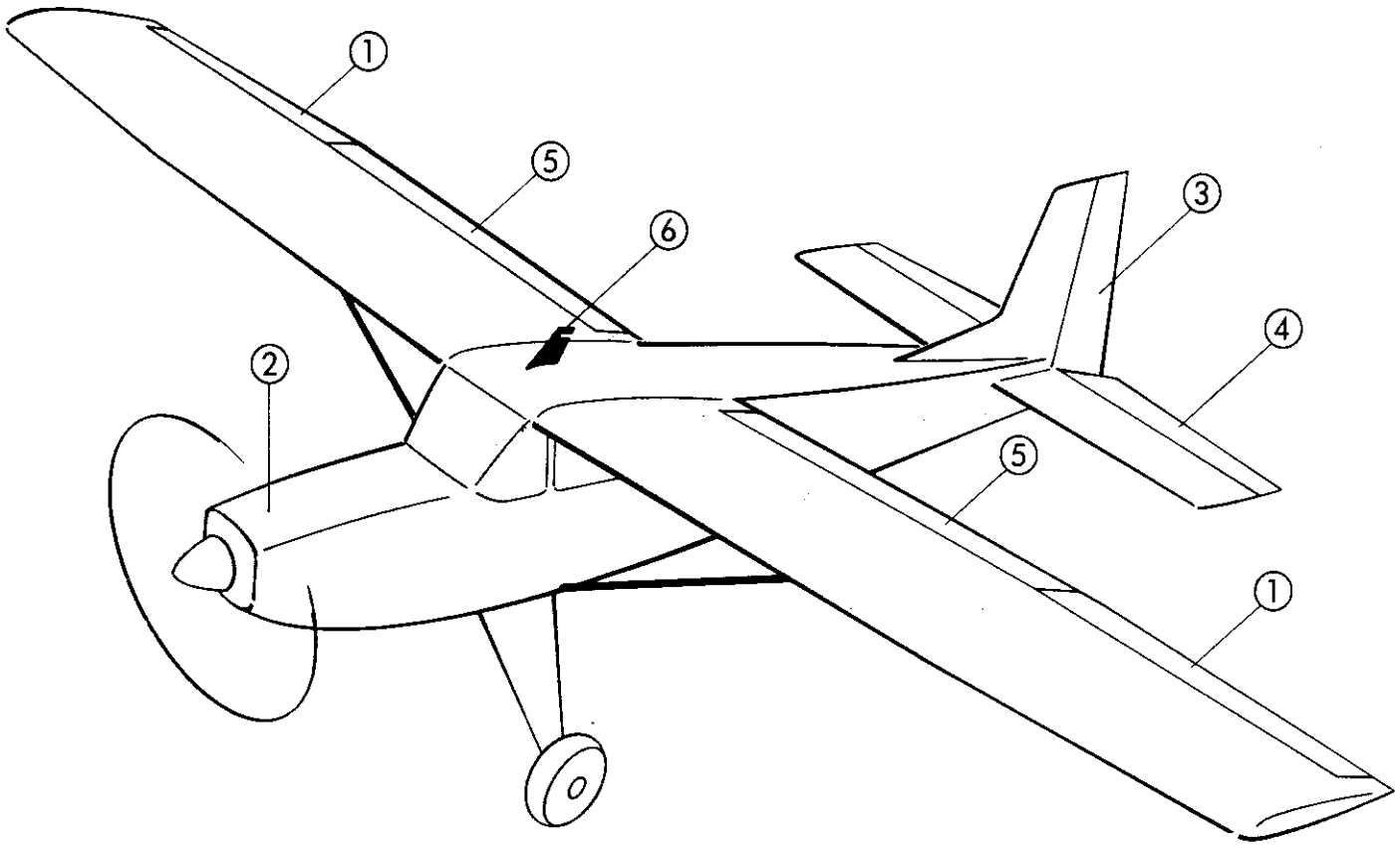
Defined inputs then: AILERON, ELEVATOR, SPOILER.

This arrangement would allow automatic elevator compensation for pitch trim changes caused by airbrakes.

# Example model: "BIG LIFT"

**Memory No. 10**

The "Big Lift" represents a simple powered model. Ailerons and landing flaps are fitted in addition to the standard controls. An aero-tow release can be operated via the switched channel.




**Summary:**

| Channel | A | B | C | D | E | F | G |
|---|---|---|---|---|---|---|---|
| controls | Aileron | Throttle | Rudder | Elevator | Flap | – – – | Aero-tow |

| Servo No | 1 | 2 | 3 | 4 | 5 | 6 | |
|---|---|---|---|---|---|---|---|
| Function | AILERON | THROTTLE | RUDDER | ELEVATOR | FLAP | AERO-TOW | |

| Switch | S1 | S2 | S3 | | S5 | | |
|---|---|---|---|---|---|---|---|
| Use | DR, ail | DR, ele | DR, rud | | Combi-Sw | | |

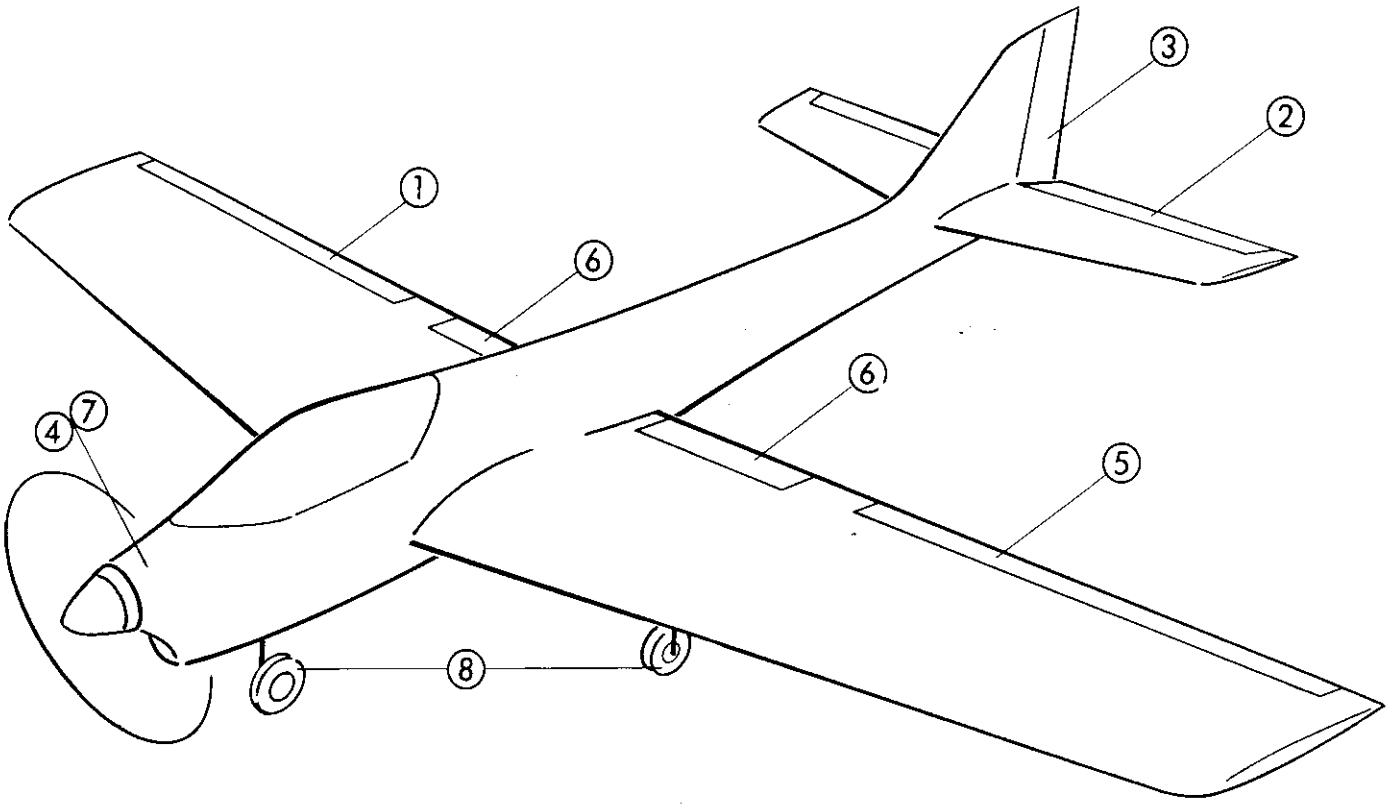
**Adjustments:** Transmitter control option: Dual Rate on aileron, elevator, rudder: 60%
Transmitter control option: throttle idle trim: –30%
Transmitter control option: flap travel: 0%, 100%
Combi-Switch: Aileron → rudder, following rate 100%
All servos: travel 100%, centre 0%

**Possible modifications:** Combi-Switch rudder → aileron, or switched off

# Example model: "RC1/F3A"

**Memory No.: 11**

Example of an F3A class competition model. The ailerons are each controlled by a separate aileron, to allow the optimum degree of differential to be set. Two spoilers are fitted, acting as airbrakes. Mixture control in addition to throttle control. A further servo can be fitted to retract the undercarriage via the switched channel. No mixers required.




**Summary:**

| Channel | A | B | C | D | E | F | G |
|---|---|---|---|---|---|---|---|
| controls | Aileron | Throttle | Rudder | Elevator | Mixture | Spoiler | Undercarr. |

| Servo No | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
|---|---|---|---|---|---|---|---|---|
| Function | L. AIL. | ELEVATOR | RUDDER | THROTTLE | R. AIL. | SPOILER | MIXTURE | UNDERC |

| Switch | S1 | S2 | S3 | | | |
|---|---|---|---|---|---|---|
| Use | DR, ail | DR, ele | DR, rud | | | |

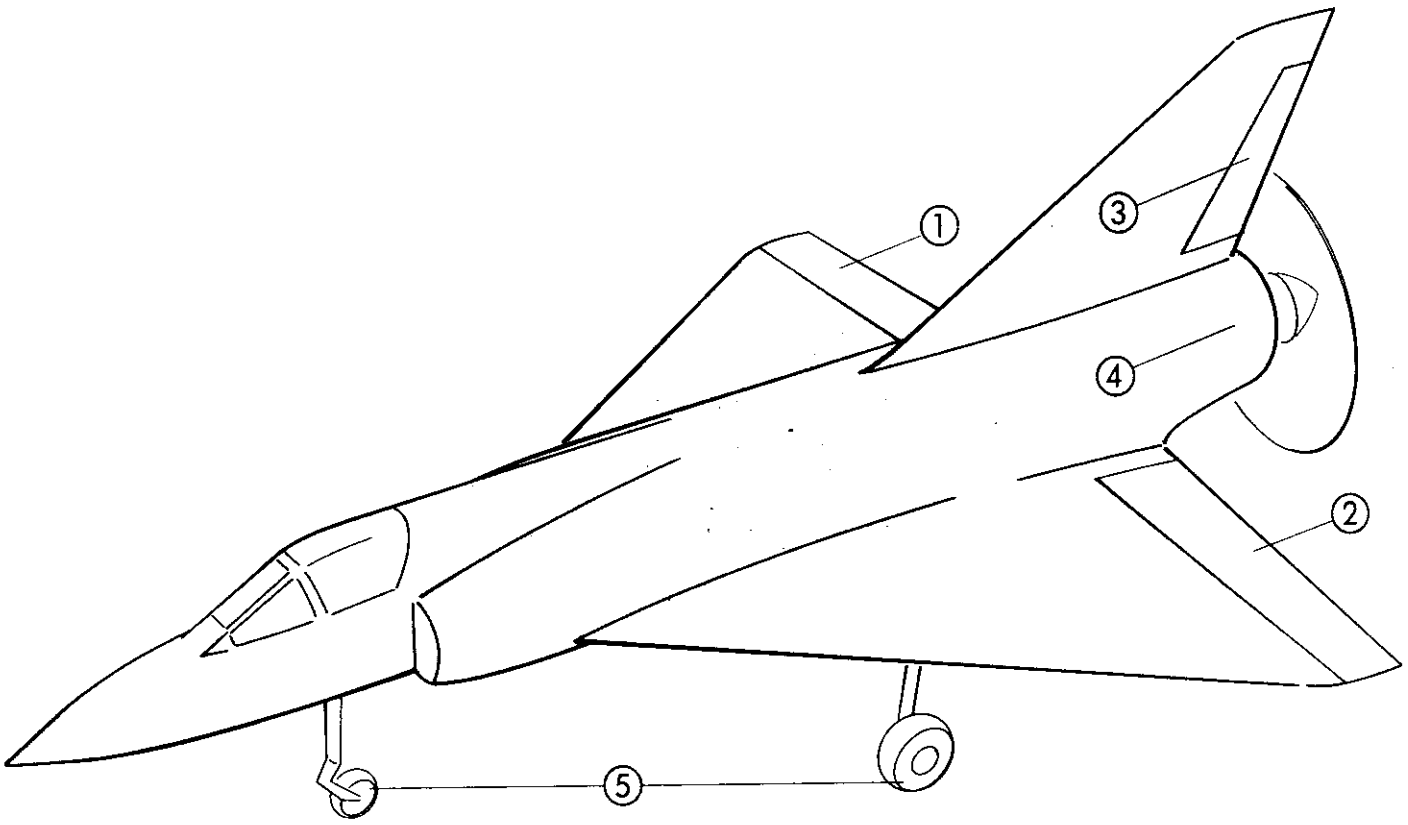
**Posible modifications:** Exponential servo travel instead of Dual Rates.
If "snap-flaps" are fitted instead of spoilers, use of "SNAPFLAP" mixer.

# Example model: "MIRAGE"

**Memory: No.: 12**

The "Mirage" is a simple delta model. It is controlled via combined ailerons/elevators (elevons), plus rudder and throttle.

The undercarriage can be retracted via the switched channel. The elevons are controlled with the help of a DELTA mixer.




**Summary:**

| Channel | A | B | C | D | E | F | G |
|---|---|---|---|---|---|---|---|
| controls | Aileron | Throttle | Rudder | Elevator | --- | --- | Undercarr. |

| Servo No | 1 | 2 | 3 | 4 | 5 | | |
|---|---|---|---|---|---|---|---|
| Function | R elevon | L elevon | RUDDER | THROTTLE | UNDERC. | | |
| Mixer | DELTA | DELTA | --- | --- | --- | | |
| 1st inp. | ELEVATOR | ELEVATOR | RUDDER | THROTTLE | --- | | |
| 2nd inp. | AILERON | AILERON | --- | --- | --- | | |

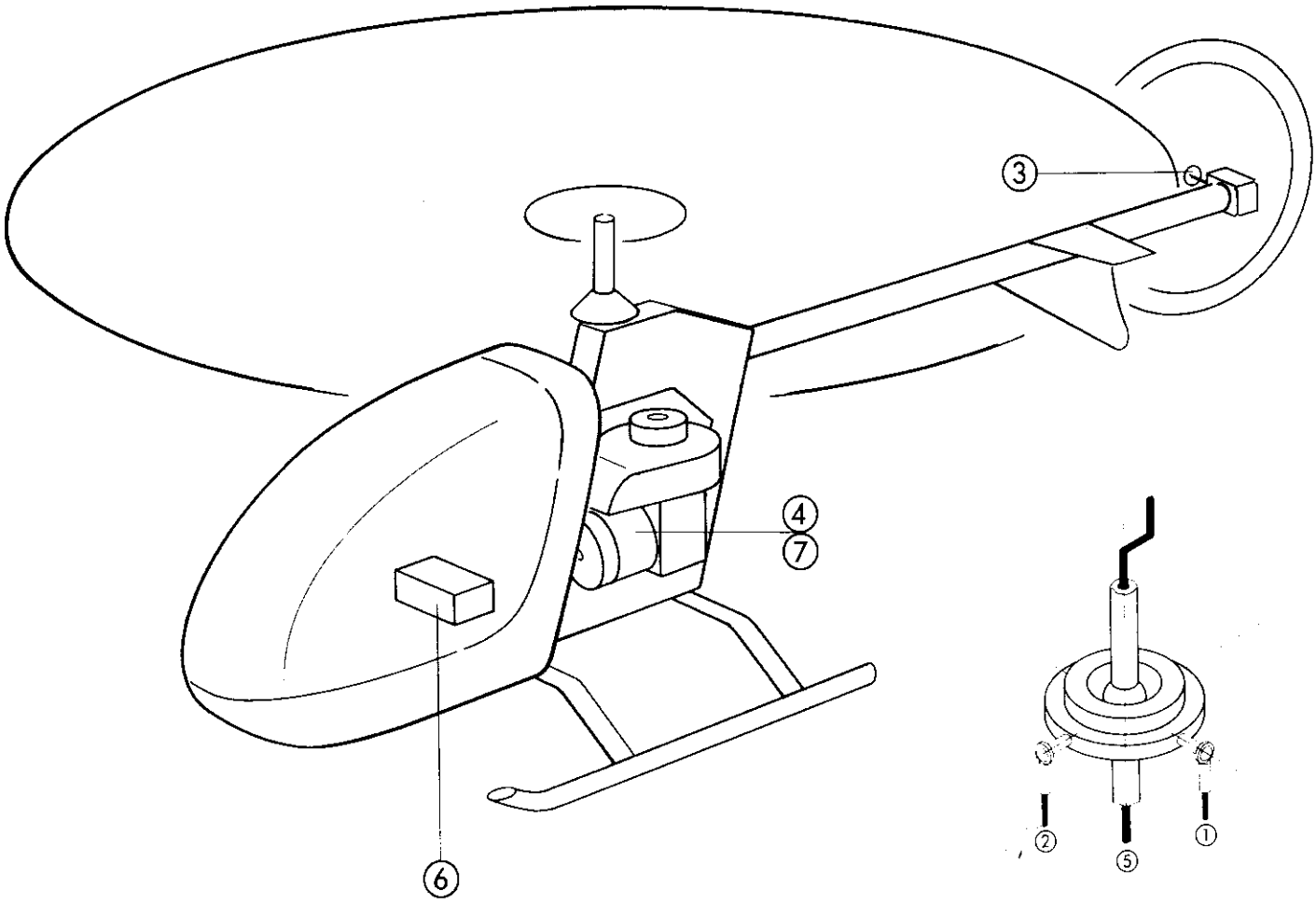
**Switches:** S1 = Dual Rates, aileron; S2 = Dual Rates, elevator

**Adjustments:** Mixing input ELEVATOR: 40% (recommended starting point)
Mixing input AILERON: 60% (recommended starting point)
Throttle idle trim: −30%
Dual Rates ELEVATOR, AILERON: 60%
All servos: travel 100%, centre 0%

# Example model: "HELI BOY"

**Memory No.: 13**

Example of a "simple" model helicopter, with swash-plate having no axial movement. Collective pitch, pitch-axis and roll-axis are controlled by one servo each. FLARE mixer used for "flare" compensation. Simple "THROTTLE" assignment used for throttle instead of "DYN.THR.". This, of course, is just a starting point.
Gyro assumed is a "suppressible" type. You can switch between minimum and maximum gyro effect using switched channel G.




**Summary:**

| Channel | A | B | C | D | E | F | G |
|---|---|---|---|---|---|---|---|
| controls | Roll | Collect. | Yaw | Pitch | Throttle | Mixture | Gyro |

| Servo No | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
|---|---|---|---|---|---|---|---|
| Function | Roll | Pitch | Yaw | THROTTLE | Collect. | Gyro | Mixture |
| Mixer | --- | FLARE | TAIL ROT | --- | --- | --- | |
| 1st inp. | ROLL | PITCH | YAW | THROTTLE | --- | --- | |
| 2nd inp. | --- | COLLECT. | COLLECT. | --- | --- | --- | |

**Switches:** S1 - Dual Rates, roll; S2 Dual Rates, pitch-axis; S5 - direct throttle

**Notes:** only the end-points of switched channel G are used; the centre position is skipped.
3-point throttle curve used.

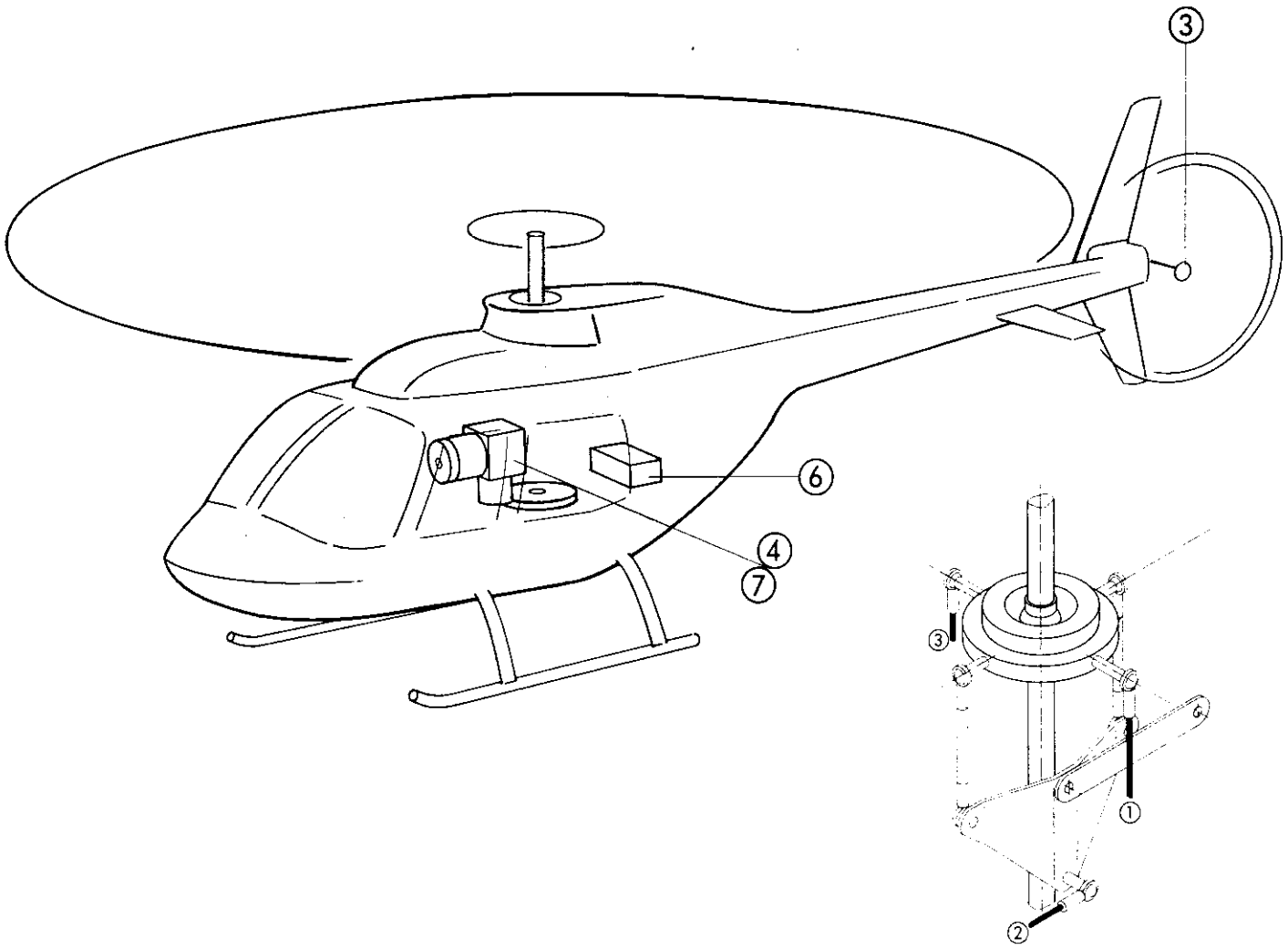
**Possible modifications:** "DYN.THR." mixer instead of THROTTLE
5-point throttle curve
"FLARE" mixer not used, only PITCH-axis on pitch-axis servo
Gyro not used (different type of gyro)

# Example model: "RANGER"

**Memory No.: 14**

Example of a helicopter with the "Heim" swashplate actuation system. The swashplate is actuated by two roll/collective pitch servos, and the "HEIMHEAD" mixer is used. A separate servo provides pitch-axis control. In this example "DYN.THR." is used.

A "suppressible" gyro is assumed, which can be switched between maximum and minimum effect by means of switched control H. "Flare" mixing is not required, as "Heim" mechanics cater for this mechanically.







**Summary:**

| Channel | A | B | C | D | E | F | G |
|---|---|---|---|---|---|---|---|
| controls | Roll | Collect. | Yaw | Pitch | Throttle | Mixture | Gyro |

| Servo No | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
|---|---|---|---|---|---|---|---|
| Function | Roll/col | Pitch | Yaw | Throttle | Roll/col | Gyro | Mixture |
| Mixer | HEIMHEAD | --- | TAIL ROT | DYN THR | HEIMHEAD | --- | --- |
| 1st inp. | ROLL | PITCH | YAW | THROTTLE | ROLL | GYRO | MIXTURE |
| 2nd inp. | COLLECT. | --- | COLLECT. | PITCH | COLLECT. | --- | --- |
| 3rd inp. | --- | --- | --- | ROLL | --- | --- | --- |
| 4th inp. | --- | --- | --- | YAW | --- | --- | --- |

**Switches:** S1 - Dual Rates, roll; S2 - Dual Rates, pitch-axis; S5 - direct throttle

**Notes:** Switch control H must be installed (On/Off switch, 3-core lead)
5-point throttle curve used

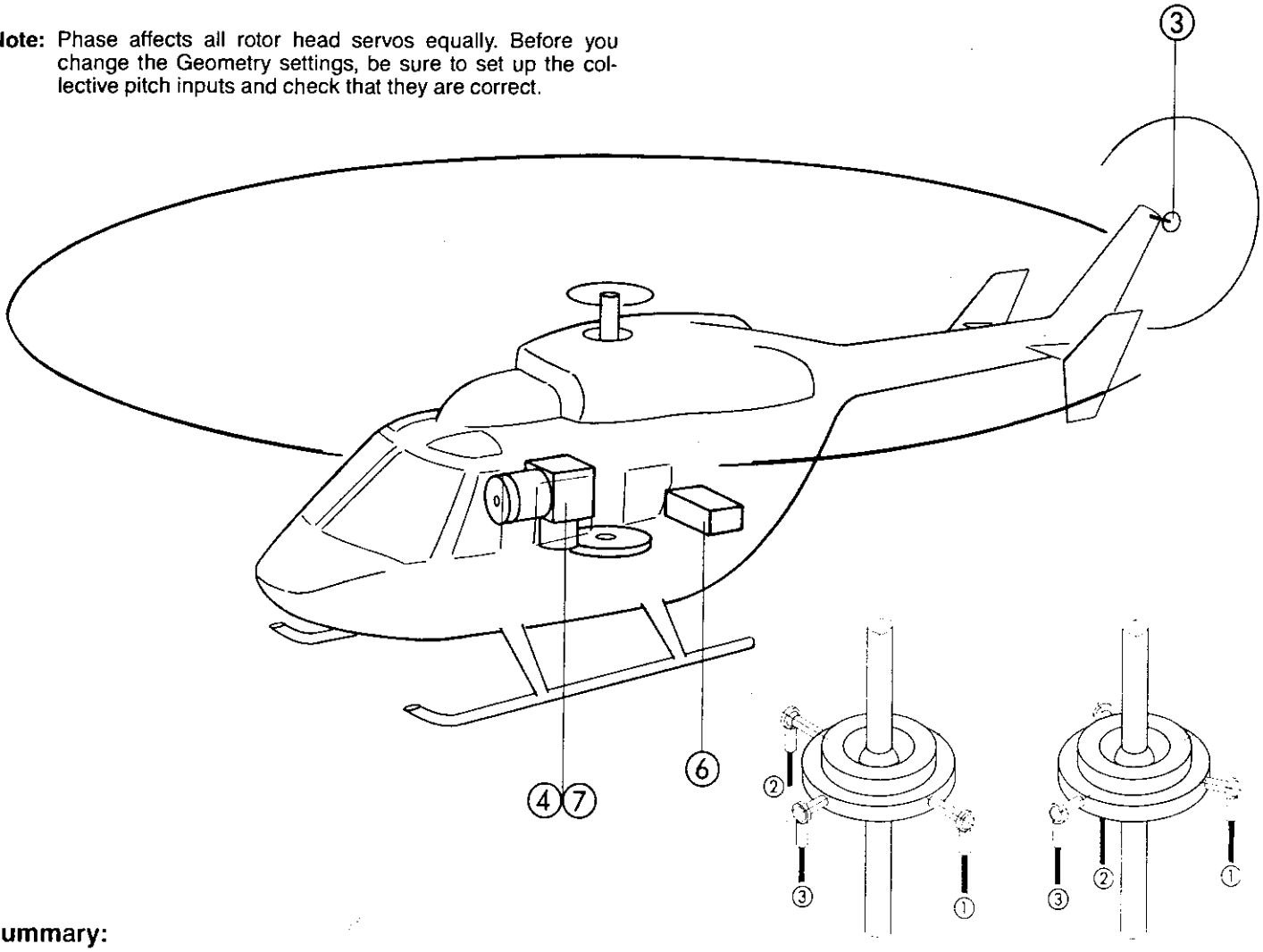
**Possible modifications:** 3-point throttle curve
Gyro not used (different type of gyro)

# Example model: "BK 117"

**Memory No.: 15**

Example of a helicopter with "CPM" swashplate control system. The swashplate is controlled directly by 3 servos, arranged at 120 degrees to each other, which provide collective pitch, pitch-axis and roll-axis control. Three servos are used, in conjunction with the "HEAD-MIX" mixer. The throttle is assigned to "THROTTLE" ("DYN.THR." is an alternative). A "suppressible" gyro is assumed, which can be switched between minimum and maximum effect by means of switched control H. "Flare" mixing can be achieved by unequal collective pitch inputs to the "centre" and "outboard" servos.

**Note:** Phase affects all rotor head servos equally. Before you change the Geometry settings, be sure to set up the collective pitch inputs and check that they are correct.




**Summary:**

| Channel | A | B | C | D | E | F | G |
|---|---|---|---|---|---|---|---|
| controls | Roll | Collect. | Yaw | Pitch | Throttle | Mixture | Gyro |

| Servo No | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
|---|---|---|---|---|---|---|---|
| Function | Ro/Co/Pi | Ro/Co/Pi | Ro/Co/Pi | Throttle | Yaw | Gyro | Mixture |
| Mixer | HEAD-MIX | HEAD-MIX | HEAD-MIX | --- | TAIL ROT | --- | --- |
| 1st inp. | ROLL | ROLL | PITCH | THROTTLE | YAW | GYRO | MIXTURE |
| 2nd inp. | PITCH | PITCH | COLLECT. | --- | COLLECT. | --- | --- |
| 3rd inp. | COLLECT. | COLLECT. | --- | --- | --- | --- | --- |
| 4th inp. Geometry | | | | 5th iput: Phase | | | |

**Switches:** S1 - Dual Rates, roll; S2 - Dual Rates pitch; S3 - auto-rotation; S5 - direct throttle

**Notes:** Switch control H must be fitted (On/Off switch, 3-core lead)
3-point throttle curve used.
Pitch input value for "centre servo" twice as great as for "outboard servos" (assuming 120 degree arrangement)
Collective pitch input same for all three servos

**Possible modifications:** 5-point throttle curve
Gyro not used (different type of gyro)

# "Assigning"




## Why assign?

Assigning, or linking up, the transmitter controls, control functions and servos is the first and most important part of the setting up process which has to be carried out before you can actually use the equipment to control a new model. But don't run and hide – there's nothing very complicated waiting for you.

If you have owned another radio control system before the "PROFI mc 3030", you have probably already carried out this "assigning" process without realising it.

If, for example, you have changed switches round, or swapped connectors over, in order to set up "aileron right" and "elevator left", then you have already "assigned" those functions to suit your preference.

**We can differentiate between two forms of assigning:**

**1. Assigning the transmitter controls to the control functions**
The example we mentioned above falls into this category. Another example would be to decide that the left-hand slider is to control the model's airbrakes.

**2. Assigning the servos to the control functions**
For example, this might mean that servo No. 2 (the servo connected to receiver output 2) is to operate the elevator; or in a helicopter that servos 1, 2 and 3 control a swashplate with a 120-degree actuation system.

On earlier radio control systems this "total adjustment" facility was not provided, and in fact it is not absolutely essential. But you will soon see that it is highly practical and useful.

The assigning procedure can also be extended to cope with the "mixing" of control functions; but we don't want to cover this point here. It is discussed in full on page 53, under the title "Mixers".

**Why do we have to assign anything?**
This question is not all that easy to answer simply; nevertheless we will try. Here are some of the reasons:
**1.** Many of the transmitter's functions are carried out by a computer and its related software. The software is much more likely to work in a sensible way if it is given specific information. For example, "elevator" instead of "left stick, up/down".

**2.** Terms such as "left aileron" or "right collective" are familiar to any modeller. If you "tell" the transmitter, when assigning the servos, that servo No. 3 is the "collective pitch" servo, you can be certain that the collective pitch signal will always be available at socket 3 on the receiver, and that all mixing arrangements which involve that channel will automatically be carried out correctly. It prevents you having to worry about details which can be difficult to sort out.

**In short:**
**Assigning draws a clear line to follow: for you and for the computer in your transmitter.**

---

## How to assign the transmitter controls

From the Status Display, move to the **"Assign"** menu using the key sequence M ◪ ◹. We assume again that "BIG LIFT" is still the model in the current memory 01. The display will look like this:

```
01 BIGLIFT  PPM9
---- ASSIGN ----
CONTROL  SERVO
SOFTSW. USRMIX
```

Select **"CONTROL"** (transmitter control) by pressing the ◪ key. This is what you will see:

```
01 BIGLIFT  PPM9
- ASSIGN CTRL. -
  CONTROL     A
  IS     AILERON
```

The transmitter responds by showing one of the nine controls (A to I) in the display. Press the ◹ key. The letter starts to flash. Now press the ⊞ key repeatedly until control "A" appears. Try using the ⊟ key as well.

**A - D** are the symbols for the stick units. The letters are also printed on the transmitter casing. For example, **C** is the right- left movement of the right-hand stick unit.

**E** and **F** are the two sliders; these letters are also printed on the transmitter casing.

G is normally (as standard) the "switched channel" No. 7.

H - I are not available on the standard transmitter. If you need these channels, you can install extra switches and connect them to the main circuit board sockets marked with those letters. See page 7.

By now this much should be obvious: in this line of the menu you select the transmitter control.

In our example, leave the **"A"** showing (flashing) and press the ◥ key.

The function which appears after the letter now starts to flash (in our example "AILERON").

Now things do get a little more difficult.

If you press the ⊞ (or ⊟) key to leaf through the functions, the transmitter will offer you the following functions in turn:

| | | | |
|---|---|---|---|
| AILERON | ROLL | RUDDER (Ship) | AUX. 1 |
| ELEVATOR | PITCH-NOSE | MOTOR (Electric) | AUX. 2 |
| RUDDER | YAW | MOTOR 2 (El.) | AUX. 3 |
| THROTTLE | PITCH | | AUX. 4 |
| THR.2 (for 2 motor) | GYRO | | UNUSED |
| SPOILER | | | |
| FLAP | | | |
| RETRACT | | | |
| TOWHOOK | | | |
| MIXTURE | | | |

**As you see, these include all the most commonly used functions:**

Columns 1 and 2 for fixed wing and helicopters;

Column 3 for model boats and electric-powered models (including electric-powered aircraft).

Column 4 is for the auxiliary functions 1 - 5. "AUX. 1-AUX. 4" are used when no other term "fits".

We will explain "UNUSED" – the last option – very soon!

We have "pre-defined" these functions for you so that you don't have to type anything in; all you have to do is select the right option. There is also another reason: if you select the terms from the list above, your "intelligent" transmitter works out what you are likely to ask next, and prepares itself accordingly.

**The best way of coming to terms with this procedure is to carry out a sample assigning exercise.**

We will assume a model glider with elevator, rudder, ailerons and spoilers.

The right-hand stick is to control elevator and aileron; the left-hand stick the rudder. The spoilers are to be operated with the right–hand slider.

It is obvious that the forward/back movement of the left-hand stick, the left-hand slider and the switch "No. 7" are not going to be used.

Now we can get going – provided that you are still at the **"ASSIGN CONTROLS"** menu.

First the elevator:

Key ◩; leaf through with the ⊞ and ⊟ keys until **D** appears (right-hand stick, forward/back).
(The line under this the display already shows **ELEVATOR**, so there is nothing to be changed here)

Now the ailerons:

Key ◩; leaf through again using ⊞ and ⊟ until **C** appears (right-hand stick, left/right).

Key ◥; leaf through until **AILERON** appears.

Now the rudder:

Key ◩; leaf through until **A** appears (left-hand stick, left/right).

Key ◥; leaf through until **RUDDER** appears.

Finally the spoilers:

Key ◩; leaf through until **F** appears (right-hand slider).

Key ◥; leaf through until **SPOILER** appears.

*P.S.: if you wish, you can assign the stick function **B** to the spoilers instead of the slider.*

Key ◥; leaf through until **SPOILER** appears.

That's almost all there is to it. But what of the unused controls (**B,E,G,H,I**)?

There is a danger here that something has already been assigned to these controls when the memory was last in use – something which could cause problems. At the very least it would offend the sensitive glider guider to see **THROTTLE** against **B**, for example. You've guessed it: this is where **UNUSED** ("**Nothing**") comes in. As described above, select the controls B,E,G,H, and I in turn, and assign them to **UNUSED**, unless that has already been done.

This is typical of the way computers have to be treated: even when they are supposed to do nothing at all, you have to tell them expressly, otherwise they might do something unexpected!

The tidy-minded modeller should always assign unused transmitter controls to **UNUSED**, even when it appears to be unnecessary. It is always worth doing, as it can avoid considerable confusion.

Now you really are finished, and can leave the menu with the Ⓜ key.

**Incidentally:**

In the example above we deliberately chose a complex sequence for the assigning process; you will soon find out just how quickly this can all be done.

**And one more thing:**

**You might have the bright idea of assigning two transmitter controls to the same function, e.g. "A = Aileron" and "C = Aileron". In that case the computer would not know which instruction it was supposed to act upon. For this reason our programmer has instructed it to consider the "last one" as the valid entry. In our example it would ignore the first entry "A = Aileron", and accept "C = Aileron".**

---

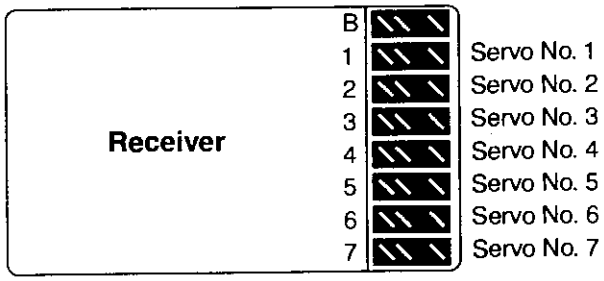
* If you want to, you can skip a few pages at this point and do the following:
1. Copy the results of your work into memory No. 02; see page 48.
2. Switch memories; to No. 02. See page 50.
3. Enter the name "FLAMINGO"; see page 50.

In the following examples we assume that you have done all this.

# How to assign the servos

By "assigning the servos" we mean informing the transmitter which functions are to be carried out by which servo, i.e. you determine the **servo functions.**

To make it quite clear which servo we mean, each servo is designated with the number of the receiver output socket to which it is connected:




The servo connected to receiver output No. 1 is therefore servo No. 1, that connected to output 2 is servo No. 2, and so on.

At this point you have a more or less unrestricted choice of which number controls which function. However, we strongly recommend that you adopt a "standard" sequence, as this makes the whole business of setting up a new model easier to understand.

**Our suggestion** (adopted from the "ROYAL mc"):
Servo No. 1 : Aileron
Servo No. 2 : Elevator
Servo No. 3 : Rudder
Servo No. 4 : Throttle
Servo No. 5 : Aileron 2 (if separate aileron servos are used)
Servo No. 6 - 9 : auxiliary functions

In special cases (e.g. wings with multiple control surfaces) you will need to arrange things differently; but more of that later.

Now the preamble is over, we can get down to business.

In the displays which follow we assume that you have moved to memory "02 FLAMINGO", as described at the bottom of page 31.

Starting from the Status display, press M ◪ ◹ ◹ to reach the **"ASSIGN SERVOS"** menu. You will see this:

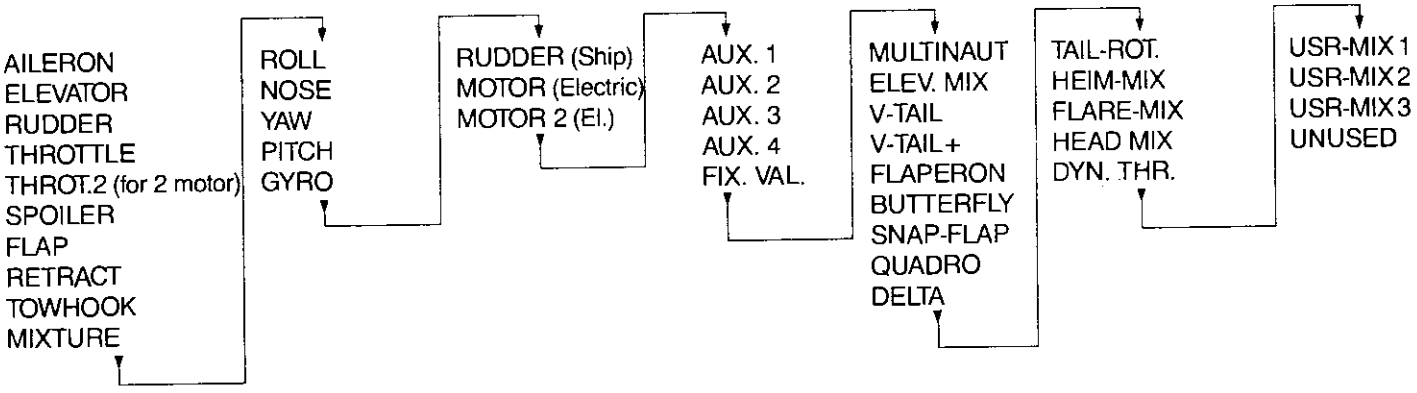



Press the ◹ key. The "**1**" starts to flash. Move on, or "leaf through", by pressing the ⊞ or ⊟ keys. The numbers rise to 9, then start again from 1.

As an example, stop at No. 3 ("**3**" flashing), and press the ◪ key.

The "3" will stop flashing, and the servo function in the bottom line will flash instead. Here again you can leaf through the options with the ⊞ and ⊟ keys and assign the correct function to that servo.

If you leaf through again with the ⊞ key, the transmitter will offer you a large number of further **functions in sequence.** The series runs as follows:




That's quite a lot to assimilate in one go. Let's take a closer look:

The "first division" includes the familiar standard control functions for fixed-wing aircraft and helicopters, as in the transmitter control assigning process. They are followed by the specialised functions for model boats and electric-powered models. As you have guessed, AUX.1 - AUX.4 are for special functions which do not fit into the usual pattern.

**Now to the second group**

Here we meet with the "mixers", which you have probably been looking for in vain in this book so far. All the mixers listed here are stored in the transmitter in "ready-made" form, and just need to be invoked, or called up.

More on this in the "Mixers" section. Using our example, we will just explain why the mixers are included in the **"Assigning servos"** process. Let's look at the example of a "V-TAIL". As you probably know, the two control surfaces are each operated by one servo, and thus both servos are "V-tail servos". If you now assign the servos like this:

Servo No. 2 controls: V-TAIL;
Servo No. 3 controls: V-TAIL,

then the transmitter automatically understands that it must send the elevator and rudder signals to servos 2 and 3. All you need to do after that is tell it how much of each signal to send.

You have **assigned** servos 2 and 3 as the "V-tail" "mixed control function".

Right at the end of the list, as in the earlier assignment table, you will see "**UNUSED**" ("Nothing") again – an apparently useless option. A servo which does "nothing" could really be left in the shop window – that's one way to save money. However, you will see later that there is a good reason for it, and that the "Nothing" option can be very useful.

**And one more tip:**
If you connect a servo to a receiver output to which "**UNUSED**" is assigned, then the servo receives an akcurate neutral position signal (and nothing else). You can use this to set the servo itself to its exact mechanical centre point.

But back to the more "normal" functions.

Don't be afraid of assigning one control function several times; the transmitter knows all about that. For example, let's discuss "electronically differential" ailerons, with 2 aileron servos: as you need two servos for this, you assign them as follows:

Servo No. 1 controls: AILERON;
Servo No. 5 controls: AILERON.

This ensures that both servos will receive the aileron signal. More on setting up aileron differential in the Section entitled "Transmitter control adjustment".

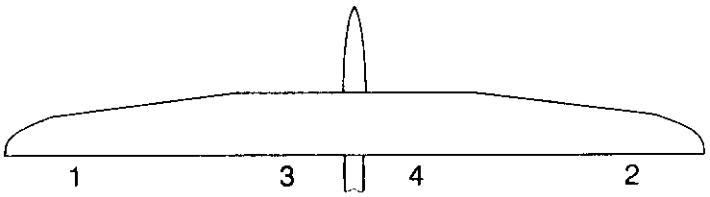
Let's imagine that you have a model with 4 ailerons, each of which you wish to be adjustable separately for travel and differential. You would then need 4 aileron servos. You could assign all four servos to the "Aileron" control function. The same applies to all the other control functions (even the "mixed" functions!).

**Finally a practical example in abbreviated form.**

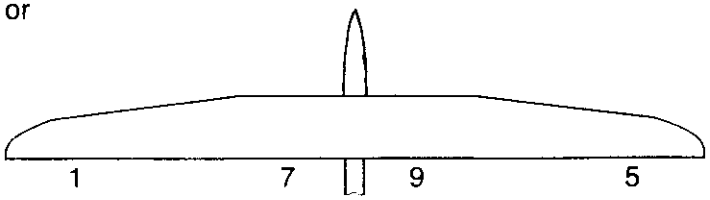
A model glider with elevator and rudder, differential ailerons, spoilers and aero-tow release (the "FLAMINGO" again).

**But take care:**
Always assign control surfaces alternately: one right, one left.

E.G.




or




**Correct:** Alternate does not necessarily mean that the servo outputs must be **directly** sequential.

If you do **not keep** to this rule, your aileron differential will work incorrectly.

First you make the connections at the receiver end:
Elevator is operated by servo No. 2
Rudder is operated by servo No. 3
Ailerons are operated by Servos No. 1 and 5
Spoilers are operated by servo No. 4
Aero-tow release is operated by servo No. 6

Now to the assigning procedure, as described above:

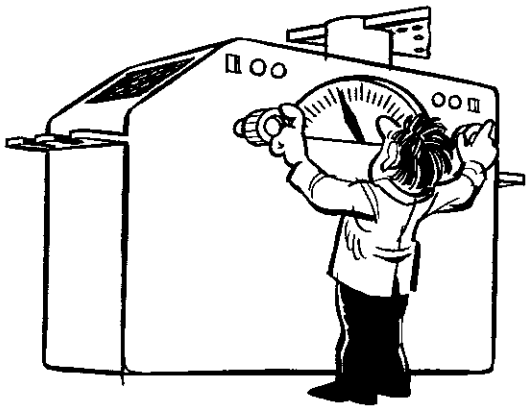
(Note: you will find that some of the servos are already assigned to the correct function when you select that servo No. Don't be put off by this. Just for practice, press the keys "round the clock" one time, until the function appears again. Of course, you never actually need to do this.)

- key; then leaf through with ⊞ key until "2" flashes.
- key; leaf through until "ELEVATOR." appears.
- key; move on to "3" with the ⊞ key.
- key; leaf through with the ⊞ key until "RUDDER" appears.
- key; leaf back to "1" with the ⊟ key.
- key; move to "AILERON" with the ⊟ key
- key; forwards again with ⊞ to "5"
- key; "AILERON" again with the key
- key; one back to "4", with the ⊟ key
- key; ⊞ key until "SPOILER" flashes
- key; leaf through with ⊞ until "6" flashes.
- key; ⊞ key until "TOWHOOK" flashes.

All done.

Leave the menu with the Ⓜ key; then Ⓜ three more times, and you are back at the Status Display.

# Adjusting the servos



In case you are not familiar with the rather sloppy language we modellers are prone to use, "adjusting the servos" doesn't mean anything like our cartoonist seems to think it means (see above). It is more a matter of adjusting and setting up the "servo end" of the transmitter. The signals for each servo are produced by the transmitter, and since they are not modified at all after they have been transmitted, the effect of any adjustment is the same as if it had been made at the servo itself.

In the following section we will describe in detail the basic adjustments which can be made to the servos.

Reversing the direction of servo rotation (servo reverse) is certainly the most important aspect of this. Please note this point right now: the servos themselves are never reversed – think for a moment of a simple V-mixer: elevator correct, rudder incorrect. Now reverse the "servo": rudder is now correct, but elevator is incorrect. Morale: only reverse the mixer input! More on this later.

You can also adjust the neutral position of the servo "electronically" at the transmitter.

Finally we have the possibility of adjusting servo travel – separately for each side of neutral.

While reversing servos is almost a daily necessity, the two other facilities are more for special cases, and for the experienced modeller who wants to tune his system to a high level of refinement.

In this Section we are concerned only with these "simple" adjustments. There is a more complex side, which is concerned with mixers. This is explained in the Mixer section (page 53).

We will discuss this in conjunction with "02 FLAMINGO".

## How to reverse the direction of servo rotation

Starting from the Status display, press [M] [◩] to reach the **"Servo adjustment"** menu.

You will see this:

```
02 FLAMINGO PPM7
- SERVO ADJUST -
TRVL+REV LIMIT
CENTRE    TEST
```

Press the [◩] key to select "TRAVEL + REVERSE"
After this you will see:

```
02 FLAMINGO PPM7
SER.1: AILERON
 PART : AILERON
 +50% C+   ON
```

Only the second line is of interest here, together with the lefthand corner of the fourth line.

**First you have to tell the transmitter which servo you want to reverse.**

Press the [◩] key. The servo No. ("1") starts to flash. Now you can press the [+] and [−] keys to leaf through to the desired servo. Once you have displayed the one you want, press the [◪] key. The percentage display (the set travel) begins to flash.

**Please note:** the travel display has a **symbol** in front of it – the prefix "+" or "−"; depending on how it was last set.

Now comes a typical example of how the [R] key is used:

Press this key, and "+" turns into "−", or vice versa. That action reversed the servo. This was a simple, standard case, when the servo concerned has no mixed control function. We will cover this area in detail in the "Mixers" Section.

You leave the menu with the [M] key; and by pressing [M] twice more you return to your starting point, after yet another successful expedition into the land of the keypad.

**Fatal error; or a special "feature"**
Really this belongs to the "Travel adjustment" section, but this is where you will look for it.

How come this feature is normally an error?

You apply right – the servo runs to the right – so far, so good. You apply left – the servo runs to the right again. What's happened?

Now, what you have done is turn once past "0" when setting the servo travel. Turning it back past zero again reverses the movement and removes the problem.

If your servo now needs to be reversed, press [R] once.

This unusual feature is important for the helicopter pilot. For example: mixing collective pitch and tail rotor. In this case that is exactly what is required – regardless of the direction of collective pitch the tail rotor compensation must always occur in the same direction, proportional to the collective pitch deflection.

## How to adjust the servo's neutral position

Within reasonable limits, you can adjust the neutral position of the servos connected to each receiver output.

**What's the point of that?**
Adjusting the neutral position can be useful: for example, if you want to use a servo of a different make with your new system. Different manufacturers use different standards, and you may find that the output arm of a rotary output servo will not be at the correct angle.

Another case might be that you find a servo's neutral position non-central for any reason, and there is no means of adjustment on the servo itself.

**Never use this facility to make up for pushrods which have turned out too long or too short!**

Generally speaking you ought to use this facility as sparingly as possible. It is easy to forget whether you have reset neutral positions or not, and this can lead to confusion, especially since there are so many other adjustment facilities which have a vaguely similar – but not quite identical – effect.

**This is how you do it:**

Starting from the Status Display, press the appropriate keys to get to the **"Servo adjustment"** menu. You will see this display:

```
02 FLAMINGO PPM7
- SERVO ADJUST -
TRVL+REV LIMIT
CENTRE    TEST
```

Select the **"CENTRE"** menu point with the ◹ key. Now you are at the right place, and will see a display like this:

```
02 FLAMINGO PPM7
- SERVO CENTRE -
SERVO1: AILERON
CENTRE:  +1.5%
```

**First you have to select the correct servo.**

Press the ◩ key; the servo No. (in our example "1") starts flashing. Press the ⊞ or ⊟ key to reach the servo No. you want. Once it is displayed, press the ◹ key. The value at the right of the bottom line starts to flash.

You can now adjust the offset with the ⊞ or ⊟ key to any point between +11% and −11% in steps of 0.1%, and then from 11% to 110% in 1% steps.

That's all there is to it. Press the Ⓜ key to leave the Servo adjustment Menu, and you return to the Status Display.

## How to adjust servo travel

The transmitter offers the facility of adjusting the travel of each servo: separately for both sides of neutral.

**What use is that?**

The simplest way of explaining this is to provide a few practical examples.

**Example 1:**

The landing flaps of a large-span model aircraft are operated by two servos: one for each flap. Manufacturing tolerances in the servos have combined to produce a slight difference in output travel. The result of this is that maximum "down" on the flaps produces unequal flap movement, and the model tends to turn. You have two options: seek out two matched servos, with exactly equal mechanical travel, or utilise the travel adjustment facility.

A point to note here is that each servo must have "its own" receiver output; otherwise it is not possible to adjust the travel of each servo independently (use the facility of assigning multiple servos to one control function: page 32).

A similar case might be ailerons with superimposed camber-changing flap function.

**Example 2:**

It is often the case that for competition use the travel of a servo must be exactly the same on both sides of neutral. Here again unavoidable manufacturing tolerances make it difficult to find a servo which fulfils this requirement precisely. In this case the remedy is to use the facility to adjust servo travel on one side of neutral only.

**Example 3:**

If, for whatever reason, a servo of a different make is to be used with the system, there will be problems due to the different standards adopted by the two manufacturers. Travel adjustment solves this problem too (the difference in neutral position can be corrected by adjusting the centre position; see page 34).

And one more preliminary note, before we get down to business:

Here we assume that the servo has one "simple" control function; e.g. elevator or aileron without mixing, or undercarriage actuation. In "mixed control functions" the same procedure is used; but then it gets a little more complex, because in some cases only certain "inputs" of the overall travel are to be adjusted or shifted, while the others are to be left unchanged. More on this in the "Mixers" section.

**But now to actually adjusting the travel.**

From the Status Display you get to the "Servo adjustment" menu by pressing Ⓜ and ◩ You will see this:

```
02 FLAMINGO PPM7
- SERVO ADJUST -
TRVL+REV LIMIT
CENTRE    TEST
```

Select **"TRAVEL + REVERSE"** with the ◩ key.

**The first step is to select the servo you wish to adjust.**

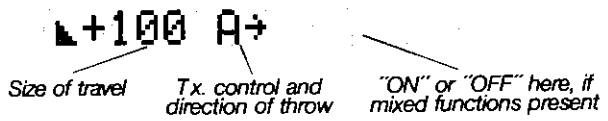
Press the ◩ key. The servo No. ("1" in our example) starts to flash. Leaf through the servos with the ⊞ and ⊟ keys until the correct number appears.

Select servo No. 3; in the example you will see this:

```
02 FLAMINGO PPM7
SER.3:  RUDDER
 PART :  RUDDER
+100% A+    ON
```

After the servo No. you will see the control function – a double-check that you have the right servo. The "Input" display in the next line down is of no interest at the moment, as it is only of significance where functions are mixed.

**But now to the bottom line – this has something for us:**




At the far right you may see "ON". This is only important for mixed functions; it shows whether that particular input is "switched on" or not at the moment.

Forget that for the moment!

In our example you will see **A** → next to the value for travel. Move stick A to the left:

The right arrow turns into a left arrow. This display also takes account of the current position of the trim slider, so it may be that in your case you see a left arrow first, which turns into a right arrow when you move the stick to the right.

You will understand it now: this is the transmitter control which acts upon the servo you have selected. The arrow shows the direction in which the control is moved.

Now press the ◹ key. The "left-hand bottom corner" starts flashing.

Hold the stick at its left-hand end-point; as described above, you will see a left arrow. If you now press the ⊞ or ⊟ key, the travel value will change. Set it to "80%". Move the stick to the right-hand end-point (right arrow) and set the travel to "90%" in the same way. That's it for now.

Are you beginning to feel at home with the system?

**The servo travel which corresponds to moving the stick to the left is selected and then adjusted by "stick left".**

**The servo travel which corresponds to moving the stick to the right is selected and then adjusted by "stick right".**

If you now move the stick to right and then left you will see that the travel value alternates between 80 and 90%.

The prefix in front of the travel value shown is normally irrelevant when adjusting servo travel (there is an exception: see below); it shows whether the servo's whole travel is reversed; see also page 34: "Servo reversing".

With the work completed, leave the Servo adjustment menu by pressing the Ⓜ key; then Ⓜ twice more to return to the Status display.

**Now a few more points:**

It makes no difference how far you move the sticks when making these adjustments; the only important point is the direction in which the arrow faces. If it is not likely to confuse you, you can move the corresponding trim slider instead, and leave the stick at centre.

The same applies to all servos/control functions. For functions which correspond to forward/back stick movements, the right and left arrows are replaced by up and down arrows.

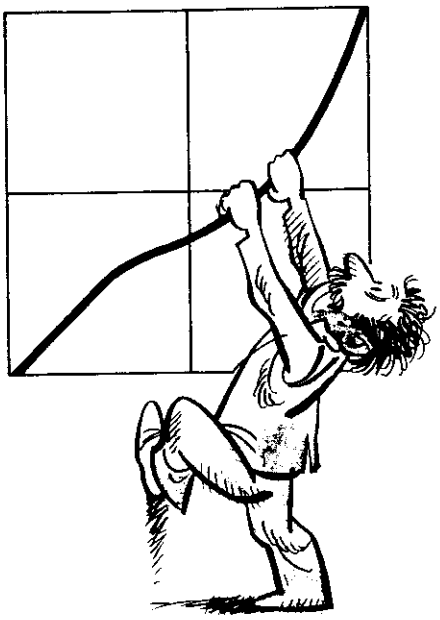
All percentage values refer to the normal nominal travel of the servo concerned; this is usually 45 degrees (although there are exceptions).

There is no reason why you should not set extreme travel adjustments. For instance, in the example above you could set the left travel of the stick to zero; in that case the servo would not move at all when you move the stick in that direction. You can even set the travel to less than zero, i.e. a negative value, by simply pressing the ⊟ key. The servo will now move to the right when you move the stick to the left, as well as when you move it to the right (as you have not changed that side of neutral). Quite why you might want to do that is beyond us just at the moment!

**Caution - a trap for the unwary!** Please don't set the travel to zero on both sides of neutral. The result would be that the servo does not move at all. If you do this for some reason, but then forget that you have done it, you will have an apparently non-functioning channel, which will drive you uncomfortably close to the edge of insanity . . . The other side of this coin: if you get "nothing at all" at one receiver output, check first whether you have set the servo travel to zero by mistake!

Servo travel can also be set to more than usual: a setting of up to 110% is possible. We do not recommend using this facility excessively, as, with certain types of servo (linear output servos in particular) you run the risk of jamming the mechanics mechanically. You might also like to bear in mind that an output travel of more than 45 degrees usually provides very little extra movement, due to the geometry of standard mechanical linkages.

# Adjusting the transmitter controls



In the previous section we discussed setting up the "servo end" of the system; now it is time to concern ourselves with adjusting the "signal source", namely the transmitter controls.

**An important difference**

The systematic differentiation between "transmitter end" and "servo end" is an important characteristic of the philosophy behind the PROFI mc 3030. For this reason we would like to explain this difference once more in brief, before we get down to business.

Once again, examples are the best method of explanation.

If you want to reduce the effectiveness of the elevator, it may seem to make no difference whether you reduce the travel of the elevator stick or electronically reduce the servo's travel.

But this is only true if the application is of the simplest possible type, i.e. no signals are "derived", "mixed" or otherwise influenced. If we assume in our example that there are two elevator servos (e.g. one for each elevator panel), then, if we insist on working at the "servo end", the travel of **both** servos would have to be reduced separately.

Things get a little more difficult if we suppose that elevator movement is also intended to involve the camber-changing flaps. In this case we would need to reduce the "mixed elevator input" to the flaps also; otherwise the ratio of the mixed functions would alter. However, if we reduce the movement at the transmitter end, things are much easier: all we have to do is reduce the elevator stick signal; everything that is affected by or derived from that signal is automatically reduced at the same time.

A second example would be differential aileron movements where two separate aileron servos are used. As differential is nothing more than unequal servo travel on different sides of neutral, it would be possible to adjust the servos themselves individually. But it is easier if we produce the two aileron control signals at the stick by a "differential circuit", as we can then set the degree of differential with one single adjustment.

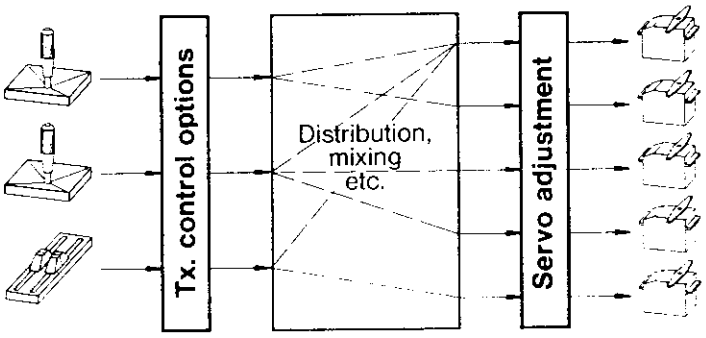
**Correct assignment is important!** If the differential movement of your ailerons works the wrong way round, please see page 33.

A further example is reversing the direction of rotation:

When we reverse the direction of movement at the transmitter control, then this reverses the rotational direction of all the servos (or, more precisely, all the inputs from this control) which are operated by this transmitter control. This is not the same as reversing the servo itself.

**You can probably see the principle already:**

We have a "flow of signals", starting at the transmitter controls (the signal "source"). The various influences on the signal then follow – mixing arrangements, signal splitting etc. The servos and the control surfaces which they operate are the final link in the chain.




If we alter something at the source – the transmitter controls – then that change affects everything which is influenced by that control.

Each transmitter control is assigned to a particular control function (elevator, aileron, . . .). If a change is made to the transmitter control, that change affects the entire control function – and this is exactly what is usually required.

One more example: if you want exponential aileron control on a model fitted with "quadro-flaps" (four separate wing control surfaces), then the entire "aileron" **funktion** needs to be altered, i.e. all four servos at once.

If, on the other hand, we try to set that up by adjusting one of the servos, the change will only affect that one servo.

**To recap:**

**Adjustments at the transmitter control affect the entire control function.**

**Adjustments at the servo end affect that servo only.**

## The transmitter control options

Now it's time to discuss the transmitter control adjustment facilities. The complex-sounding term "transmitter control options" is simply an overall description of the adjustment facilities which are provided for the transmitter controls. You are probably familiar with them already from other radio sets. For example: Dual Rates, Exponential and so on.

These options are supplied "ready made" in your transmitter, and are offered via the "Transmitter Control Adjustment" menu. No "assigning" is necessary. In order to activate an option, you simply need to "leaf through" to the appropriate point in the menu, then set the value you want. If you do not need a particular option, just set its value to 0% (or 100%, depending on the type of function).

Not all options are available for all transmitter controls; that would not make sense (who would want a retractable undercarriage with exponential travel?). The availability of the options is based on practical requirements:

Dual Rates and Exponential:
Ailerons, elevator and rudder.

Travel, adjustable separately on both sides of neutral:
All functions, except ailerons and throttle.

Travel, symmetrical adjustment:
Ailerons only.

Centre adjustment:
All functions, except throttle, flap and spoiler.
Idle trim: Throttle and spoiler only.

Differential:
Ailerons only, provided that at least 2 servos are assigned to this function.

Fixed value:
Not for ailerons, elevator, rudder or throttle; all other functions.

You can also use 2 or more of these options together; for example, exponential and Dual Rates on aileron (if you think this will be to your advantage), plus differential and centre adjustment also. All you need to do to apply these options is increase the value in the display. It's all explained below:

In the case of helicopters there are further possibilities; we will discuss these in detail on page 61.

**But now, finally, to business.**

## How to set transmitter control options

As we are now talking about adjusting the characteristics of transmitter controls, move to the "**Transmitter Control Adjustment**" menu.

From the Status display you reach the menu with the key sequence [M][◥][◥]. If we return to the first example – 01 BIG LIFT – you will see this display:

```
01 BIGLIFT  PPM9
CTRL.A: AILERON
        EXPO
           0%
```

Press the [◤] key. The transmitter control letter (in our example "A") starts to flash.

Now you can "leaf through" the options with the [+] and [−] keys. The various transmitter controls will appear one after the other; at the same time the display shows which function they operate.

Select, for example, "Elevator" (leave it flashing) and press the [◥] key.

The option "Expo" flashes in line 3.

You can now leaf through again, using the [+] and [−] keys, and the transmitter will offer you all the available options in turn.

---

## The "Dual Rate" option

Leave "Dual Rate" displayed in the above example. The display will look like this:

```
01 BIGLIFT  PPM9
CTRL.D:ELEVATOR
      DUAL-RATE
S2+*          60%   May vary
```

Press the [◤] key. The value at bottom right flashes. You can alter it using the [+] and [−] keys. 100% is full travel, i.e. no throw reduction when the switch is operated; at 50% it will be reduced to half when the switch is operated. You have set up "Dual Rates" for the elevator.

**But wait a moment – there's something else!**

In the bottom left corner are more symbols. Press the [◥] key: and this area of the display will begin to flash. Press the [−] key until "ON" or "OFF" is shown there. This much will probably be clear: this shows whether the option is switched on or off. You can switch between ON and OFF by pressing the [R] key.

Switch to ON, then press the [+] key. You will see this:

```
S1+*          60%
```

This part is also easy to understand: Dual Rates is one option which requires a switch, namely to switch between full and reduced travel; and you have just selected the switch S1 for this purpose. If you don't like this arrangement, press [+] again and S2 will be selected. You can continue up to S5 – even the Teacher/Pupil switch can be used (if you insist).

You are free to choose which switch it "ought to be".

However, it is important that you establish your own "personal layout", otherwise sooner or later you will find yourself totally confused.

Our suggested layout:
Dual Rates, aileron: S1
Dual Rates, elevator: S2
Dual Rates, rudder: S3

**The asterisk**

And now an explanation of what the symbols after the switch mean: this is a real connoisseur's refinement:

Let us suppose that you have selected S2, and that "S2" is still flashing. Press the [R] key. The small arrow after "S2" is reversed. You have now reversed the switch. And the point of that? Well, many pilots want Dual Rates "active" when the switch toggle faces away from them; others the opposite way around. You can select it yourself.

(**Caution** – don't turn the switches themselves round! They must be installed as dictated by the Transmitter Control Test on page 73; otherwise the whole arrangement will be upset.)

The asterisk (star) which appears after the arrow in one of the two positions shows that the switch is "ON" in this position.

This entire "switch corner" only appears on the screen when you are dealing with an option which requires a mechanical switch; for fixed-wing models these are "Dual Rates" and "Fixed Value".

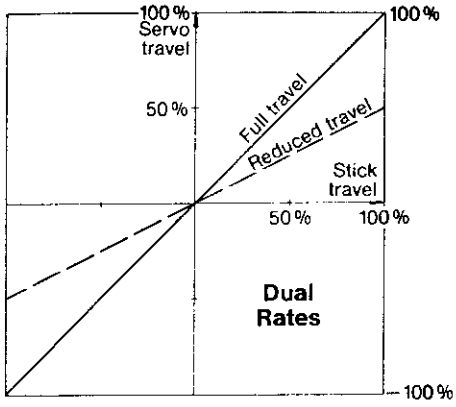



Fig. 20

Dual Rates reduces servo travel equally in both directions, and is controlled by a mechanical switch.

## The "Expo" option (exponential travel)

An exponential curve is one which increases disproportionately the further it moves away from zero. Its effect on a control function is that the servo makes small movements around centre, but the further the stick is moved, the more servo travel increases. At the stick's end-point, the servo reaches its own normal end-point.

In practice the result is that the pilot has very fine control of the model in normal flight, but still has available the large control surface movements which are occasionally required.

Selecting and setting up this option are carried out exactly as described for Dual Rates above, so we do not need to repeat the information in detail.

Exponential is not switchable; so there is no mechanical switch to select. 0% exponential means normal, linear control characteristics. 100% is the maximum possible exponential deviation from normal.

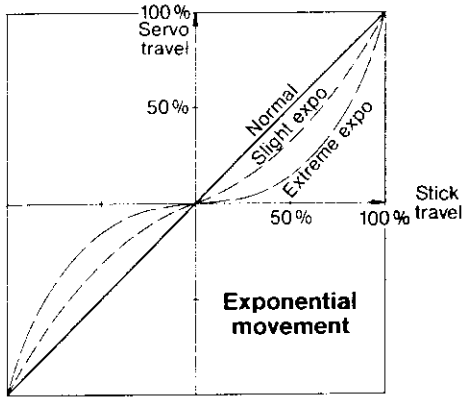



Fig. 21

## The "travel adjustment, separately for both sides" option

This facility allows you to adjust maximum servo travel separately for each of the two directions of the stick.

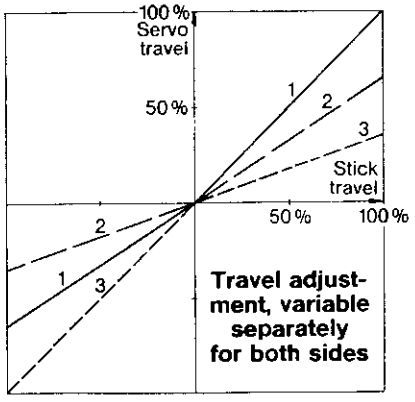



Fig. 20

A typical application would be in a model whose control response is not equal in both directions, perhaps for aerodynamic reasons.

It is available for all control functions with the exception of "throttle" and "ailerons". This option is found in the **"Transmitter Control Adjustment"** menu. The following symbol will appear in the third line:

TRAVEL+/-

*Symbol for symmetrical adjustment*

**The adjustment process itself** (line 4):

ON SIDE→ 80%

Press the ◪ key; the set value at bottom right starts to flash. Move stick C to its right-hand end-point; **the small arrow before the displayed value will face right.** If you adjust the travel with the ⊞ and ⊟ keys, this setting applies to **travel to the right** of centre. Move the stick to the left end-point; **the small arrow will point to the left.** You can now set **travel to the left** (again using the ⊞ and ⊟ keys). 100% = maximum possible travel; 0% = zero travel.

That was simple enough. One further point to note:

In the adjustment process just described it makes no difference whether the stick is at full right or full left movement. The crucial point is that the small arrow points in the correct direction.

All you need to do is move the stick slightly to the desired side; even moving the trim slider is enough. Just watch the small arrow; it indicates whether you are adjusting the right-hand or left-hand travel. In the case of "fore/aft" movements or switches small up and down arrows appear.

## The "symmetrical travel adjustment" option

This option is only available for ailerons. A travel adjustment facility for both sides separately would make no sense here; with two differential aileron servos the effect would be the same as if differential had been applied.

If you have already tried out some of the options described above, you will have no trouble setting up this function; it is carried out in exactly the same way.

Here again: 100% = maximum travel;
0% = no travel

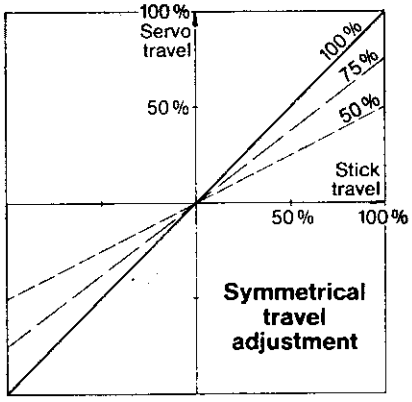



Fig. 23

## The "Centre Adjustment" option

This is available for most control functions. It is used to shift the centre position of the transmitter control "electronically"; it has roughly the same effect as moving the trim sliders.

The maximum travels which you have set are not influenced by the centre adjustment (i.e. it works in the same way as the "centre trim" system used by the trim sliders).

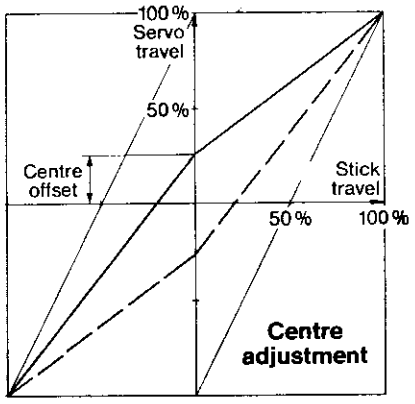



Fig. 24

The adjustment range is up to 100%, i.e. as far as the end-point of the corresponding transmitter control.

**The adjustment procedure** is simple:
Move to the "Transmitter Control Adjustment" menu. Let's look at transmitter control D = Elevator as an example. First press the ◩ key and then leaf through until "Ctrl D:ELEV" appears. Press the ◹ key and leaf through with the ⊞ key until **"Centre"** appears in line 3 (flashing). You will then see this:

```
01 BIGLIFT  PPM9
▛CTRL.D:ELEVATOR
        CENTRE ▜
        -50%◢
```

Press the ◪ key; the value displayed at bottom right will flash. You can carry out the centre adjustment you want, using the ⊞ and ⊟ keys. Once you have completed the adjustment, return to the Status display with the Ⓜ key.

**Here are two more examples of typical applications for this option.**

**Example 1:**
You have seen that it is possible to offset the centre by up to 100%, i.e. to one end-point. If you select such an extreme setting – in this example for one stick axis the associated servo does not move at all when the stick is moved to one side. When it is moved to the other side the servo carries out its full movement.
This facility could be used for a glider with airbrakes: the brakes are extended when the throttle stick is moved back from the centre position. Over the entire "forward" half of the stick travel the servo does not respond at all, and stays at full movement. You now have full servo travel controlled by half the stick movement.

**Example 2:** perhaps the most common application!
With a well-built and carefully trimmed model the position of the trim sliders is not usually changed in flight, or only very slightly. If you adopt the position of the trim sliders as your centre adjustment, you will not need to alter the trims when you change models; the basic setting of the trim sliders is then always the centre position.

**Caution:** do not use the transmitter control centre adjustment facility to "centre up servos". There is a separate facility provided for this (see page 34).

## The "Idle Trim" option

This option is only available for the "THROTTLE" control function (or THROTTLE-2). Its effect is that the throttle stick trim slider is only effective when the stick is at its "idle" position. Its effect is steadily reduced towards the centre position of the stick. In the whole of the full-throttle "half" of the stick arc (especially at the "full throttle" end-point) the trim slider has no effect.

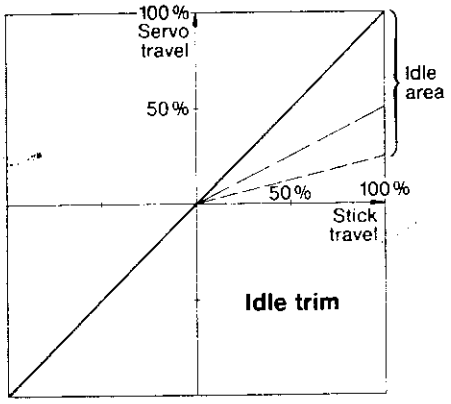



Fig. 24

The practical advantage of this option is that you can adjust the idle setting of the carburettor without affecting its full-throttle position.

**Selecting and adjusting** this option is the same as for the other options already described.

**Adjustment range:**

**0%** in the display: the "throttle" trim slider has no effect. Scope for errors here – take care!

**100%** in the display: the "throttle" trim slider adjusts the idle position within the whole of one half of the stick arc.

In practice (special cases excepted) a value of 20 to 30% is a sensible setting.

**One further note:**

Normally the idle position of the throttle stick is "stick back". If you want it the other way round (e.g. for a helicopter), press the [R] key once at the adjustment stage. This reverses the entire stick function; idle is then "forward". This is indicated in the display by a minus sign (–) in front of the set value, instead of a plus sign (+). If the servo then rotates in the wrong direction, reverse it as described on page 34.

## The "Differential" option

This option is only available if a transmitter control has been assigned to the control function "AILERON" at the "Assigning" stage, and if at least two servos have been assigned to "aileron". In all other cases differential makes no sense, or can be replaced by the option "Travel adjustment separately for both sides".

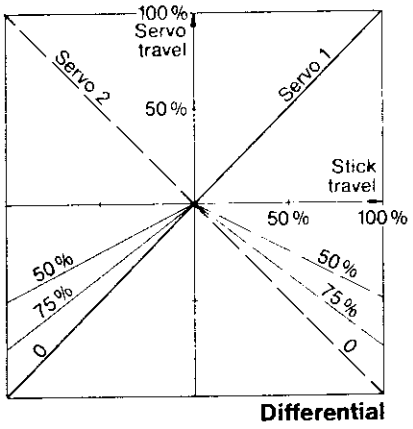
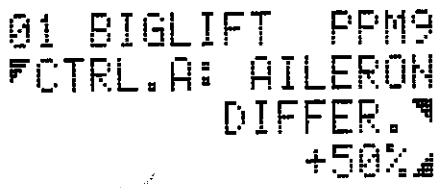



Fig. 24

To explain how this works, we will take another example. The transmitter controls and servos have been assigned as follows:

**Transmitter control A = AILERON;**
**servo 1 = AILERON; servo 5 = AILERON**

Starting from the Status Display, move to the "Transmitter Control Adjustment" menu. Press the [◪] key and leaf through with [+] until you see "DIFFER." in line 3, flashing:




**It is vital that the servos are assigned correctly, otherwise the differential movements will not be correct (see page 33).**

Press the [◪] key; the value at bottom right will flash. You can now set the desired degree of differential using the [+] and [–] keys.

The figures mean:

**0%**: no differential; same movement up and down for both servos.

**50%**: the "down" movement is only half as large as the "up" movement.

**100%**: maximum differential; each aileron moves up, but does not move down at all.

You don't need to worry about anything else when setting up differential. The differentiated control signals are sent to the two servos automatically.

**When setting the degree of differential you can "reverse" the differential with the [R] key.**

You will find that it is possible to set up differential ailerons correctly, regardless of your installation, by using this option in conjunction with reversing one or both servos (see page 34). We cannot give general guidelines, however, as there are so many possible variations in model design and radio installation.

One more tip (which also applies to other adjustments): It is sometimes easier and quicker to find exactly the right settings by carrying out "in flight" adjustments.

This is very easy using the Digi-Adjustor:
Before starting a flight, move to the appropriate menu as already described, and select "Adjust Value" as described above; but this time don't leave the menu!

The Digi-Adjustor is connected "in parallel" with the ⊞ and ⊟ keys, and has exactly the same effect, namely of adjusting the degree of differential. All you need to do in this case is to rotate the Digi-Adjustor while the model is flying (don't look down at it!) until you are satisfied.

Land the model, then leave the menu by pressing the Ⓜ key (everything gets stored automatically – there's nothing more to be done).

**Caution!**
**Although it is theoretically possible, you should never attempt to make changes via the keypad while the model is flying. You would have to take your eyes off the model to find the right key; and if you made a mistake, the results could be catastrophic!**

---

## The "Fixed Value" option - what's that?

"Dual Rates", "Exponential" and so on are terms familiar to the advanced modeller. He may not be on such close terms with "Fixed Value", however.

The simplest method of explaining it is to describe an example:
Imagine a model with camber-changing flaps which are operated by the right-hand slider = transmitter control F. Travel has been reduced (using the "Travel" option) so that full flap movement is in the range −5 to +7.5 degrees at the two slider end-points (this is not necessary to use "Fixed Value", but it does show up the usefulness of the option).

Now, on this model there is a specific flap position (+ 15 degrees) which is only needed for a particular flight situation (say, launching). Wouldn't it be nice if we could move the flaps to this fixed position with a switch, then return to normal operation again afterwards?

In order to achieve this it would be necessary for the switch to override the "normal" flap control signal, so that the flaps take up a pre-set, fixed value.

**This is what "Fixed Value" is all about.**

**"Fixed Value" brings the control function to a pre-set fixed value when the associated switch is operated, and overrides the transmitter control itself.**

There are therefore two things to set up:
First, of course, the Fixed Value itself (in % of full travel). Secondly, the switch which is to "activate" the Fixed Value has to be selected.
Adjustment is carried out in a similar way to that described above for "Dual Rates".

Here is another example:

We will assume that you have assigned the controls as follows:

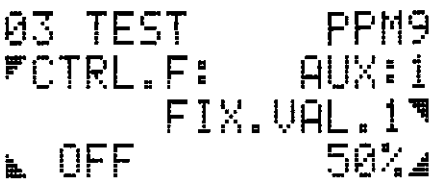
**Transmitter control F = AUX.1; Servo 6 = AUX.1.**

This means that the right-hand slider controls the servo connected to receiver output 6.

Move to the "Transmitter Control Adjustment" menu. Select Transmitter Control **F: Aux.1.**

Press the ◥ key; then ⊞ again, until "FIX.VAL." appears.

You will now see this display:




**Selecting the Fixed Value switch:**
In our example this is to be the switch S5. Press the ◥ key; the display in the bottom left-hand corner will flash. It will probably show "OFF". Press the Ⓡ key; "OFF" turns to "ON".
Leaf through with the ⊞ key until "S5" appears (after it you will see an arrow and possibly an asterisk). Operate the switch S5; at one of the two positions the asterisk must appear. This means that the switch is set to "ON".

**Adjusting the Fixed Value itself:**
Press the ◪ key; the value shown in the bottom right-hand corner starts to flash.
You can now adjust the "Fixed Value" with the ⊞ and ⊟ keys. 0% means one servo end-point; 100% the other end-point. For example, if you set the value to 75% this means a position half-way between centre and one end-point.

Now you can carry out a practical test to see how the "Fixed Value" function works: when switch S5 is "Off", the servo can be controlled in the normal way with the slider. When set to "On" the servo runs to the position you have just set.

If you now want the switch to work the "other way round", press the ◥ key again; "S5" will flash. Press the Ⓡ key, and the arrow after "S5" will be reversed, and you will find that the direction of switch actuation is also reversed.

**Important note for F3B flyers:**
When "leafing through" the options you may have noticed that there is a further option "Fixed Value-2".
You can, in fact, set up two "Fixed Values" (Fixed Value and Fixed Value-2) which you can select at will.
For example, you could set up two pre-set positions for camber-changing flaps on a glider: "Tow" and "Speed".

In order to exploit this option, you will need to use the special 3-position switch "SI". If you use the switch I for this purpose, you must not assign it as a transmitter control for normal usage; **i.e. I controls = ----- (Nothing).** More on this on page 78.

If your brain is still functioning clearly, this is a good time to present **a further refinement** of this transmitter:
**An alternative method of operating many switched functions is to use a momentary switch (or press-button), instead of a normal toggle switch. The optional "stick press-button" is one example, or the momentary switch which is recommended for operating the stopwatch.**

In the following we assume that you have **connected a momentary switch of this type to "S4".**

Press the ◥ key again. Go past "S5" with the ⊞ key; after the displays "LS", "Gx" (the x stands for the letters A - I) and "SI" the symbol S1 appears again, but this time followed by the symbol instead of the arrow. This indicates that a momentary switch is now "expected".
Press the ⊞ key again until "S4↑" appears.
Press the momentary switch "S4". Servo No. 6 will run to the pre-set Fixed Value. Next time you press the button the servo responds to the slider again, and so on.
In this way you can use the momentary switch to release or activate a function in the model which then remains "on" or "off" until you press the button again.

**Caution!**
If you set up this option you can no longer see at a glance the current state of the model, i.e. from the position of the switch toggle. For this reason we only recommend using this facility for a non-critical function, or a function which works in a definite and obvious sequence; for example "undercarriage retracted/extended" or "smoke generator on/off".

**FIXED VALUE again**
You can also assign a servo directly to a FIXED VALUE, regardless of what we have just said. This then functions as a virtual control. Using any assigned function switch you can run the associated servo to and fro between the two positions you have chosen.

## The "Normpos" option

This option serves a special purpose and is only of significance in conjunction with mixers.
When you extend spoilers or flaps it is often desirable to compensate for the change in pitch trim which occurs. To achieve this, part of the spoiler signal is bled off to the elevator servo.

**The following problem then arises:**
The "idle position" (brakes retracted) of the transmitter spoiler control (e.g. stick or slider) is usually one of the two end-points. If we were just to mix the spoiler signal with the elevator, "full movement" of the transmitter control would shift the elevator significantly from its neutral position. This is not what we want; the elevator should not be affected at all at the "spoilers retracted" position.

This can be achieved by sending the "spoiler –› elevator" mixer a "corrected" signal, instead of the true spoiler signal (curve A in the diagram). If the "spoilers retracted" end-point is point X in the diagram, then a signal corresponding to curve B should be sent to the mixer. For the end-point Y the correct curve is curve C.
As you can see from the diagram, the mixer at the "spoilers retracted" position now receives a "zero" mixed input, but it receives the normal, full compensation value at "spoilers extended".

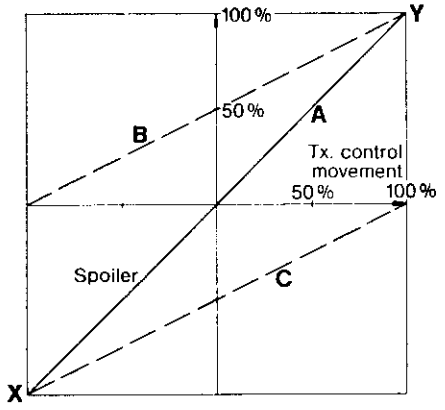



Fig. 27

There is not much to adjust in this option. It is activated by the transmitter automatically when SPOILER or FLAP is assigned. You only need to tell the transmitter the position of the transmitter control for "spoilers retracted" – "back" or "forward".

As an example we will consider "09 CORTINA". Select this model, then, as in the previous examples, press Ⓜ◥◥.

When leafing through the options at "SPOILER" the following display appears:

```
12 CORTINA   PPM9
CTRL.B: SPOILER
      NORM POS.
```

Press the ◪ key; the arrow under "Normpos" starts to flash. You can reverse the facility with the Ⓡ key, if necessary.

At "Arrow forward" you select "idle forward", and vice versa.

With the ⊟ key you switch to Norm Pos "Centre", and if your transmitter control is at centre (a – sign will be visible in the display) you can switch over to one of the end-points with the ⊞ key. If necessary you can then change the end-point again by pressing Ⓡ, and select whether Norm Pos is to affect forward movement (↑) or back movement (↓). The Norm-position is the source point for mixed functions.

That's it; leave the menu in the usual way with the Ⓜ key.

**One further point to note in this connection:**
If you wish to mix spoiler and elevator, or flap and elevator, you must assign the corresponding servo to "ELE+" instead of "ELE"! In this case the inputs Flap and Spoiler will be available in addition to elevator.

# How to use the "Combi-Switch"



The main use of the Combi-Switch is to help the less experienced pilot handle the more demanding forms of model glider. For aerodynamic reasons many gliders require co-ordinated control of rudder and ailerons in order to fly a smooth turn - just like the full-size. However, simultaneous control of two functions can present problems, especially for the less practised pilot.

**The Combi-Switch is used to couple these two controls electronically. The coupling can be be turned on and off via a switch, so that it is possible to switch between "normal" (separate controls) and coupled controls at any time in flight.**

**You can choose the way in which the coupling works:**

The rudder follows the ailerons; in this case you operate both controls with the aileron stick.

The ailerons follow the rudder; in this case you operate both controls with the rudder stick.

The mode which you choose is a matter of personal preference. In both cases you retain full control of the "following" (or "slave") function via its own stick.

**A further point which needs explanation here is the "following rate".** It can be set to any point between 0 and 200%.

An explanation:

At a following rate of **50%** the slave control surface will deflect to half its full travel when the master control is at full throw. The only way of getting greater movement from the following control surface is to operate its own stick.

At a following rate of **100%** both control surfaces move to the same extent.

At a following rate of **200%** the slave control surface deflects to its full extent when the master control surface is only at half-throw. If the master stick is moved beyond this point, the master control surface moves to its full extent; the slave control surface stays at full throw – because there's no more movement available.

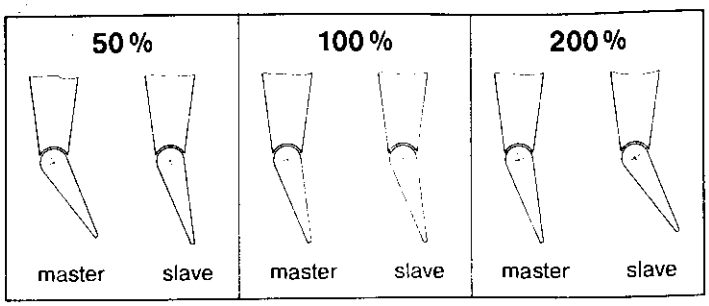



Fig. 28

It is very difficult for us to make recommendations here, as the ideal following rate varies from model to model. If in doubt, you could start with 100% and then carry out test flights to find the best setting for smooth, tidy turns.

**This is an ideal case for using the Digi-Adjustor, as you can then easily adjust the following rate in flight.**

**Now, after this necessary preamble, to the matter in hand:**

You cannot set up the Combi-Switch until you have already assigned one transmitter control to ailerons and one to rudder. You will also need to provide, or "release", a switch for the function. As supplied, the transmitter is set up to use switch S5; it is installed on the left, next to the display.

We will take as our example "06 FIESTA".

You will find the special **Combi-Switch menu** under "Transmitter Control Adjustment".

From the Status display you reach this menu with the key sequence [M][↘]. Then press [↘] to go on. You will see this display:

```
02 FLAMINGO PPM7
COMBI-SW:  S5↓ ↰
FOLLOWING: 100%◢
AILERON→ RUDDER
```

"S5↓" in the second line indicates that switch S5 is selected as the Combi-Switch. Press the [↘] key, and "S5↓" flashes. Using the [+] and [−] keys you can now select a different switch. If you continue pressing the [−] key the final option that appears is "ON". Press y, and "ON" becomes "OFF". Now the Combi-Switch is out of circuit:

```
02 FLAMINGO PPM7
COMBI-SW:   OFF↰
FOLLOWING: 100%◢
AILERON→ RUDDER
```

As we don't want that at the moment, press [R] again ("ON"), then the [+] key, until "S5↓" appears again.

The ↓ arrow after "S5" indicates that the switch is on – i.e. the controls are coupled – if you move the switch in the direction of the arrow. If you wish to reverse this, press the [R] key now; this reverses the direction of operation of the switch. In the display you will see that the ↓ arrow turns into a ↑ arrow.

Incidentally: when the switch is in the ON position, an asterisk appears after the arrow in confirmation (↑*).

Now you can select whether aileron is to be master and rudder the slave, or vice versa.

Press the [◪] key; the following rate value starts to flash. If you press the [R] key, the bottom line of the display alternates between "RUDDER governs AILERON" and "AILERON governs RUDDER". Leave it as you want it to work. In our example we will leave it at "AILERON governs RUDDER", i.e. the aileron control is the master.

Now you have to set the value for the following rate: as the appropriate input field is already flashing, i.e. "released", simply set the value you want with the [+] or [−] keys, or the Digi-Adjustor; in our example 100%.

In the display you should see the following:

```
02 FLAMINGO PPM7
COMBI-SW:  S5↓
FOLLOWING: 100%
AILERON→ RUDDER
```

That's all there is to it: you can leave the menu with the [M] key.

**If you want to adjust the following rate in flight:**
Before launching the model, move to the menu as described and press the [◪] key, to release the value input field. Don't leave the menu! While you are flying your model you can now vary the value of the following rate by rotating the Digi-Adjustor. Land the model and press the [M] key to store the value you have found to be correct.

**Caution!**
**Never attempt to make changes via the keypad while the model is flying. You would have to take your eyes off the model to find the right key; and if you made a mistake, the results could be catastrophic! For in-flight adjustments use the Digi-Adjustor, which you can operate "blind".**

# Memories and lists



When you were deciding which radio set to purchase, the fact that the PROFI mc 3030 transmitter can store, or memorise, up to 99 different models was undoubtedly an important factor.
First a little information on the way in which the PROFI mc 3030 records and stores the model information.

Then we will move on to the more practical matter of the "Memory" Menu and its sub-menus, which are used for:
copying memories
deleting memories
switching memories
naming memories
checking and matching trim settings

## The model list - a simple principle

Imagine one of your models. And now imagine all the aspects of that model for which the transmitter has to be adjusted (the technical term is "configured").
For example, the settings might be:
Aileron on the right-hand stick; elevator left; exponential on elevator; differential ailerons, adjusted to a particular value; sweet bomb release, actuated by a switch,

.
.

the normal position of the trim sliders; direction of servo rotation;

.
.

As you occasionally fly this model at displays/events, a stopwatch would be a handy feature.

.

etc...
If your transmitter had no "memory", you would probably write down all these points in a list and – when you change models – re-adjust the transmitter according to this list. You would write the name of the model at the top of the list.

The PROFI mc 3030 transmitter does exactly that.

If you have already owned a transmitter with a memory, it is best to forget right now that it used "programs" and "adjustment values". These "programs" were nothing more exotic than lists of mixing arrangements, control characteristics etc., made up by the radio manufacturer; usually they could only be modified slightly, if at all. You might have liked a flap – elevator mixer instead of the V-tail mixer – but that was only available in another "program" . . .

**The PROFI mc 3030 is quite honest about the matter of "programs".**
For each model your transmitter draws up a "**list**". It includes everything that applies to that particular model. You do not need to specifically create this list: when you set up the transmitter to meet your requirements, the transmitter assembles the list automatically: everything that you select or adjust is "noted down" by the transmitter. Thus you do not need to store the list in a separate procedure; if you switch off, then on again, the list you last used is "there again" immediately.
You might object at this point: *"that's all very well, but now I always have to make up this list before I can fly a new model, i.e. scratch around for the different assignments, mixers etc. That sounds complicated, and other manufacturers offer ready-made programs!"*

We have two answers to this:
1.) You will soon see that the procedure is by no means complicated or difficult. For your slight effort, however, your reward is that you can seek out and assemble precisely those options and features that you want, "a la carte". And you can leave out what you don't need.
2.) In any case, if the idea of so much "work" is off-putting, or you do not trust your ability at first, the transmitter includes **10 ready-made lists** as standard, which cater for the vast majority of models. Some other manufacturers would call this provision "10 programs" .

**How many lists are available?**
The transmitter can store 15 or 99 such lists, and recall any one of them at any time, when you want to change models. This is probably the most frequently used "memory operation", and it could hardly be easier. When you want to "call up" a different list, move to the "Memory" menu, select "SHIFT", then "leaf through" to the model you want to fly (model names in English – no codes!), and that's (almost) all there is to it. See page 50 for more details of this procedure.
But there are other "memory operations". For example, you can create a copy of a tried and tested list, and you can then give the copy a new name. You can "clear the decks" and erase lists which you no longer need; and much more.

**We don't mind if you want to use the ordinary terms.**
We have used the word "list" here, because that is what the transmitter actually assembles for each model, and because a list is easier to imagine than a "program".
Now, it has become usual to talk of "storing models" or "copying memories". In fact it would be pretty difficult to store even one model in a transmitter – it just ain't big enough. Copying the memory chips in the transmitter is not exactly a simple job, either.

Joking aside: everybody knows what the terms mean. But we think it is worthwhile cultivating a clear and correct style of thinking when dealing with this equipment. Everything that the transmitter "needs to know" about a particular model is included in a list, and the list is contained in a memory. When a memory is copied, it is the contents of the memory which are duplicated in a different memory, and so on.

Are we splitting hairs? We have to admit that we occasionally use the terms "list", "memory" and "model" interchangeably. In this manual we sometimes use the one term, sometimes the other, depending on what is most appropriate. However, if the "sloppy" terms occasionally sound less than precise, then you at least know why, and can always keep the idea of the list in the back of your mind.

**One important point to remember:**
The model which is shown in the display, and which you are actually flying, is the "current" model.

If you make any changes (e.g. to the trims, to servo travel, to mixing ratios etc.), then the modification is always recorded in the list (the "current" list) automatically, immediately. When you switch off, the memory is therefore always "up to date".

When you switch on again, this "latest state" is automatically restored, i.e. you never need to store anything expressly. We have found that this is the easiest and most natural method of working, and the one which strains the old grey cells the least.

**But take care – there could be a catch!**
Let us imagine that you have test-flown a new model and trimmed it out with great care. You would not want to risk making any further changes to this "ideal list". Nevertheless, you would like to try something out as an experiment – but this would change your hard-won list. Or perhaps you have built a new, similar model, and want to use the same list, with minor modifications.

What to do?
Well, the solution to the problem is simple: copy the list into a different memory, then "shift" to the new memory, and experiment to your heart's content.

**This also applies to the "ready-made" sample lists. While you are unfamiliar with the transmitter, you should always work on copies of the original lists, and not on the "genuine originals".**
**For this reason "copying memories" is one of the most important things to learn at the start. It's simpler than you might think!**

---

## The "Files" Menu

All the tasks connected with memories are carried out from the "**Files**" menu. From the Status display you reach this menu with the key sequence [M][◣].
You will see a display similar to this:

```
09 FIESTA   PPM9
---- FILES -----
▛COPY       NAME▜
▙SHIFT  CHKTRIM▟
```

From here you select the following points with the arrow keys:

**Copying:**
The term "copying" embraces the actual copying of one memory to another, but also related tasks, such as transferring a list from one transmitter to another.

**Naming:**
This allows you to enter or modify the model's name in the list.

**Shifting:**
This is where you go to switch to a different model whose list you have already stored.

**Trim:**
From this sub-menu you can check whether the position of the trim sliders has been moved since "last time". More accurately: since the last time you used this memory.
After you shift memories this menu is called up automatically, as it is very likely that the trims have been moved since the last time you used the "new" memory. Naturally, you can also call up this menu without switching memories. In normal use, when you switch on the transmitter there is no automatic check that the the trim sliders are still at the position where they were when you last switched off, so this is a useful feature. For example, if you think that they might have been moved, but you are not quite sure.

These four sub-menus are explained in greater detail below.

---

## The "Copying" Menu

From the Status Display you reach the "**Files**" Menu with the key sequence [M][◣], and move from there to the "**Copy**" Menu with the [◤] key. You will then see this:

```
-- FILE COPY ---
▛ MODE:FULLY
FR. 09:FIESTA  ▜
TO  09:FIESTA  ▟
```

In the second line you see "**Mode:**" At this point there are possible variations from the simple copying procedure. We will discuss these later. At the moment we will only discuss the "normal" copying process, which is used most frequently.

## How to copy a model list

Here we assume that you are already at the **"Copy"** Menu, as described above, and that the display is as shown on the previous page.
The second line (Mode: FULLY) does not interest us at this point.
The **third line** shows the "source"; namely the **number and name of the model list which you want to copy.** The transmitter suggests, in the lack of better knowledge, the "current" model. If that is what you want to copy, then line 3 is finished with too, and you can turn to line 4.
However, we will assume that you want to copy a different model; e.g. the model "BIG LIFT" in memory No. 10.
Press the ◥ key; the memory number begins to flash. You can now "leaf through" the memories using the ⊞ or ⊟ keys, or the Digi-Adjustor, until BIG LIFT appears. This defines the "source". The display looks like this:

```
-- FILE COPY ---
MODE:FULLY
FR: 10:BIGLIFT
TO  06:FIESTA
```

Now you have to **enter the "destination" in line 4, i.e. the memory into which** you want to copy BIG LIFT.
Here again, the transmitter does not know what you are up to, and simply suggests the current memory (No. 6). Naturally this would overwrite the current list (FIESTA), which would be lost for good. If you no longer need FIESTA (you may have crashed or sold it), then you probably want that to happen. In that case, press the Ⓜ key and you are done. FIESTA has been replaced by a copy of BIG LIFT in memory No. 6.
However, we will assume that you want to copy BIG LIFT into another memory, which is not presently in use; e.g. into memory No. 5.
Press the ◪ key; the number of the destination memory will flash. Leaf through again, using the ⊞ or ⊟ keys, until No. 5 appears. As every memory shows what is in it, you can still check whether the memory is actually empty, and that you are not unintentionally overwriting a model which you are still using.

The display should look like this:

```
-- FILE COPY ---
MODE:FULLY
FR. 10:BIGLIFT
TO  05:-EMPTY--
```

If this is what you want, press the Ⓜ key, and you are finished. BIG LIFT is now stored in memory No. 5. By pressing the Ⓜ key once more you leave the menu as usual.

**Here is the whole procedure again in brief:**
**Select the source (the model which you want to copy) in line 3. Select the destination (the memory in which the copy is to be stored) in line 4. Press the Ⓜ key; the transmitter makes the copy. Leave the menu with the Ⓜ key.**

**Note:**
As you have seen in the example, you do not need to "delete" the "destination" memory before you copy.

**Two more tips**

**Tip No. 1**
On occasion you may have second thoughts, and decide not to copy anything, in spite of being at the "Copy" Menu (for example, you may find that there is no vacant memory). You cannot just leave the menu without doing anything, since pressing the Ⓜ key to leave the menu would execute the copying procedure. What to do?

There are two ways out of this problem.

The first: select as "destination" the same memory No. as the "source", and then press the Ⓜ key. You have then copied the model on top of itself, which means that nothing has changed.

Or the second: just switch off the transmitter.

**Tip No. 2**
Let us assume that you notice too late that you have copied a list into the wrong memory, and have thus overwritten the list stored there. Now you've done it! But it's not a disaster. Please see page 49 for the final rescue solution (Memory "Mx").

---

## How to delete a memory

If you are creating a "new" list, the simplest and least confusing route is usually to pick a memory which is vacant, or empty.
This is not absolutely essential, as everything which you enter when assigning and adjusting overwrites the old contents of the memory in any case. However, bear in mind that some aspect of the previous model might lurk unseen in the new list, and it could give you a nasty surprise at an inopportune moment.
For this reason the transmitter offers the option of erasing the contents of a memory. This is done from the **"Copy"** memory.
Here is where the line "Mode: " comes into play – the line we skipped earlier on.

We shall assume that you are still at the "Copy" menu. Press the ◪ key, and "FULLY" on the right starts to flash. Now press the ⊞ key, and "CONTROLS" (transmitter controls) appears. Press the ⊞ key again, and it turns into **"ERASE"**. This is the mode which we now need:

```
-- FILE COPY ---
MODE:>ERASE<
FR. 10:-EMPTY--
TO  05:BIGLIFT
```

Now all you have to do is enter the memory which is to be erased.

To do this, press the ◪ key. In line 4 the (destination) memory number starts flashing. Leaf through again with the ⊞ or ⊟ keys, or the Digi-Adjustor, until you reach the memory No. you want, and press the Ⓜ key. The memory is erased, and you can leave the menu in the usual way, with the Ⓜ key.

**Note:**

The erasure process actually copies "EMPTY" into the destination memory.

That is why you cannot enter anything in line 3 as the "source". "EMPTY" is a form of "source" in this case.

## The "TRANSMITTER CONTROL" copying mode

Earlier on in this Copying section we used the **"FULLY"** copy mode. This simply copies the entire "list", i.e. all assignments and settings of transmitter controls and servos, into the new memory.

As you have already seen when you leafed through to the "ERASE" mode, there is also the (transmitter) **"CONTROL"** mode. This is easily explained:

If you select the "CONTROL" copy mode, only the assignments and adjustments of the transmitter controls are copied into the new memory. The "servo side" is not copied.

**The reason for this mode:**

Many pilots have a "standard" assignment and arrangement of the transmitter controls, which they use for every model. If you acquire a new model, in which only the servo arrangement is different, you can use this copying mode instead of the normal assigning and adjustment procedure for the transmitter controls. For the more complex models (e.g. helicopters, or models with many control surfaces), this can save time.

It is never absolutely essential to use this mode; you could just as easily spend a little more time and assign and adjust your transmitter controls step by step, as described earlier in this manual.

It is not necessary to describe how to copy the "CONTROLS". Apart from the fact that you select "CONTROLS" first, the procedure is exactly the same as when copying "ALL".

## The "EXPORT" and "IMPORT" copy mode

These two "exotic" modes of copying are used to transfer entire "lists" from one transmitter to another.

More details of this on page 79.

**Note:**

You may be surprised to see terms such as IMPORT and EXPORT, which appear to have nothing to do with modelling. The reason is simple: your transmitter's programmer was forced to pick words which describe the feature as accurately as possible, which at the same time would fit within the maximum available number of letters!

## The "Mx" memory - the point of no return

When "leafing through" the memories you may well have come across the fact that there are not really 15/99 memories: there are 16/100. Between memories No. 15 and 1 there is another memory, designated **"Mx"**.

However, you cannot use this memory to store a model permanently, like the other memories. It is "administered" by the transmitter itself, in the following way:

**1) When you erase a memory, the transmitter automatically stores a copy of the deleted memory in Mx.**

**2) When you copy a memory, the transmitter automatically stores a copy of the previous contents of the "destination" memory.**

**3) The transmitter automatically stores a copy of the current memory as soon as you start modifying anything in it, e.g. assignments or adjustments. It does this before the modification in the current memory takes effect, and only at the first modification.**

**And the point of all this?**

Well, the first case is quite obvious. If you make a mistake and erase the wrong memory, you have a "second chance": copy it back from "Mx" into the deleted memory, and all is well.

The second case is also clear: if you copy into the wrong memory by mistake, and overwrite its previous contents, you can still save the situation, because a copy of the overwritten list is now in "Mx". Simply copy it back from "Mx" into the correct memory, and once again your bacon is saved.

In the third case the reasoning is not quite so obvious, but the reason is similar. When modifying a list there is always the danger that you will make a fatal error. Perhaps the modification does not produce the desired effect. You know by now (see page 47) that every change is executed immediately in the current memory. Unless you made a back-up copy beforehand, and are working on the copy, the original list would be lost for ever.

The automatic creation of a "back-up copy" reduces this risk. In an emergency you can recreate the "old state" again, by copying the contents of "Mx" back into the current memory, as described above.

**There is another use:**

Suppose that you want to "swap models", i.e. move two lists into each others' location. To do this you need an intermediate storage location. You could, in fact, use any free memory.

However, if there is no vacant memory available, you can't do that. And in any case it is easier to use "Mx" as the intermediate store.
As an example, we will assume that you want to interchange the contents of memories No. 14 and 16.

First copy No. 14 to No. 16. The transmitter automatically copies the previous contents of No. 16 to "Mx".

Now all you need to do is copy the contents of "Mx" back to No. 14, and you are finished.

---

# The "SHIFT" Menu

**How to switch models**

To switch the transmitter over to another model – it must already be stored in a memory, of course – you just need to "call it up". You don't need to worry about the "current" model (the model in use before you change memories); i.e. you do not have to "save" it first.

As changing models is a Memory operation, move to the "**FILES**" Menu from the Status Display, with the key sequence [M] [◣].
You will see something like this:

```
01 BIGLIFT  PPM9
---- FILES -----
COPY        NAME
SHIFT  CHKTRIM
```

You will see at once that you have to press the [◣] key, next to the word "**SHIFT**".
You will see a new display:

```
01 BIGLIFT  PPM9
----------------
CHANGE TO FILE
NO. 01:BIGLIFT
```

The bottom line still shows the "current" model.
**You want to change this:** so press the [◣] key; the memory No. begins to flash.
"Leaf through" the memories using the [+] or [–] keys, or the Digi-Adjustor.
As the numbers change, naturally the actual name of the model changes too, so that you quickly realise where you are.
Once you have found the memory you want – in our example "02 FLAMINGO", press the [M] key, and you are finished – well, almost!

**There is just one little problem:**
you need to set the trim sliders back to where they were last time you flew the new model. The transmitter cannot do it by itself; it has plenty of brain power, but no muscle power.
To cater for this, the "**TRIM POSITION**" menu appears automatically when you press the [M] key.

```
02 FLAMINGO PPM7
 TRIM POSITION
STICK : A B C D
BEFORE: → ↓ ← ↓
```

Note: in the fairly unlikely eventuality that you have not shifted the trims at all since you last flew this model, you will see equals signs ("=") instead of arrows. Explanation in a moment!

If you do **not** wish to adjust the trims, for whatever reason, press the [M] key to leave the menu. Press [M] twice more, and you are back to the Status display – all done!

**Normally**, however, you will want to reset the trims to the earlier positions.

As an example, we will do this for transmitter control **A** in the above display:
Under "**A**" you see an **arrow** pointing to the **right**. Push the associated trim slider (transmitter control A = left stick, right/left) slowly to the right. At a particular point the arrow will turn into an "=" sign – that's all there is to it.

If you push the trim slider further to the right, the "=" is replaced by an **arrow** pointing **left**. Now you can see what the arrows mean: they indicate the direction in which you must move the trim slider in order to reach the correct setting.
Adjust the trim sliders for B, C and D in the same way.
You are now finished, so press [M] three times to return to the Status display.

---

# The "NAME" menu

**How to enter or change a model name**

The transmitter stores the various models in its memory under the numbers 1 to 15 or 1 to 99 (MASTER Edition only). For you as user it is much easier to be able to recognise each model by its name. Mind you, this assumes that you give your models sensible names; "Model No. 99" doesn't reveal much!
For this reason you can differentiate each "model list" with a name. This name is then stored with the appropriate model (= memory) No., and displayed with the number.

**There are certain restrictions to model names:**

1. Names may be no more than 8 characters long.

"Characters" in this sense are letters, numbers and certain "special symbols", as in the following list:
/0123456789:;=? ABCDEFGHIJKLMNOPQRSTUVWXYZ.
Please note that there is an extra character between ? and A - a blank space, which is also considered a character.

For example, "ASW 20" is 6 characters long. "ASW20" is only 5 characters long.

You don't need to worry about sticking to the permissible characters, as the transmitter does not let you use any others. For instance, lower-case letters cannot be used and are not made available to you.

**Very important:** the eighth character should not normally be a number. There is a "special function" which requires a number as the eighth character, so do not use one otherwise. More details on page 80.

Here are a few possible names:
ASW 20, TYPHOON, CORTINA, STUKA, NONAME; CORTINA3 or STUKA 01 are also possible, but read page 80 and heed the warnings first!

**Tip:**
If you have a model list in a memory which you no longer need, and you want to mark it as such, it is best to erase it altogether. The erasure process gives it the name EMPTY automatically. You may think you will remember which memory is obsolete, but you won't. It makes much more sense to erase memories which are no longer in use, than to continue to store "dead lists".

**After this necessary preamble - let's get down to it:**
From the Status display select the "**Memory**" menu, with the key sequence [M] [◥]. You will see a display similar to this:

```
02 FLAMINGO PPM7
---- FILES -----
▛COPY      NAME▜
▙SHIFT  CHKTRIM▟
```

Now select the sub-menu "NAME" with [◥]. This is what you will see:

```
02 FLAMINGO PPM7
-- MODEL NAME --
 FILE        06▜
 NAME FLAMINGO▟
```

Lines 3 and 4 automatically show the number and name of the "current" model. In our example this is No. 02 and "FLAMINGO".
If you want to change the name or pick another number, you must first select the memory No. To do this press the [◥] key; the displayed number starts to flash. You can now select the number you want, using the [+] and [−] keys (or the Digi-Adjustor). As you do this, the name displayed will also change, as it always relates to what is in the new memory.
We will imagine that you have selected Number 09 "CORTINA". The new name is to be "BAMBINO".

```
09 CORTINA  PPM9
-- MODEL NAME
 FILE        09▜
 NAME CORTINA ▟
```

Press the [◪] key. The "C" of CORTINA starts flashing.

Using the [+] and [−] keys, or the Digi-Adjustor, you can now change the "C". In our example that is simple; press the [−] key once, and "C" turns into "B". Now it's the turn of "O". Press the [◪] key again, and the "O" flashes. Change the O to A, again using the [+] and [−] keys. Move to the next letter with the [◪] key, and so on.

The "underline" character, which you will see alternating with the flashing letter, is known as the cursor: the cursor marks the current position. Without the cursor you would not see anything at a blank space.

Enter the new name letter by letter. If you look carefully when you press the [+] and [−] keys, you will see that the various characters appear in the display in the sequence stated on the previous page. If you want to enter a space, select the **"space" symbol (between "?" and "A").**

When entering a name you can only work from left to right, one character at a time. If you make a mistake, don't worry. You simply press the [◪] key until you reach the eighth character, after which the sequence begins again.

For those of you with absolutely no experience of computers, we will recap:

**The old name is not "erased" immediately; instead each letter is overwritten in turn by the new name. Where there is to be "no new letter", you have to overwrite with a space.**

Now we will assume that you have tackled this task successfully and the new name is on display.

Press the [M] key to leave the menu; then press it a second time, and you are back to where you started: the Status display.

---

## The "TRIM" menu

### How to check the position of the trim sliders

The transmitter "remembers" the position of the trim sliders by entering their values in the "current list". This gives you the chance to check, if you switch on and think that the trims might have been shifted accidentally since the last time you flew.

This is the procedure:

From the Status display press [M] and [◥] to go to the "Memory" menu. Now select "**TRIM**" with the [◪] key. You will see a display similar to this:

```
09 BAMBINO  PPM9
 TRIM POSITION
STICK : A B C D
BEFORE: → ↑ ← ↓
```

If your display were exactly like this one, you would correct the trims as follows: slide the trim slider A slowly to the right. At a particular point the right-facing arrow under "A" would be replaced by an equals (=) sign. If you were to push it further to the right, you would see a left-facing arrow.

**The arrow after the colon (:) indicates the direction in which you have to move the trim slider in order to match the current position with the stored position.**

In our example you would have to move the A trim to the right, the B trim forward, the C trim left and the D trim back, until an equals sign appears at each point.

You can now leave the menu with the [M] key.

**Note:**
Every time you change models (shift memories) this menu appears, as you will have been flying a different model in the meantime, and it is very likely that you need to adjust the trims. And you will certainly want to carry on flying with the trims set to the same positions as the last time you flew the model.

**Caution:**
**Even if you are only entering the data for a model temporarily, be sure to set the trims. If you don't, the trim slider positions for that model will be lost next time you switch memories.**

# Mixers



In this Section you will get to know the mixers which the transmitter has to offer.

Before you dive in here, please make sure that you are familiar with the simpler setting-up tasks, such as assigning transmitter controls and servos, adjusting servo travel and direction and so on. Practise these procedures several times until you feel at home with them.

In our examples we will restrict ourselves to fixed-wing model aircraft; helicopters are covered in a separate Section (page 61). Nevertheless, all the basic information we provide here applies in full measure to the specialised helicopter mixers.

The mixers provided by the PROFI mc 3030 are operated in a rather different way from normal. We think that this new type of "operating philosophy" is much simpler than the conventional method.

For this reason we will first discuss our new method of considering mixers. You will see that the concept fits in elegantly with the simple and logical overall concept of the transmitter, with which you are by now familiar.

After this we describe the characteristics of the "pre-defined mixers" (explanation later); the description is brief, since everything always works in the same way.

Now, modellers are by nature inventive souls, and the probability is high that somebody will find he needs a mixing function which our programmer, in spite of his vast experience, has not thought of beforehand. For this reason there are the "User-defined mixers" ("USR-MIX") which you can "define" yourself. This gives you the chance to overcome the most exotic problems. These user-defined mixers are discussed in the final Section.

---

## What is "mixing"?

Let's imagine a simple case:

Your model is fitted with camber-changing flaps or landing flaps. They are lowered for the landing approach, and thereby increase the lift coefficient of the wing. However, one result of this is usually an alteration in the pitch trim of the model – it becomes nose-heavy or tail-heavy. The pilot then has to apply "up" or "down" in order to keep the model on an even keel.

This manual form of "pitch trim compensation" can be automated by passing a proportion of the "flap signal" to the elevator. Of course, this has to be in the correct direction, and of a suitable magnitude. You don't need to worry that this part of the flap signal "goes missing"; the electronics are designed in such a way that the full signal reaches the flaps, even when part of it is "bled off" to the elevator.

**The net result is that the elevator servo receives part of the "flap" signal in addition to its main "elevator" signal.**

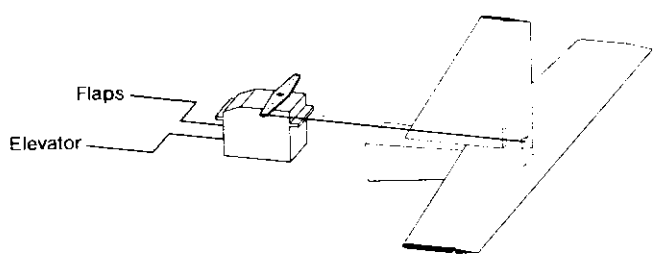



Fig. 29

Now we will refine the arrangement (and complicate it).

Your model is capable of flying smaller-diameter loops if the wing flaps deflect down slightly when you apply up-elevator. Once again the pilot could do it, but we will remove that task from him and automate the process by feeding a proportion of the elevator signal to the flap servo.

**The net result is that the flap servo receives part of the "elevator" signal in addition to its main "flap" signal.**

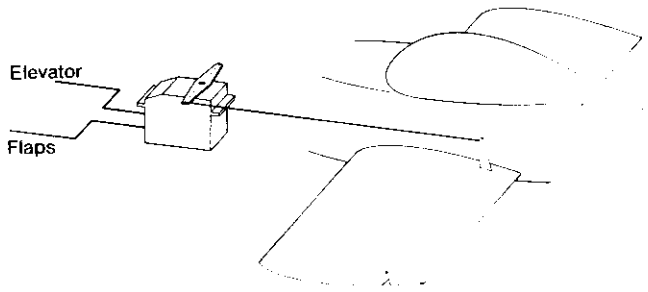



Fig. 30

A year or two ago we might have said this: "that's an elevator/flap mixer". Please forget that right now – it's just too vague to cover the possibilities. Our example is about to become even more sophisticated. The model has suddenly sprouted spoilers, allowing the pilot to make it lose height rapidly. In most cases spoilers also affect the model's pitch trim.

You can probably see what is coming: we feed a proportion of the spoiler signal to the elevator servo: again in the correct direction and of the correct magnitude, and the pitch trim compensation is automatically correct.

**The elevator servo now receives the following signals:**
**the main "elevator" signal**
**part of the "flap" signal**
**part of the "spoiler" signal**

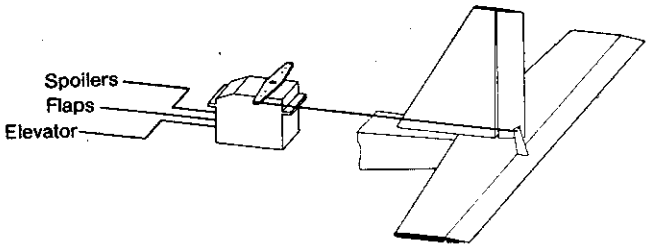



Fig. 31

Our earlier idea of a mixer is now creaking somewhat.

And now the final touch:

We don't always want to fly tight loops; for "normal" flying it is better if the flaps do not deflect automatically when the elevator is moved. Obvious solution: install a switch so that the part of the elevator signal that is fed to the flap servo can be switched on and off.

**We have introduced a switch into the signal line "elevator to flap input".**

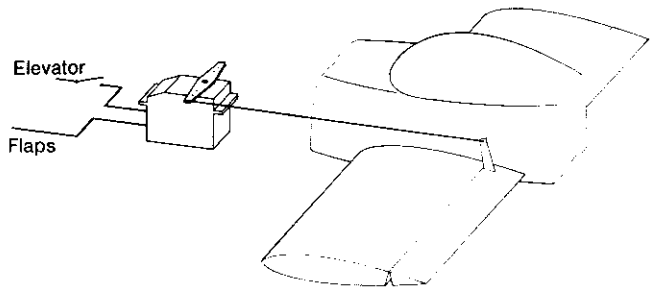


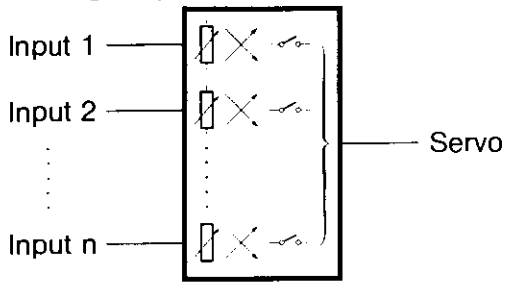

Fig. 32

Now you can probably see how it all hangs together:

Each servo which is to receive more than one single signal is provided with an (imaginary) "black box". The "black box" has inputs for all the signals we need to pass to the servo. But it has only one output – and that provides the composite signal which is actually fed to the servo.

Now we provide an adjustor for each input, so that each of the part-signals can be varied in size. A "reversing device" is also fitted for each signal. And finally, where it is likely to be useful, we fit a switch, so that each part-signal can be turned on and off.

**It is this imaginary "black box" that we call a mixer.**




Now we will look at a different example: a V-tail. First we will only look at one tail panel – one "half". In this case we need a "black box" which combines the "elevator" and "rudder" signals.

It is called a V-tail mixer. In slightly more technical and abstract terms:

A V-tail mixer combines the "elevator" and "rudder" signals and feeds the composite signal to the servo.

We need the same mixer for the other half of the V-tail. Of course, the size of the two signals is fully variable, as in the previous mixer. In this case we have to pay attention to the "prefix", i.e. the direction of rotation of the part-signals: the "elevator" part must work in the same direction for both halves of the tail. The "rudder" part must act in opposed directions. But this presents no problem, as we can, of course, adjust the direction of rotation separately for each part-signal. Even better: we do not need to worry any more about the mechanical linkages and the space available: when the model is complete, we apply, for example, "up elevator"; if the elevator moves down, we simply reverse the direction of rotation of the "elevator part-signal". The same applies to the rudder signals.

**Since the magnitude and direction of each part-signal is fully adjustable, you can see that installation problems are a thing of the past.**

As in this example, there are many other commonly used "mixed functions", for which "pre-defined" mixers can be used. A "flaperon" mixer, for example, produces a composite signal for the flaperon servos consisting of the basic flap and aileron functions (hence **"flaper on"**). If you have a model fitted with flaperons, you again need two such mixers: one for each flaperon servo.

**Commonly used mixers can be pre-defined. The part-signals for the functions of a pre-defined mixer are already laid down.**

Each mixer of this type is given a name which describes its use clearly.

**Such pre-defined mixers are available in an "adequate" number in your transmitter, and cater for all the most commonly used applications.**

You will find mixers for:

V-tail, "V-tail +", flaperons, "elevator +", snap-flaps, delta, "aileron brakes (crow)", "Quadro".

If at this point the operation of any one of these mixers is not clear from its title, don't worry. They are all explained in full at a later stage. You can implement each of these mixers (i.e. install the black box in front of a servo) as often as you like. The actual limit is nine times, since the system is "only" able to control 9 servos. That has to be the definitive answer to the oft-posed question "how many mixers?"!

The answer is not what you might think, and certainly not 9 mixers. It is 9 mixer systems with 10 different transmitter controls to 4 different inputs, i.e. $10^4$ possibilities per servo!

## How to use the pre-defined mixers

The use of the pre-defined, "ready-made" mixers is based on the same scheme that you have already come to know: **first assign, then adjust**. Once again the transmitter "offers" options in the form of menus.
From what we have just said it should be clear that **mixers are assigned to the servos.**

**First a simple example: the V-tail**
Here we will suppose that you have set up memory 03 for a model named "TEST", and assigned the controls like this: "Transmitter control B = ELEVATOR" and "Transmitter control C = RUDDER". Servos 2 and 3 are to operate the V-tail.

**First the mixer is assigned to the servos:**
Move to the **"Assign servos"** menu.
There you first select servo No. 2 in the usual way. Now "activate" the select function field in line 4 with the ◪key.
Leaf through with the ⊞ key. The functions with which you are by now familiar from the normal assigning procedure appear one by one. After "AUX.5" and "MULTNAUT" come the mixers; please see page 32 for the full list. After "ELEVATOR +" comes "V-TAIL". This is the mixer we want. (After this comes the "V-TAIL+" mixer, which can do even more, but we will come to that in a moment).
You will see this:

```
03 TEST      PPM9
- ASSIGN SERVO -
  SERVO        2¶
  IS      V.TAIL◢
```

Press the ◥ key, select servo No. 3 and repeat the whole thing for this servo. The assignment process is now complete.

You have now "informed" your transmitter that:
Servo No. 2 operates V-TAIL,
and Servo No. 3 operates V-TAIL.

It also knows that it is to place the appropriate mixer before each of the two servos. In more abstract terms: you have assigned servos 2 and 3 to the "V-Tail higher mixed function".
Leave the menu in the usual way.

**Now we come to setting up the mixer.**
Move to the **"Servo adjustment"** menu. Press the ◪key to select the sub-menu **"TRAVEL + REVERSE"**.
Select servo No. 2 in the usual way.
You will see this:

```
03 TEST      PPM9
▛SER.2:  V.TAIL
 PART :ELEVATOR¶
◣+100% B↑   ON ◢
```

Line 3 should now make sense (it probably didn't before); here you see "Part: ELEVATOR".

Press the ◥ key and adjust the throw to the one side (stick back) and then the other side (stick forward), just as if setting up in the normal way. There is no reason in this case why you should set unequal movements, so set both to, say, 40%.

If you have an actual model to hand while you carry out this practice procedure, check at this point that "up" on the stick makes the elevator rise. If this is not the case, press the Ⓡ key, and it will be reversed.

**Note:**
If you set mixing ratios which add up to less than 100%, then the mixer will operate in a "linear" fashion, and the control signals will never be restricted. You could, on the other hand, leave both inputs at, say, 100%. In such a case, if you apply elevator or rudder one at a time, you will have full travel available. However, as soon as the sum of the two inputs for either control surface exceeds 100%, i.e. when a lot of elevator and rudder are applied simultaneously, the movement will be restricted, as the servo and the control surface cannot move to more than 100% of maximum. The effect is aerodynamic asymmetry, which can be disturbing.

"Linear" mixing (no more than 100%) is the most elegant solution, but in practice a setting part-way between the two extremes has proved a very effective compromise.

Now to the rudder input. Press the ◥ key, then ⊞. "Input: ELEVATOR" is now replaced by "Part: RUDDER". You will see this:

```
03 TEST      PPM9
▛SER.2:  V.TAIL
PART  :  RUDDER¶
◣+100% C↑   ON ◢
```

Press the ◥ key again, then set the "rudder" input for both directions of rotation; in our example 60% for each side. Here again, check that the control surfaces move in the correct direction (if you have a model handy). Reverse the function, if necessary, with the Ⓡ key.
We hope you didn't find that all too confusing. Never mind – you can repeat the whole operation now for servo No. 3!

**One further note:**
In the right-hand bottom corner of the display you will always see "ON" or "OFF" or "S . . " If you "activate" this corner with ◪, you can switch between "ON" and "OFF" with the Ⓡ key. This switches the corresponding input on and off. This can be a useful feature at the setting-up stage.

**And now a more complex example**
At the start of this Section we discussed a model which featured pitch trim compensation for camber-changing flaps and spoilers, and elevator to flap mixing.

We will assume that transmitter control B has been assigned to the "elevator" function, control D to the "spoiler" function and control F to the "flap" function. The following servo assignments have also been made:

Servo No. 2: elevator
Servo No. 4: spoilers
Servo No. 6: camber-changing flaps

**Here we come to another special feature which**, although it has nothing to do with mixing, is important in an indirect sense.

We will assume that the "basic position" (spoilers closed) of control D is "forward"; to extend the spoilers the stick is pulled right back.
At the basic position a very large signal is already present – namely full travel forwards. Of this a certain proportion would reach the elevator, and that would need to be "compensated away" by some means.

The transmitter offers a better alternative, namely the **"Normpos"** (Normal Position) **control option.** If you have not yet tackled this feature, you should do it now; otherwise you will encounter problems in the next section. Please refer to page 43.

**You must set this option to "forwards" (forward arrow in the display). Assuming, that is, that your spoilers are retracted with the stick forward!**

This action compensates for the undesired basic mixing input before it reaches the mixer. It has no effect at all on the signal to the spoiler servo itself.

From now on take care that control C is set to one or other of its end-points for all your adjustments. Alternatively, you could switch the "SPOILER" input off when adjusting the elevator, as described above.

But enough of the preliminaries.

**First step, as always: assigning:**
Move to the **"Assign servos"** menu with the key sequence M ◪ ◹ ◹.
For servo No. 4 (spoilers) everything is clear; there is no mixing. So, just as with "normal" assignment, first select servo No. 4, then assign "SPOILER" to it. Now to the elevator.
Select servo No. 2, then press the ◪ key; the control function field in line 4 starts flashing. Once again the familiar "list of options" appears. After "AUX.5" and "MULTNAUT" comes "ELEVATOR+":

```
03 TEST      PPM9
- ASSIGN SERVO -
  SERVO        2
  IS   ELEV.MIX
```

This is the mixer that we need. (It is described in detail in the preamble to the detail description of mixers which follows.)
That's all there is to it; flap servo next:
Select servo No. 6, then select the servo function field with the ◪ key. Leaf through again with the ⊞ key.
For an unmixed flap function you would now select "FLAP"; because of the mixer, however, you have to continue leafing through until **"SNAPFLAP"** appears: the name of the mixer which produces the desired mixing effect:

```
03 TEST      PPM9
- ASSIGN SERVO -
  SERVO        6
IS     SNAPFLAP
```

**Now to the setting-up process.**
Move to the "Servo adjustment" menu.
Servo No. 4 is the first one to adjust. There is not much to say about it: set the direction of rotation and the centre point (if necessary) in the usual way.
The flap servo (No. 6) comes next. In this case we should really call it the snap-flap servo, because we have assigned the SNAPFLAP function to it. Hair-splitting? Well, that's how your transmitter sees it.
Select servo No. 6. You see this:

```
03 TEST      PPM9
SER.6:SNAPFLAP
 PART :     FLAP
 +50% F↑    ON
```

In the "Part" line you will see "FLAP" already. So we will set up this input first.
Release the input value field with the ◹ key (value flashes). Check whether the direction of servo rotation is correct. If not, press the R key. But the values themselves? We cannot tell you exactly what they should be, as this depends on your model, and in particular on the length of the actuating arms on the servo and the control surfaces. It is best to measure the result on the flaps themselves; for camber-changing flaps a good starting point would be around 5 - 10 degrees up and 15 - 20 degrees down. Set the slider to the one end-point and then the other, and use the ⊞ and ⊟ keys to set the % values.

Now to the "elevator" input.
Press the ◹ key, then the ⊞ key. With ELEVATOR flashing, the display will look like this:

```
03 TEST      PPM9
SER.2:SNAPFLAP
 PART :ELEVATOR
+100% B↑    ON
```

Activate the input value field with the ◹ key once more. Check the direction of servo rotation; for snap-flaps the elevator must move in opposition to the flaps, i.e. up–elevator with down-flap. Is that how it is? If not, reverse it with the R key. Apply "full up" at the elevator stick, and set the desired flap deflection with the ⊞ or ⊟ keys. Repeat the process for "full down" elevator. A good starting point for both sides would be around 5 - 10 degrees flap deflection; you will be able to find the optimum settings later on, during test-flying.

**Do you remember that we wanted to make the elevator › flap mixing switchable?**

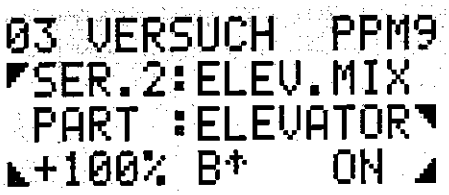
That comes next.

You can – or rather, must – tell the transmitter which switch is to carry out this task (you have to do this because your PROFI mc 3030 sets virtually no restrictions on what you can and cannot do).

We will assume that you decide on "S5". In this case, press the ◪ key. Tap the ⊞ key repeatedly until "S5↓" appears and flashes. The arrow shows that the switch must be pushed in that direction to switch it ON, i.e. the coupling is then effective. If you want to reverse this, press the R key, and the job is done.

You are finished with the snap-flap servo. Now to the elevator (more accurately: ELEVATOR+) servo, in our case No. 2.

Select servo No. 2 with the ◪ and ⊟ keys. The display will look like this:




Part: "ELEVATOR" is already there, so we will set that up first. Release the input value field with the ◪ key, then check the direction of rotation; reverse it if necessary.

Then set the travel itself on both sides: 90% would be a useful starting point.

The "SPOILER" and "FLAP" inputs are adjusted next, but we don't need to describe the adjustment procedure in detail again. In both cases it is all "business as usual": select the input, set the value for both sides. Reverse the function if necessary.

**Our tip: Practise "adjusting inputs" until you are confident with the procedure. Later on, at the flying site, you will also need to know what to do, so that you can make sense of the test-flying process. It is not always quite as quiet and calm out there on the flying strip as it is in your workshop; and in such "mild stress situations" you can easily make an error - unless you are confident of what you are doing, that is.**
**The same applies if you use the "ready-made lists" supplied with the transmitter, without assigning anything yourself. It is almost impossible to use any of the mixers unless you know how to set and adjust input values.**
**Never attempt to adjust anything from the keypad when you are flying a model. Instead use the Digi-Adjustor, which is always switched "in parallel" with the ⊞and ⊟ keys, when it makes sense to use it.**
**The basic rule is this: keep the keypad flap shut while you are flying!**

One final thing you might like to try out in addition to the last example (this has nothing to do with mixers):
Try out the transmitter control option "Fixed Value" for the flap function (see page 42). You will see that every aspect of the adjustments you have made regarding the slider control still functions if you "override" the slider position with a switch.

## Description of the pre-defined, "ready-made" mixers

Now that you have become familiar with the way the mixers are assigned and adjusted, here is a list of the pre-defined mixers in the same sequence as they are offered by the transmitter when you "leaf through" the options.
With all mixers the stick unit trim sliders are automatically included where it makes most sense, or where it is standard practice. You don't need to concern yourself with them at all.

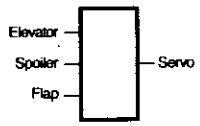
Examples:
For a "V-tail" the elevator trim works in the usual way; for "snap-flaps" it does not.
For each mixing input the size and the prefix (rotary sense of the servo) can be adjusted. The inputs can be switched on and off wherever that is of practical advantage.
You can assign each mixer as often as your application demands it.

Example:
You must use the "Quadro" mixer at least four times; less than that number means that it is no longer a "Quadro" mixer. However, there is no reason why you should not use it six times if your model has three wing control surfaces on each side.
One more time – just to remind you:
You can set any input to "zero" and then disregard it altogether. This may make a particular mixer suitable for a different, but similar purpose.

Example:
With the "Quadro" mixer you could set the "elevator" input to zero, and you then have a mixer which involves "flaps" and "ailerons" only.

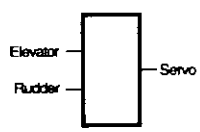
## Mixers for fixed-wing models

**The "ELEVATOR+" mixer**
Inputs: Elevator
Spoiler
Flap



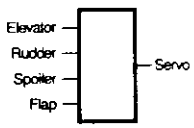

The mixer is usually assigned as follows:
Elevator servo
Main application:
Standard models with camber-changing or landing flaps and/or spoilers.

**The "V-TAIL" mixer**
Inputs: Elevator
Rudder



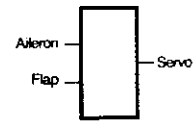

The mixer is usually assigned as follows:
V-tail servos
Main application:
Model aircraft with V-tails

**The "V-TAIL+" mixer**
Inputs: Elevator
Rudder
Spoiler
Flap



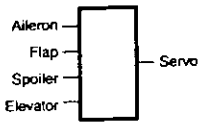

The mixer is usually assigned as follows:
V-tail servos
Main application:
Models with V-tail and/or spoilers and/or camber-changing or landing flaps.

**The "FLAPERON" mixer**
Inputs: Aileron
Flap




The mixer is usually assigned as follows:
Flaperon servos
Main application:
Models with flaperons (combination flap/ailerons)

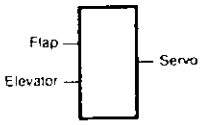
**The "aileron brake" (Crow) mixer**




Inputs: Aileron
Flap
Spoiler
Elevator

The mixer is usually assigned as follows:
Flap and aileron servos. Usually 4 servos.
Main application:
Models in which the "Crow" configuration is to be used as an aid to flight path control in certain flight situations (descent, landing approach). Can also be used for pure "aileron brakes".

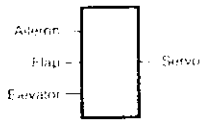
**The "SNAPFLAP" mixer**




Inputs: Flap
Elevator

The mixer is usually assigned as follows:
Flap servos
Main application:
F3A class aerobatic models for "square" manoeuvres

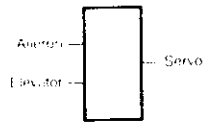
**The "QUADRO" mixer**




Inputs: Aileron
Flap
Elevator

The mixer is usually assigned as follows:
Flap and aileron servos
Main application:
Gliders with "Quadro" flap configuration (flaps support ailerons, ailerons support flaps)

**The "DELTA" mixer**

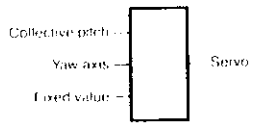



Inputs: Aileron
Elevator

The mixer is usually assigned as follows:
"Elevon" servos (combination ailerons/elevators) Main application: delta model aircraft and flying wings.

## Mixers for model helicopters

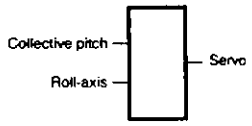
**The "TAIL ROTOR" mixer**




Inputs: Collective pitch
Yaw-axis
Fixed value

The mixer is usually assigned as follows:
Tail rotor servo
Main application:
Model helicopters with main rotor torque compensation via tail rotor

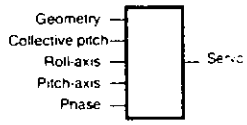
**The "HEIM HEAD" mixer**




Inputs: Collective pitch
Roll-axis

The mixer is usually assigned as follows:
Swashplate actuation servos
Main application:
Model helicopters with Heim-type swashplate linkage, or similar

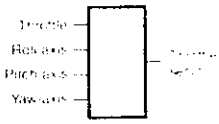
**The "HEAD-MIX" mixer**




Inputs: Collective pitch
Roll-axis
Pitch-axis
Geometry
Phase

The mixer is usually assigned as follows:
Swashplate control servos
Main application:
Model helicopters with "Collective Pitch Mixing" swashplate linkage

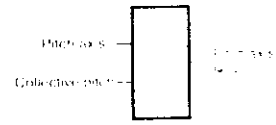
**The "DYNAMIC-THROTTLE" mixer**



Inputs: Throttle
Roll
Pitch-axis
Yaw-axis

The mixer is usually assigned as follows:
"Throttle" servo
Main application:
All model helicopters in which throttle is not controlled directly by the pilot, but is controlled indirectly according to the power absorption of the main and tail rotors.
Special feature:
The "roll", "pitch-axis", and "yaw" inputs are mixed "without prefixes", as the power requirement of the main and tail rotors rises from zero "on both sides".

**The "FLARE" mixer**



Inputs: Pitch-axis
Collective pitch

The mixer is usually assigned as follows:
Pitch-axis servo
Main application:
Helicopters with separate pitch-axis servo (e.g. Schlueter, "Shuttle"), if "flare" mixing is desired.

---

## The freely definable mixers ("USR-MIX" mixers)

In contrast to the "pre-defined" mixers discussed in the previous Section, the user-definable mixers give you the chance to select precisely the mixing inputs you require. This feature caters for all possible applications for which no pre-defined mixers are provided.
Once they have been "defined", these mixers can be used exactly like the "pre-defined" mixers.

This means that they are assigned and adjusted in exactly the same way. And in exactly the same way, switches are provided for turning individual inputs on and off.
These mixers give you total freedom!

**Note:**
In practice, the term "defining mixers" means that you select:
Input 1 controls (say) aileron
Input 2 controls (say elevator

That is all you need to do to define a delta mixer. You can now assign the mixer in the standard way. However, when you try out the system, you will discover:

No trims!

Right then, back to defining the USR-MIX mixer, release the input field with the [R] key, and add the trim.

E.G. Input 1

**1. AIL +T**

And the result? Nothing! Has the transmitter gone wrong?

No, there's nothing wrong: first you must re-assign the modified USR-mixer. Move to the servo assignment menu, select the appropriate servo, and activate the input field. The legend USR-MIX 1 flashes – now the altered USR mixer is active.

You may find this difficult or complex, but bear with us; this "trap" in fact offers immense possibilities.

If you are really clever, you will already have realised the potential:

Since we have to re-activate the mixer each time, we can alter the USR mixer definition between each servo assignment (servo 1, 2, 3 etc.), so that each of the 9 servos has its own USR mixer. But – of course – there has to be a drawback.

The USR mixers can indeed all be different, but they all have the same name, e.g. USR-MIX 1.

At this point we will come back to the game we played before, in answering your friends' question:

*"My transmitter has 6 mixers; and yours?"*

Independent of the 13 ready-made mixer systems, each of which you can apply 9 times, you now have the USR mixers. These can be assigned up to 10 different inputs for all four channels. That means: 104 possible mixers per servo!

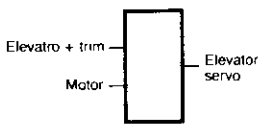
And if you happen to possess the Master-Edition transmitter you can set up 891 of these mixers differently!

**Sample applications:**

**As the first example,** imagine an electric-powered model aircraft. Imagine also that it has the unpleasant habit of becoming more and more tail-heavy, the more the "throttle" is opened (the more power is fed to the motor). Quite why this occurs we don't need to waste time thinking about: perhaps the modeller just wanted an easy life, or maybe he made a mistake at the building board.

Now, wouldn't it be nice if we could mix down-elevator in with the "throttle" automatically, so that more "down" was applied as the throttle was opened. We would then need a "motor" and "elevator" mixer.

A case for a mixer – a USR-MIX mixer.

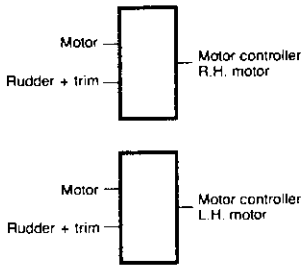



**Second example:** in a model boat with 2 motors and 2 screws the motors are required to support the rudder.

When "right rudder" is applied, the left motor is to be fed with more current, and the right one less; and the other way round when "left rudder" is applied.

Here we need two mixers of the same type for the inputs "rudder" and "motor":

If the two motors have already been set for separate




control from the transmitter, using the assignments "MOTOR" and "MOTOR-2", then the solution can be even more sophisticated, but we won't go into that here.

**How to "define" the mixers**

Every definable mixer has four inputs. To define the mixer, we need to tell the transmitter which control functions it is to send to these inputs.

That is what we mean by "defining".

Naturally, this is done by means of a menu, which you will find in the "bottom right-hand corner" of the **"Assigning"** menu.

Starting from the Status display, move to the **"Assigning"** menu with the key sequence [M][◪][◹]; then select "USR-MIX" with the [◪] key. You will see this display:

```
- DEFINE MIXER -
USR-MIX1 IS
  CONTROLLED BY:
1.    UNUSED
```

**Now we will define the mixer for the first example.**

This will be USR mixer 1.

Of the four possible inputs we need only 2: one for "MOTOR", the other for "ELEVATOR". In line 2 (Number and "name" of the mixer) you will see "USR-MIX1"; i.e. there is nothing to be done here.

Now we will "define" the inputs in turn: in line 4 you will see "1", which is the first input; we can leave it as it is.

Press the [◪] key; and the "type of input" = control function can be entered. Leaf through with the [⊞] key until "MOTOR" appears. That's it done.

Now to the second input. Press the [◹] key, followed by [⊞]. "1" turns into "2". Press the [◪] key again, then leaf through with the [⊞] key until "ELEVATOR" appears:

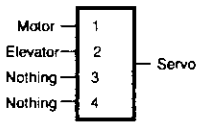
```
- DEFINE MIXER -
USR-MIX1 IS
  CONTROLLED BY:
2.   ELEVATOR
```

Now you really are finished. Inputs 3 and 4 are not used.

It is always possible that there could be something undesirable left here from an earlier mixer definition, so we ought to have a look, to be on the safe side:
Select input 3 as discussed above. If you see "-----" (Nothing) there, move on immediately to input No. 4; otherwise leaf through with the ⊞ key until "-----" appears. Repeat the process with input 4.
This really does complete the task. Leave the menu in the usual way with the Ⓜ key.

**At this point** a little "operating convenience" is built in: you are taken immediately to the "Assign servos" menu, where you can carry out this process. If you do not wish to do this, just press Ⓜ again.

The result of your work, in diagrammatic form:




To assign this mixer to the elevator servo, leaf through until you see "Servo No. . controls USR-MIX1".
*number of servo*

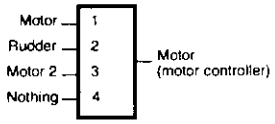
If you want to adjust this servo, you must then, as with the other mixers, adjust both inputs "MOTOR" and "ELEVATOR".

**The second example in abbreviated form:**
For this you use USR mixer 2. Assign "MOTOR" to input 1; "RUDDER" to input 2.

If you assign "MOT-2" to the 3rd input, then a further refinement is automatically available. Why not try and work out what it is? (clue: bear in mind that you can later switch off or set inputs to zero).

Input 4 is again set to ----- (Nothing).

This mixer in diagrammatic form:




**And now one small, but very important difference: What happens to the trims?**

With many mixers it is necessary to include the trim slider positions with the "pure stick signal". For example, that applies to a V-tail, otherwise it would not be possible to trim the elevators and rudder. The same also applies to the elevator control of a flying wing model.

On the other hand there are mixers in which the position of the trim sliders should not be included. Example: "snap-flaps" on an aerobatic model. In this case the wing control surfaces should not deflect when the elevator trim slider is shifted; flap movement is only required when you "control" the elevator.

It depends therefore on your particular application, whether you want the mixing inputs with or without trims, and this applies equally to the USR mixers.

**You can choose this too:**
We will return to the first example we discussed here. We had this display:

```
- DEFINE MIXER -
FUSR-MIX1 IS
 CONTROLLER BY:
◣2.  ELEVATOR  ◢
```

Press the ◪ key again; "ELEVATOR" flashes.

If you now press the Ⓡ key, "+T" will appear next to it. This means "with trim", and indicates that the trim position is now mixed in with the ELEVATOR input:

```
- DEFINE MIXER -
FUSR-MIX1 IS
 CONTROLLED BY:
◣2.  ELEVATOR+T◢
```

If you press the Ⓡ key again, "+T" disappears again, and the mixing occurs "without trims".

**One last time:**
**Please bear in mind (as already described above) that you must re-assign the USR-Mixers every time you alter their definition, otherwise the changes will not take effect.**

# Helicopter control systems



Over the course of its existence the model helicopter has developed into a sophisticated and demanding machine. The demands these machines make on the radio control system are no less comprehensive. The PROFI mc 3030, with its vast flexibility, is more than a match for all these requirements; thanks in particular to the specialised "helicopter mixers" and the user-defined mixers, which can be used to fulfil almost any conceivable need. Experts will also be delighted to exploit the possibility of "switching memories in flight" (see page 76).
If you already have some experience with choppers the following Section will probably present no problem.

If you are a beginner to the world of the whirling rotor, we strongly advise you to read and study modelling magazines and specialist books to complement the information in this manual.

That is not because the PROFI mc 3030 is complicated, but because helicopters are inherently complex. And because it is not possible to start with 2 or 3 functions, as with a fixed-wing model. It is far outside the scope of this manual to go into the basics and finer points of helicopter control systems, as they are by no means as easy to understand nor as easy to imagine as those of fixed-wing models. Some of the commonly used terms are explained in this section where necessary; and you will find some further explanations under "Some helicopter terms" on page 90.

In this Section we start from the assumption that you are already familiar with the way the transmitter works, so that we can concentrate on the characteristics of the helicopter.

Even if you consider yourself an expert and a helicopter specialist you should at least carry out a few "dry runs" with the fixed wing examples, so that you become familiar with the way the transmitter works.

As a minimum, you should feel at home with the method of finding your way around the menus, and with selecting, assigning and adjusting servos and transmitter controls.

Basically the "helicopter" transmitter is operated in the same way as for a fixed-wing model. Everything that we have said up to now on working with memories, mixers and so on, applies in full to the helicopter transmitter.

However, there is one fundamental difference: every modern model helicopter is flown with at least one mixer right from the start, and most of them feature several mixers. The "collective pitch/throttle curve" is another feature which is peculiar to the helicopter world.

**But now: down to business.**

---

## The assignment process for helicopters

If we disregard the early, very simple helicopters, which managed without collective pitch, the model helicopter requires at least five primary control functions:

1. Collective pitch
2. Pitch-axis (fixed wing: elevator)
3. Roll-axis (fixed wing: aileron)
4. Yaw-axis (tail rotor - fixed wing: rudder)
5. Throttle; usually linked to and derived from collective pitch

Commonly used auxiliary functions:

6. Gyro suppression

and 7. Mixture adjustment for the motor.

## Assigning the "transmitter control" end of the system

At the transmitter end the four main control functions:
COLLECTIVE PITCH, PITCH-AXIS, ROLL
and YAW have to be assigned to the two transmitter sticks in the usual way.

As the "THROTTLE" function is controlled in two ways – partly via a derived signal from "COLLECTIVE PITCH" and partly via a separate control (more details later) – a transmitter control must also be assigned to it; usually one of the two sliders.

The other slider is used for mixture adjustment.
Start by moving to the "Assign transmitter controls" menu as described before. Assign the transmitter controls A - D to the control functions COLLECTIVE PITCH, ROLL, PITCH and YAW, using the arrangement you prefer.

Assign slider E or F to "THROTTLE"; then the remaining slider to "MIXTURE".

If you are using a gyro which can be controlled from the transmitter, a further transmitter control needs to be assigned to it; for example one of the "switched channels" H; in the transmitter's language: transmitter control H = GYRO.

If you do not need mixture adjustment, you could assign one of the sliders to the gyro.

## Assigning at the "servo end"

Here things get a little more complex. But let's do things in the right order!

In the model there are three groups of control functions:

1. **The tail rotor (yaw) control system, including gyro suppression**
2. **Throttle control system including mixture adjustment**
3. **Swashplate (main rotor) control system.**

**No helicopter can manage without this:**

## The tail rotor control system

Move to the "Assign servos" menu. Select in the usual way the desired servo number, and activate the servo function field in line 4 with the ◪ key.

"Leaf through" with the ⊞ key until "TAILROTOR" appears:

```
06 TEST      PPM9
- ASSIGN SERVO -
  SERVO         6
  IS   TAILROT.
```

In our example servo No. 3 is now assigned to tail rotor control. This automatically makes available the essential mixer which passes part of the collective pitch signal to the tail rotor servo. All you need to do later is set the level of the **two** inputs.

**Important:**
Be sure to assign "TAIL ROTOR". If you assign "YAW" instead, you will have the normal stick function, but not the collective pitch mixing – i.e. no static tail rotor compensation!

**Set up gyro suppression** in the same way:
As the "sensitivity" input of the gyro is connected to the receiver in the same way as a servo, the "formal" designation here is: "Servo No. .. controls GYRO".
In our example the gyro is connected to receiver output 6.
So: press the ◥ key and select servo No. 6. Press ◪ and leaf through until "GYRO" appears:

```
06 TEST      PPM9
- ASSIGN SERVO -
  SERVO         7
  IS         GYRO
```

Leave the menu as usual; that's it – done!

---

## The throttle control system

**First the mixture adjustment**
At the "Assign servos" menu select, say, servo No. 7; then press the ◪ key and select "MIXTURE":

```
06 TEST      PPM9
- ASSIGN SERVO -
  SERVO         7
  IS    MIXTURE
```

**Now the "throttle" servo.**
First we select the appropriate servo again; in our case No. 4.
Now, instead of the simple "THROTTLE" function as on a fixed-wing aircraft, we are offered the mixed function "DYN.-THROT." (dynamic throttle). This mixed function allows you to "switch in" part of the ROLL, PITCH and YAW control signals to the throttle signal. This is desirable because every control movement requires extra power from the motor. If you do not want to use this feature, the ROLL, PITCH and YAW inputs will be set to zero.
So: press the ◪ key, then leaf through with the ⊞ key until you see "DYN.-THROT.":

```
06 TEST      PPM9
- ASSIGN SERVO -
  SERVO         7
  IS   DYN.THR.
```

That's all there is to it here, too.
**Incidentally:** if you don't hold with such refinements, you can always use the simple "THROTTLE" function. In that case the mixing arrangements simply do not apply.

---

## The swashplate control system

Here we can't avoid getting a little deeper into the technology, as there are several different rotor head control systems, or designs, which differ widely from each other. In fact they all do the same job: they provide control of collective pitch, roll-axis and pitch-axis. However, the different systems make quite different demands on the number of servos and how they are used.

**For this reason we present here a brief description of the three most important systems, and the assignments required for each:**

**1. The "classical" fixed swashplate**
This design is used, amongst others, on the "Schlueter System 80" and the "Shuttle".
The swashplate cannot move along the axis of the rotor shaft; it can only tilt. Collective pitch control is via a pushrod which runs inside the hollow rotor shaft, or in a groove in the rotor shaft. Collective and cyclic pitch are mixed mechanically "higher up", at the rotor. The swashplate is controlled by two servos, set at 90 degrees to each other.

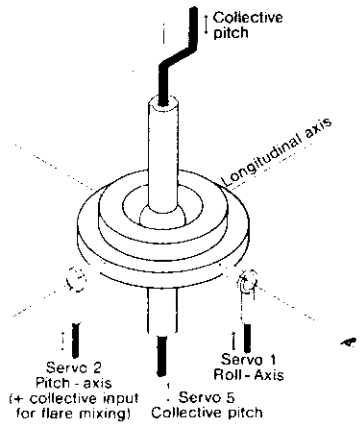



Fig. 33

There are therefore three servos for collective pitch, roll-axis and pitch-axis, which have entirely separate functions.

Servo No. 1 controls ROLL-axis
Servo No. 2 controls PITCH-axis
Servo No. 5 controls COLLECTIVE PITCH

If you wish, you can mix in the pitch-axis input to collective pitch at a later stage, if you find it necessary (for the transition from cruise to hover). To achieve this, assign "FLARE" to the pitch-axis servo.
Please note that if you change the assignment, all the previous pitch-axis servo adjustments will be lost.

**2. The "CPM" swashplate**

CPM stands for "**C**ollective **P**itch **M**ixing". This type of linkage is to some extent the extreme opposite of the fixed swashplate. In this case the swashplate is free to move along the rotor shaft in the axial direction. Moving it axially produces collective pitch control; tilting it produces cyclic pitch control.
Three servos are again required, but in this case all three act on the swashplate. This arrangement is known as a 3-point linkage. However, it is possible to use more servos to control the swashplate.
A 4-point linkage presents no problem to the transmitter.
You could even "distribute" 5 or more servos around the rotor head, should a helicopter with these features ever come onto the market.
There are two different methods of arranging these three servos: the "90-degree arrangement" and the "120-degree arrangement":

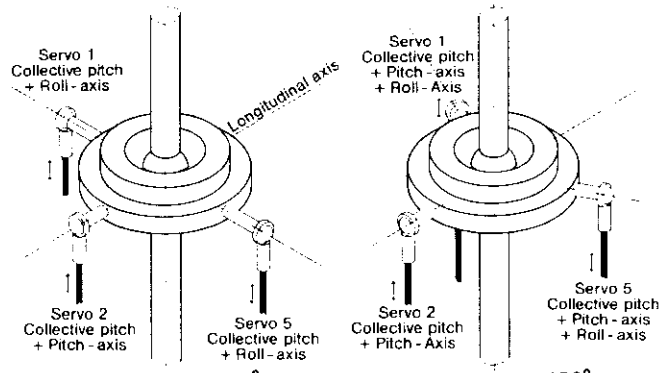
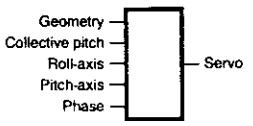



Fig. 34

**The 90-degree arrangement is the simpler one.**
All three servos must first be assigned an equal part of the COLLECTIVE PITCH signal; the result is that the swashplate rises and falls evenly when the collective pitch control is operated.
For roll control only the two outer servos are operated, in this case in opposite directions. Finally the central servo alone provides pitch-axis control.
**The 120-degree arrangement distributes the loads to the servos more evenly.**
For collective pitch control all three servos again receive an equal part of the COLLECTIVE PITCH signal. For roll control, once again, only the two outer servos are operated, in opposite directions. For pitch-axis control, however, all three servos must work: the two outer ones work together, but in the opposite direction to the central one.
Even this is not the end of the matter: the servo movements must be different. The two outer servos, when required to produce a pitch-axis movement, deflect by the same amount. The central one has to move twice as far.

**The same "HEAD-MIX" mixer is used for controlling the servos in both versions of the CPM rotor head:**




*For a more detailed description regarding geometry and phase see the adjustment samples!*

This mixer offers the facility to feed adjustable COLLECTIVE PITCH, PITCH-AXIS and ROLL-AXIS inputs to each servo. Any input which is not required – e.g. ROLL for the central servo – is simply switched off.
The servo assignment is simple:

Servo No. 1 controls HEAD-MIX,
Servo No. 2 controls HEAD-MIX,
Servo No. 5 controls HEAD-MIX.

Naturally, you still have to set the level and direction of the three inputs.
As an example to help you remember, the display will look like this (servo No. 2):




The 4-point linkage is, in practice, a 90-degree arrangement with 2 pitch-axis servos.
Your PROFI mc 3030 makes everything very simple. You assign "HEAD-MIX" to, say, servos 3 to 6. A 4-point linkage is supposed to offer advantages should a servo fail. Depending on the cause of the problem, it may then be possible to carry out an emergency landing.
You will find the necessary adjustments on page.

**3. The "Heim" swashplate**

This swashplate is also free to move axially, and collective pitch is achieved by this movement. However, it is only controlled directly by two (outboard) servos; when they move in the same direction the result is a collective pitch movement; when they move in opposite directions the result is a roll movement.
A bellcrank is provided for pitch-axis control, and this is operated by the pitch-axis servo, which is mounted at right-angles to the rotor shaft. The bellcrank "floats", and thus moves up and down with the swashplate. The bellcrank "de-couples" pitch-axis control from collective pitch. By an ingenious design of the floating bellcrank pivot "flare" mixing is achieved automatically, so no special "flare" mixer is needed.

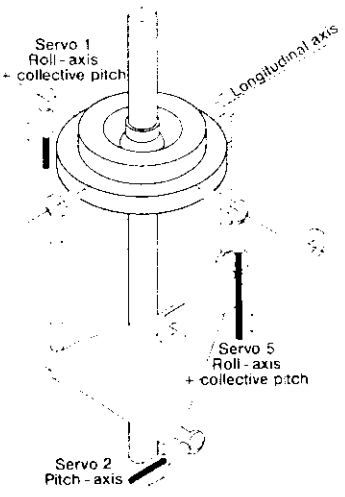
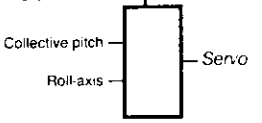



Fig. 35

A special "HEIMHEAD" mixer is provided for the two "collective pitch/roll" servos.




Servo assignment is as follows:
Servo No. 1 controls HEIMHEAD
Servo No. 5 controls HEIMHEAD
Servo No. 2 controls PITCH-AXIS

# Transmitter control options for helicopter control systems

The transmitter offers a series of options for helicopter control systems, exactly like the fixed-wing control systems, which you can "activate", and adjust, when you need them.

If the term "transmitter control options" is not clear, please turn back to page 38 and read that section.

To some extent these options are identical to those for fixed-wing models; however, some of them are specific to helicopters.

The helicopter-specific options are explained in the following section. We assume that you are familiar with the others; you can read up on them on page 38 if you are not sure.

Here again, you are free to make use of as many of these options – or as few of them – as you wish.

**The following options are available:**

| Option | Transmitter control |
|---|---|
| Dual Rate | PITCH, ROLL, YAW (tail rotor) |
| Exponential | COLL. PITCH, PITCH, ROLL, YAW |
| Travel adjust, both sides | PITCH, ROLL, YAW, COLL. PITCH* |
| Centre adjust | PITCH, ROLL, YAW, MIXTURE, COLL. PITCH** |
| Idle | THROTTLE |
| Fixed value | THROTTLE |
| Throttle curve | COLLECTIVE PITCH |
| Direct throttle | COLLECTIVE PITCH |
| Gyro ON/OFF | GYRO |

* "Collective pitch maximum" and "collective pitch minimum" in helicopter terminology.
** "Collective pitch-hover" in helicopter terminology.

# The "collective pitch curve"

The term "collective pitch curve" refers to the relationship between the position of the collective pitch stick and the actual angle of collective pitch. Please refer to Fig. 36 here:

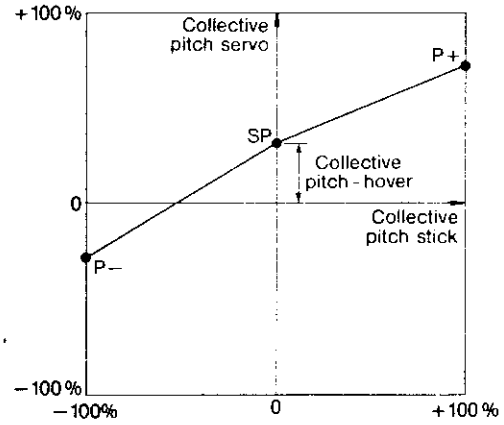



Fig. 36

When the collective pitch stick is set to "Centre", the helicopter is required to hover: this is the "Hover Point" (HP). The corresponding angle of rotor blade pitch is usually stated by the helicopter manufacturer, and is usually in the range +2 to +4 degrees; +3 degrees is a good starting point for your own experiments.

At the "maximum collective pitch" stick position the rotor blades are set to the maximum pitch angle for normal flying; here abbreviated to "P+". Its actual value is best discovered in practical flight testing, as it varies according to the motor power available (see below).

At the "bottom end" is the "minimum collective pitch" position – point "P–" (stick right forward). This setting is not critical and varies according to the model and the pilot. It is best for beginners to stick to the helicopter manufacturer's recommendation here; experts will have their own ideas.

You can adjust all three points independently of each other. In fact, these adjustments are no different from centre adjustment and separate travel adjustment of the collective pitch transmitter control, and you will find them in the menu under these terms. So: move to the "Adjust transmitter controls" menu; leaf through to the COLLECTIVE PITCH control. Set the hover point (HP) with the "Centre" option, and collective pitch maximum and minimum with the option "Travel ↑/↓ .

**Note:**
As collective pitch is always adjusted in conjunction with the "throttle curve", we will have to come back to this subject in due course.

# The "throttle curve"

The level of motor output, i.e. the position of the throttle slide in the carburettor, is usually derived from the position of the collective pitch stick for normal flying. The relationship between the two is termed the "throttle curve".

**The options**

You can select either of two types of curve:

**"3-point curve"** Fig. 37;
or **"5-point curve"** Fig. 38.

**The philosophy concerning control and adjustment is the same for both curves:**

The starting point is always the hover, as this is the most important basic adjustment. The collective pitch required for the hover is determined within close limits by the design of the helicopter. The required "throttle" setting for the hover is adjusted to match the collective pitch setting.

The next important "corner point" is maximum collective pitch. This cannot be set to any old value, however, as it depends on the maximum power of the motor. For this reason full throttle is set first, and the maximum possible collective pitch subsequently set to match it.

The last corner point is "minimum throttle" at low collective pitch. On older transmitters this is where the "idle-up" or throttle pre-select function was used. To avoid confusion, we have also termed this point "IU". In this case the throttle is adjusted with the rotor "unloaded"; so that the rotor speed remains as nearly constant as possible.

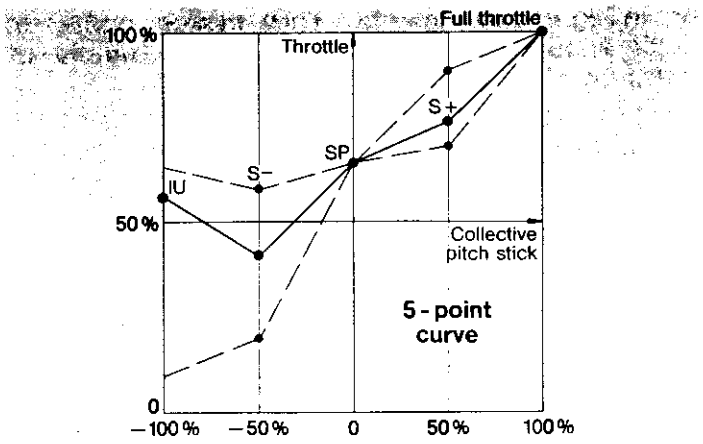



Fig. 37

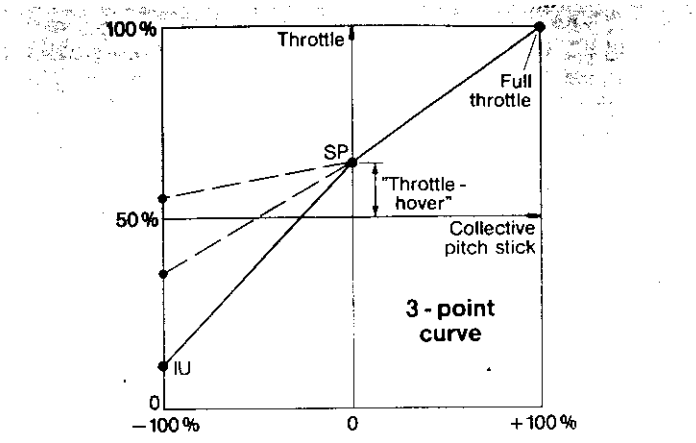



Fig. 38

**The 3-point curve** is simpler to set up, and is adequate in most cases. It also forms the basis for the 5-point curve.

**The 5-point curve** offers a further, adjustable point above and below the hover point, so that you can match the required motor power more accurately to the characteristics of your motor. By setting these two points the "throttle curve" is endowed with either a progressive or a regressive shape. It also provides an easier method of increasing power for "negative collective pitch" – i.e. for aerobatics. The only drawback is that it gives you more work at the adjustment stage.

The additional point in the middle, between hover point and maximum collective pitch, is termed "S+", the point between hover and minimum collective pitch "S–".

**How to set the points**

It is very helpful if you become familiar with the process of selecting and adjusting these curves, so we recommend that you carry out the following practice session.

At the "Adjust transmitter controls" menu, select the COLLECTIVE PITCH control, and then select the "Throttle curve" option. The menu will look like this:

```
06 TEST      PPM9
CTRL>B:    PITCH
        THR.CURVE
 ff3P HP:   75%
```

Press the ◪ key; the "bottom left-hand corner" will flash. You can now select either "ff" or "fb", using the Ⓡ key. Choose between "3P" and "5P" with the ⊞ and ⊟ keys.

You can probably guess what the abbreviations mean already:

ff3P = "Full throttle forward", 3-point curve
fb3P = "Full throttle back", 3-point curve
ff5P = "Full throttle forward", 5-point curve
fb5P = "Full throttle back", 5-point curve

**First the 3-point curve.**

Stay at "ff3P" and press the ◪ key. "HP" (hover point) will flash. You are already at the point where you adjust the "hover throttle" setting. Use the ⊞ or ⊟ keys, or the Digi-Adjustor, to set the desired value; e.g. 75% (here 0% = throttle closed; 100% = full throttle).

Move the stick back to the full-throttle position and hold it there. The display will now show "P+" instead of "HP"; and you can again set the correct value using the ⊞ and ⊟ keys, or the Digi-Adjustor.

**Caution: you are now adjusting collective pitch maximum** (not full throttle)!

This method of adjustment is based on practical experience: full throttle is a fixed value, and maximum collective pitch must be set to match that value. If you want proof that you are actually setting collective pitch maximum, you can later move to the "Travel ↑/↓" option, and examine COLLECTIVE PITCH travel at "stick back". There you will find the same value set.

Now to minimum throttle. Move the stick forward and hold it there; the display will now show "IU". You can now set the carburettor position for collective pitch minimum; e.g. 10%.

**The 5-point curve**

The setting-up procedure is similar to that outlined above. No doubt you realise that you must first select "5P" instead of 3P.

If you have already set up a 3-point curve, then those values still apply. Otherwise you should set those three points first, as already described.

You are sure to have discovered by now that the symbol "S+" appears in the display when you move the stick between "HP" and "P+". This is the additional point interposed between hover and maximum collective pitch. Hold the stick in that position and enter the value you think correct.

Exactly the same applies on the "other side". Between "HP" and "IU" you will find "S–". Hold the stick in this position and enter the correct value with the ⊞ and ⊟ keys, or the Digi-Adjustor.

**Adjusting the values in flight**

**Caution:** never attempt to make changes in flight using the keypad. The risk of making a catastrophic error is too great!

**Always use the Digi-Adjustor for making in-flight adjustments.**

You don't really need to concern yourself with the details of adjusting this curve. If you rotate the Digi-Adjustor during a flight, it adjusts that part of the curve which corresponds to the position of the collective pitch stick at that moment – just as when setting up the curve in the first place. Nevertheless – a few words on the basic principles:

The 3-point curve:

When you rotate the knob, the minimum throttle position, the hover throttle setting or the collective pitch maximum setting will be altered, depending on the position of the collective pitch stick.

The 5-point curve:
Here again, minimum throttle, the central part of the curve, or the collective pitch maximum setting is altered, depending on the position of the collective pitch stick (the centre part moves the three points S–, HP, S+ "in parallel").

**In brief:**
**Because of the "intelligent" method adopted for throttle adjustments, a single adjustor is sufficient for in-flight adjustments. This makes operation much simpler, and removes a whole bundle of stress from the pilot.**

Now to recap: you have two useful adjustment facilities: on the one hand you can adjust the "throttle curve" as just described; on the other you can adjust collective pitch (the hover setting) at any time, using the collective pitch trim slider.

## The "throttle slider"

The throttle slider can also be used to influence the throttle setting. There are two optional modes of operation.

**Normal mode of operation**
While you are in this mode of operation, the slider works as a "limiter" for the throttle. At any time the maximum throttle position is limited to the current position of the throttle slider; regardless of where your collective pitch stick is set, and regardless of how you have set up the throttle curve.
In diagrammatic form:

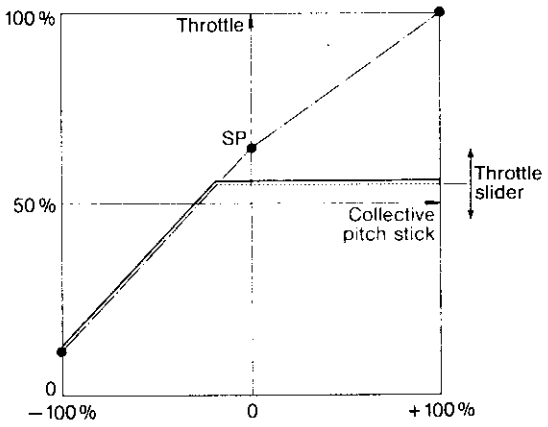



Fig. 56

The throttle slider is set to the value shown in the diagram by the dotted line. If you now set the collective pitch stick to minimum and slowly push it towards maximum, the throttle at first follows the throttle curve shown by the dot/dash line. From the point at which the two lines meet, the throttle remains constant, and follows the dotted line again.

If you now set the slider to a lower point, so that its value is completely below the throttle curve, then the curve has no effect, and throttle is controlled entirely by the slider.

Practical application:

Using the throttle slider you can reduce throttle independently of the collective pitch position, or, at the other extreme, release it again. If you reduce throttle greatly with the slider, you will drop below the speed at which the centrifugal clutch "bites": idle with helicopter "landed".

The whole thing in reverse: the helicopter is on the ground; throttle is "closed"; motor at idle. To take off push the throttle and revs high (collective pitch minimum); the "throttle curve" takes over, and with the throttle fully released the helicopter can finally be taken off by increasing collective pitch.

**"Direct throttle" mode of operation**
In many cases – for example, for adjusting the motor – the throttle needs to be adjusted without any automatic variation of collective pitch. In this case a switch is used to disconnect the collective pitch/throttle coupling: this is termed **"Direct throttle".**
**In this mode of operation the throttle is adjusted directly, using the slider alone.**

As usual, you have to tell the transmitter which switch you want to use to select "Direct Throttle". This is done at the "Adjust transmitter controls" menu, as a transmitter control option under COLLECTIVE PITCH.
First move to the "Adjust transmitter controls" menu, select the COLLECTIVE PITCH transmitter control, press the x key, and then leaf through with the ⊞ key until you reach the "Direct Throttle" option.
You will see this:

```
06 TEST      PPM9
CTRL>B:   PITCH
     DIR.THRO.
          OFF
```

Press the ◪ key first, then switch ON with the Ⓡ key, and finally select the switch you want to use with the ⊞ and ⊟ keys.
Now you can switch between "throttle coupled to collective pitch" and "direct throttle control" by means of the mechanical switch you have just selected.

**Note:**
The idle position of the throttle slider is fixed at "idle back", i.e. you cannot choose to reverse this channel, as you can with fixed-wing models. If you wish, however, you can adjust the throttle position at the "idle" position of the slider; this is done from the "Adjust transmitter controls" menu, at the THROTTLE control point, using the "Idle" option.
If you wish to set full throttle at "slider back", simply disconnect the plug from the corresponding slider inside the transmitter, and turn it through 180° degrees.

## Auto-rotation

One switch can be dedicated as an auto-rotation selector.

When it is switched to auto-rotation, the transmitter does two things:

1. It sets the throttle to a pre-selected setting (idle for practising; OFF for competition work).
2. Any limit set on collective pitch travel at the transmitter control end is lifted (to make full collective pitch movement available). If you do not require this feature, adjust collective pitch travel at the servo only.

You will now probably be thinking: "What happens to the tail rotor?" Normally, because main rotor power torque is absent during auto-rotation, the mixing of collective pitch to tail rotor has to be removed.

The PROFI mc 3030 offers you a very simple and elegant feature: you simply need to move to the "Servo adjustment" menu, select "TAILROT", and select the "COLLECTIVE PITCH" input as switchable, then assign the same switch as for auto-rotation. If, for example, you select the switch "S5" for auto-rotation (we're just coming to that!), then make the COLLECTIVE PITCH input to "TAILROT" also switchable by "S5".

There is a further possible refinement to this; please read the note at the end of this section.

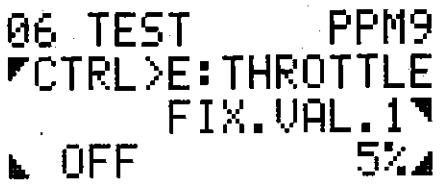
**What you have to adjust:**
There are two points to remember here:

1. Set the "auto-rotation throttle" to "Fixed Value"
2. Assign the "auto-rotation" switch.

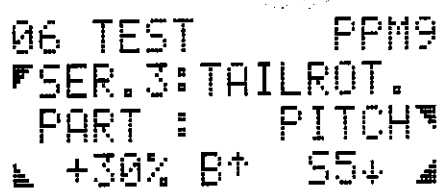
This should tell you where you will find auto-rotation: it is "hidden" under THROTTLE.

To do this, move again to the "Adjust transmitter controls" menu; then on to the THROTTLE control. Press the ◥ key and select the "Fixed Value" option with the ⊞ key.

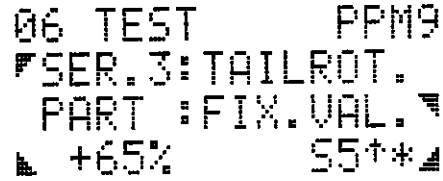
You will see the following display:




First: "auto-rotation throttle"
Press the ◪ key, then set the desired throttle setting in the usual way with the ⊞ or ⊟ keys, or the Digi-Adjustor; 0 - 10% is a good starting point.
Now define the auto-rotation switch:
Press the ◥ key and select the switch you want to use, using the ⊞ and ⊟ keys, as usual; for example the switch "S5". That's all there is to it.
Note that that the collective pitch input at collective pitch minimum and maximum must occur in the same direction.
Servo adjustment menu, tail rotor servo, turn servo travel for collective pitch input once past "0".
Now to the actual problem.
For auto-rotation the collective pitch input needs to be switched off. So, as usual:




Assign the auto-rotation switch S5 to the "COLLECTIVE PITCH" input.
Switch the "INPUT" to "FIXED VALUE" and assign the switch S5 to that too, but working in the opposite direction. To do this, with the input field still active (flashing), press ⊞.




The net effect is that by operating the switch S5 you close the throttle, set collective pitch off, set a (variable) fixed value on, and switch to a second collective pitch travel.

---

## Gyro suppression

"Suppression" means reducing or eliminating the damping effect of the gyro when the pilot wishes to override it. This is essential, as the gyro is only intended to reduce unwanted flight movements due to gusts etc., and not to counteract deliberate efforts on the part of the pilot.

**There are three basic types of gyro:**

**1.** Gyros with no special facilities for allowing control from the transmitter.
Some of these gyros also have a "suppression" effect, which is derived from the yaw control signal emanating from the receiver. These gyros have only one connection to the receiver. If you are using this type of gyro, you do not need to assign "GYRO" to a transmitter control nor a servo. There is nothing else to say on this type of device.

**2.** Gyros whose sensitivity can be **altered** or **switched off** from the transmitter.

For this type of gyro a switched transmitter control is needed (e.g. channel "G"), which is then assigned to the "GYRO" function; you will also need a "servo" output by the name of "GYRO". This is where the sensitivity switch input from the gyro is connected. "Automatic proportional suppression" is of no relevance here.

"Gyro suppression" at the "GYRO" transmitter control is therefore set to "OFF".

**3.** Gyros with proportional sensitivity, adjustable from the transmitter.

This is the type of gyro with which we are mostly concerned here. To control the sensitivity of the gyro a special signal is derived from the YAW signal in the transmitter, and this signal is then transmitted to the gyro via the servo output "GYRO": this is termed "automatic gyro control" or "automatic gyro suppression".

**How suppression works**

The transmitter generates a "suppress" signal which is proportional to the tail rotor stick position (regardless of the direction of movement). This signal is transferred to the "sensitivity input" of the gyro via a separate channel. The further the stick is moved, the more the sensitivity of the gyro is reduced; the less sensitive it becomes, the less effect it has, and the more the model responds to deliberate control movements. This effect is represented in Fig. 40. Fig. 40a shows the suppression signal, 40b the corresponding gyro effect.

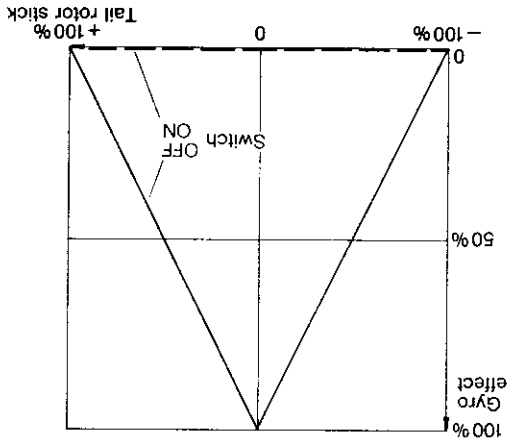



Fig. 40 a

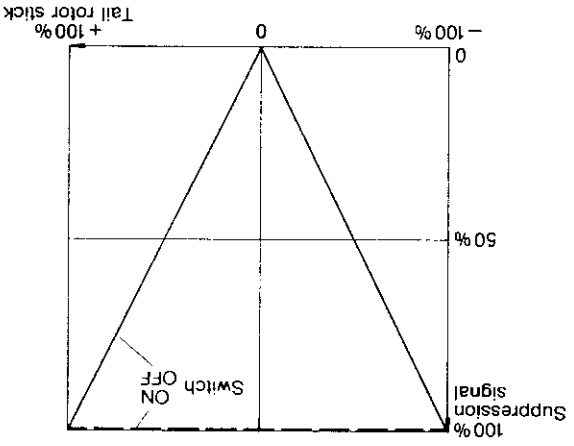



Fig. 40 b

The gyro usually has two adjustors which are used to set top and bottom limits on the sensitivity range.

At the transmitter end a slider or a switch can be used to control "GYRO".

If a slider is used, it becomes possible to adjust "gyro suppression" steplessly (not to be confused with infinitely adjustable suppression, which is proportional to stick movement!). In this case the range of adjustment is within the limits set on the gyro itself. Using a switch, on the other hand, you can "only" switch between the two limits set on the gyro. In practice, this latter facility has proved to be quite adequate; an infinitely adjustable setting is really one thing too many for most pilots to cope with. Please read the note at the end of this section in this connection.

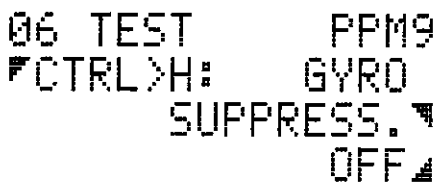
**The system in practice**

We will suppose, as an example, that you have assigned **"transmitter control H = GYRO"** and **"Servo No. 6 controls GYRO"**, as already described.

**You must also ensure that a suitable switch is connected to Input H. It is essential that this is an ON/OFF switch with a 3-core lead** (Order No. 7 5711, on/off, short toggle, or 7 5712, on/off, long toggle).
**No other type of switch can be used!**

Now all that is left is to switch automatic suppression on. Move to the "Adjust transmitter controls" menu and leaf through to control H.

You will see this display:




Press the ◪ key, then ®. "OFF" is replaced by "ON"; and that's it.

**Tip:**
Connect a servo (instead of a gyro) to the receiver "GYRO" output for this setting up process. You will then be able to see exactly how the suppression effect works:

With switch H set to OFF and the tail rotor stick at centre, the servo will be at one end-point. If you now operate the stick, the servo will run towards the other end-point, its movement proportional to the stick position; regardless of which side the stick is moved to.

If you now set switch H to ON, the servo runs straight to this end-point, and is not affected by movement of the stick: it receives the signal "gyro fully suppressed".

**If necessary:**
Depending on your particular gyro, it may turn out that the suppression works "the wrong way round"; i.e. when the tail rotor stick is at centre, suppression is at a maximum, and it reduces as stick deflection increases.

In this case you need to move to the **"Servo adjustment" menu.**

Select **"TRAVEL + REVERSE"** and leaf through until you reach "Servo" No. 6. Press the ◪ key, then ®. You have now "reversed" gyro suppression.

**Supplementary notes**

**1.** Minimum and maximum suppression

During this description we have assumed that the "corner values" for suppression (maximum and minimum suppression), between which you can move using the switch H, were set on the gyro itself, as explained at the beginning of the section.

If the gyro does not offer this feature, or you want to carry it out at the transmitter, then there is an alternative method:

Move to the "Servo adjustment" menu, select "TRAVEL + REVERSE", and set the "travel" of gyro suppression as you wish. When you adjust the travel (you can do it separately for both directions!), all you are doing is setting the corner values for gyro suppression (see Fig. 41).

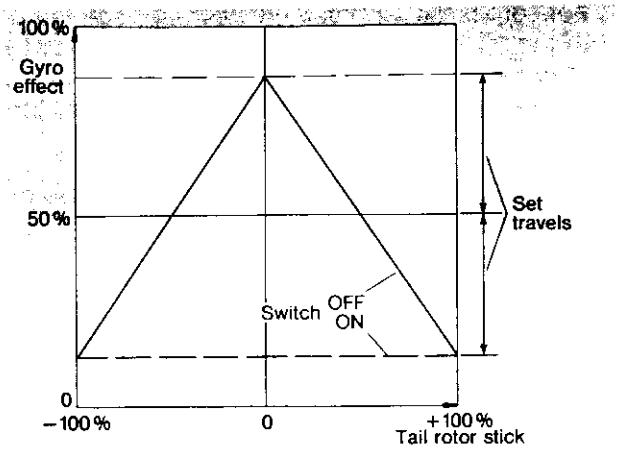



Fig. 41

**2.** ON/OFF switch for gyro suppression

Just to complete the picture, we ought to point out that you could, in theory, assign a further switch to automatic gyro suppression, when you switch the function ON, as described above. If you continue with the ⊞ key after switching to ON, in the usual way, the transmitter offers you the familiar list of switches. In this way you would be able to switch the automatic suppression ON and OFF. However, apart from using up one extra switch on your transmitter, this offers absolutely no advantage; the same effect is achieved (better) by switch H, which we have assigned as the GYRO control. So please set up the system as described and do not assign a further switch to it.

# The Heli-Menu

**The Recipe:**

## The transmitter controls

You may well have read through the information concerning fixed-wing models in order to understand how the system works (no bad idea), but please note that you must never adopt the transmitter control designations of the fixed-wing pilot. You may be tempted to think: aileron – well, that's roll, and I can remember that easily.

You may be able to remember it, but that's not good enough for your transmitter. Enter "Aileron", and it will give up with an error message, but usually not until you have finished your setting-up procedure.

That's enough of the preaching.

Assuming that your transmitter is at the Status display, press the keys M◪◹◪ to reach ASSIGN CONTROLS. Activate the input field ◪ and press the ⊞ key to reach control "A".

"A" is the left-hand stick unit (the letters are printed on the transmitter). Release this input field with the ◹ key (field flashes). Leaf through the suggested control list with the ⊞ or ⊟ keys until you find the required function.

For example:

**A controls ROLL**; now press the ◪ key, and ⊞ once. In the display you see "B controls . . . " (something or other). Press ◹ again, and select the required function with the ⊞ or ⊟ keys or the Digi Adjustor.

**B controls COLLECTIVE PITCH** (or, if you prefer, PITCH-AXIS).
The procedure should be obvious now.
Continue this process until you have assigned functions to all the transmitter controls you need. Assign "-----" (Nothing) to controls you don't need. However, please don't assign the same function to two controls, e.g. "E controls throttle" and "H controls throttle"! On no account forget to assign "THROTTLE" to one of the sliders (E or F).

Now you will need your helicopter; or at least a receiving system complete with servos.

Go back to the "ASSIGN" menu with the M key, and branch to SERVO with ◹. We will begin with servo No. 3.

The servo sequence is not binding, but please keep to our suggestions while we deal with our examples.

Servo 3 is the servo which controls the tail rotor. So press the ◹ key again (the servo No. will flash), and move to servo 3 with the ⊞ key. Now press the ◪ key to release the input field (field flashes). Use the ⊞ or ⊟ keys or the Digi Adjustor to select the "TAIL ROTOR" mixer. If you now move the yaw stick (and if your receiving system is switched on), the tail rotor servo will move. Move the collective pitch stick, and the same servo should also respond.

Normally you would assign all the servos in turn, and then make any adjustments necessary. This time, however, we will run through the procedure step by step.

Press the M key repeatedly until you return to Menu 1. Branch to Servo Adjustment with the ◪ key, press the ◹ key (CENTRE) and check that all servos are at 0%.

If not, press ◪ (input field flashes), set them to 0% with the ⊞ and ⊟ keys, then leave the menu with the M key. Otherwise leave the menu immediately with M. Now branch to TRAVEL + REVERSE with the ◪key. You will see this:

```
13 HELI BOY PPM9
◤SER.3:TAILROT.
 PART :      YAW◥
◣ +90% A+    ON ◢
```

Check the direction of effect of the yaw servo. If the servo rotates in the wrong direction, activate the appropriate input field with the ◹ key and press R once: the prefix will alter, and your tail rotor servo will be reversed for the yaw input.

Now the collective pitch input:

```
13 HELI BOY PPM9
◤SER.3:TAILROT.
 PART :    PITCH◥
◣ +90% D+    ON ◢
```

Press the ◹ key and ⊞ until COLLECTIVE PITCH appears. Work out in which direction the tail rotor must deflect in order to compensate for the torque effect of the main rotor. If necessary, reverse this for maximum collective pitch, as described for the yaw input.

A good starting point is about 30%.

Your tail rotor mixer requires a further input (press the ◹ key, then ⊞).

**FIXED VALUE** (software revision 3.0 only)
You only need this if your helicopter has a tail rotor which continues to rotate during auto-rotation. More on this under "Auto-rotation". The default for FIXED VALUE is "OFF". For now, leave it unchanged.

**THROTTLE SERVO**
Let's move on to the next servo. Leave the Adjustment menu with the M key and move through Menu 1, Menu 2 and Assign to "Assign servos". Select servo 6, release the input field, and select the "THROTTLE" funktion using the ⊞ and ⊟ keys. Later, if you wish to set up a mixer circuit for aerobatic flying, you would select "DYN. THROTTLE" here. For our experiment we will stay with THROTTLE.

If you now push the throttle slider (the usual control) forward, and operate the collective pitch stick, your throttle servo should move.

Here again we need to set a basic adjustment, and select the THROTTLE CURVE.

Press M to return to Menu 1, then branch to the "TRANSMITTER CONTROL" adjustment menu. Select OPTIONS, then the Collective Pitch control. Using the ◹ selector key, move on to "THROTTLE CURVE". Release the input field with ◹ (ff 3 or similar flashes) you can select a 3- or 5-point throttle curve as preferred, using ⊞ or ⊟ keys, set the full throttle position with the R key (ff = full throttle forward, fb = full throttle back – more details on page 64). After releasing the input field you can set up the throttle curve with the help of the collective pitch stick.

For a 3-point curve:
IU = Idle Up
HP = Hover Point
Throttle maximum (servo travel)

And for a 5-point curve:
IU = Idle Up
S– = Pre-idle point
HP = Hover Point
S+ = Pre-max. throttle point
Throttle maximum (servo travel)

Note here that the throttle slider should be set to full throttle.

**Now to the rotor head**
This is the only area in which model helicopters exhibit major differences.
We will describe 5 different examples:

**Schlueter**
**Heim**
**3-point CPM 90-degree, with virtual rotation**
**4-point CPM with virtual rotation**
**3-point CPM 120-degree, with virtual rotation**

If you wish, skip these examples if they are of no interest at present.

## SCHLUETER

That means no rotor head mixing (no electronic mixers). Return to Menu 1 with the [M] key, then move to Menu 2, to ASSIGN and ASSIGN SERVOS.

Now select:
Servo No. 1 controls ROLL
Servo No. 2 controls PITCH
Servo No. 4 controls COLLECTIVE PITCH

Naturally this set-up will only work if you connect the servos to the corresponding receiver output sockets.
Return to Menu 1 with the [M] key, then go to Servo Adjustment, TRAVEL + REVERSE.
Check the direction of rotation of the servos and set up the approximate servo travels. To do this, activate the appropriate input field with ◥, set the travels with the [+] and [–] keys (holding the transmitter controls at the corresponding end-points) for both sides of centre. You can reverse any of the servos with the [R] key if necessary.

## HEIM

When we speak of a HEIM rotor head (HEIMHEAD) we are referring to the classic version with the free-floating pitch-axis rocker (see also page 63).
Return to Menu 1 with the [M] key, then move to Menu 2 and on to ASSIGN SERVOS.

Select (Assign) the servos as follows:
Servo No. 1 controls HEIMHEAD
Servo No. 2 controls PITCH
Servo No. 4 controls HEIMHEAD

The two roll servos are connected to the receiver outputs 1 + 4, and the pitch-axis servo to output 2. Use the [M] key to return to Menu 1, then on to Servo Adjustment, TRAVEL + REVERSE.

First select servo 1 and the Collective Pitch input. Operate the collective pitch stick – look at servo 1 only – and check the direction of rotation of the servo. Reverse it if necessary.

Now look at servo 4. If the direction of rotation for collective pitch should be wrong, switch to this servo and reverse the collective pitch input.

Now for the two roll servos and the roll input: operate the ROLL stick and watch the servos. If the direction of rotation of one or both servos is incorrect, select the corresponding servo, then the roll input, and set the correct direction of rotation.

## 3-point linkage, 90-degree "HEAD-MIX"

The 90-degree arrangement is swiftly losing popularity since the distribution of forces is very inefficient. Nevertheless, we will describe the application in detail.

We assume that you are at the Status display. Move to Menu 1 with the [M] key, then to Menu 2 with the ◪ key, and then via ASSIGN to ASSIGN SERVOS.

There you assign the servos as follows:
Servo No. 1 controls HEAD-MIX
Servo No. 2 controls HEAD-MIX
Servo No. 4 controls HEAD-MIX

**Once more, to remind you:**
Release the SERVO input line with the selector key ◥. Select the servos in turn with the [+] or [–] keys. Release the Controls field again with the selector key ◪, and select HEAD-MIX with the [+] or [–] key. Repeat the process with the second servo, and so on.

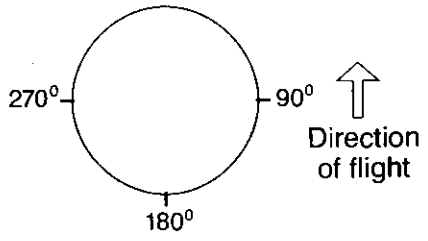
**After you have assigned the rotor head servos, return to Menu 1 using the [M] key and branch again to SERVO ADJUSTMENT. Select Centre, and set the servo centres. Check here that the trim sliders and the transmitter controls are set to zero (0%).**

Return to the "Servo Adjustment" menu with the [M] key, then branch to TRAVEL + REVERSE with the selector key ◪.

**Important:**
**1.** It is essential that you set the direction of rotation of the collective pitch inputs to the head servos first. Operate the collective pitch stick, and watch the rotor head servos. Check carefully which servo or servos rotate in the wrong direction. Select the servo concerned, then the Collective Pitch input, and release the input field (selector key ◥). Press the [R] key to reverse the direction of rotation of that input.

**2.** Select the GEOMETRY input for all the rotor head servos in turn, and set the position of each servo in degrees. Switch to the input field using the selector key ◪, and switch GEOMETRY "ON".

The right-hand servo should be 90 degrees, the rear servo 180 degrees, and the left-hand servo 270 degrees. If your pitch-axis servo lies in front of the swashplate, enter 0 degrees instead of 180 degrees for servo 2.



If you have followed these instructions carefully, all the correct roll-axis and pitch-axis movements will now be available on your model.

**3.** If you require virtual rotation of the swashplate for your helicopter, select the PHASE input for one of the rotor head servos. Switch the input ON (input field ◪ and key [R]), move to the Degree input field with ◹, and set the desired swashplate rotation. If you hold the pitch-axis or roll-axis stick to one end-point, you will be able to see the change clearly.

## 4-point linkage "HEAD-MIX"

The 4-point linkage is becoming increasingly popular. Even if one servo fails completely, the helicopter remains controllable, and can be "saved".

We assume that you are at the Status display. Move to Menu 1 with the [M] key, then on to Menu 2 with the ◪key, on to ASSIGN and finally to SERVO.

Assign the servos as follows:

Servo No. 1 controls HEAD-MIX
Servo No. 2 controls HEAD-MIX
Servo No. 3 controls HEAD-MIX
Servo No. 4 controls HEAD-MIX

**Once more, to remind you:**
Release the SERVO input line with the selector key ◹. Select the servos in turn with the [+] or [-]keys. Release the Controls field again with the selector key ◪, and select HEAD-MIX with the [+] or [-] key. Repeat the process with the second servo, and so on.

**After you have assigned the rotor head servos, return to Menu 1 using the [M] key and branch again to SERVO ADJUSTMENT. Select Centre, and set the servo centres. Check here that the trim sliders and the transmitter controls are set to zero (0%).**

Return to the "Servo Adjustment" menu with the [M] key, then branch to TRAVEL + REVERSE with the selector key ◪.

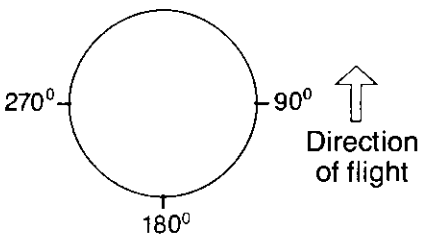
**Important:**
**1.** It is essential that you set the direction of rotation of the collective pitch inputs to the head servos first.

Operate the collective pitch stick, and watch the rotor head servos.

Check carefully which servo or servos rotate in the wrong direction. Select the servo concerned, then the Collective Pitch input, and release the input field (selector key ◹). Press the [R] key to reverse the direction of rotation of that input.

**2.** Select the GEOMETRY input of all the rotor head servos in turn, and set the position of each servo in degrees. Switch to the input field using the selector key ◪, and switch GEOMETRY "ON".

The right-hand servo should be 90 degrees, the rear servo 180 degrees, the left-hand servo 270 degrees, and the front servo 0 degrees.




If you have followed these instructions carefully, all the correct roll-axis and pitch-axis movements will now be available on your model.

**3.** If you require virtual rotation of the swashplate for your helicopter, select the PHASE input for one of the rotor head servos. Switch the input ON (input field ◪ and key [R]), move to the Degree input field with ◹, and set the desired swashplate rotation. If you hold the pitch-axis or roll-axis stick to one end-point, you will be able to see the change clearly.

## 3-point linkage, 120-degree "HEAD-MIX"

The 3-point, 120-degree linkage is the most popular arrangement.

We assume that you are at the Status display. Move to Menu 1 with the [M] key, then on to Menu 2 with the ◪key, on to ASSIGN and finally to SERVO.

Assign the servos as follows:

Servo No. 1 controls HEAD-MIX
Servo No. 2 controls HEAD-MIX
Servo No. 4 controls HEAD-MIX

**Once more, to remind you:**
Release the SERVO input line with the selector key ◹. Select the servos in turn with the [+] or [-]keys. Release the Controls field again with the selector key ◪, and select HEAD-MIX with the [+] or [-] key. Repeat the process with the second servo, and so on.

**After you have assigned the rotor head servos, return to Menu 1 using the [M] key and branch again to SERVO ADJUSTMENT. Select Centre, and set the servo centres. Check here that the trim sliders and the transmitter controls are set to zero (0%).**

Return to the "Servo Adjustment" menu with the [M] key, then branch to TRAVEL + REVERSE with the selector key ◪.

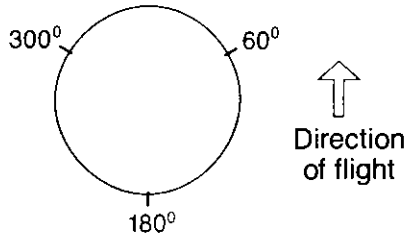
**Important:**
**1.** It is essential that you set the direction of rotation of the collective pitch inputs to the head servos first.

Operate the collective pitch stick, and watch the rotor head servos. Check carefully which servo or servos rotate in the wrong direction.

Select the servo concerned, then the Collective Pitch input, and release the input field (selector key ◹). Press the [R] key to reverse the direction of rotation of that input.

**2.** Select the GEOMETRY input of all the rotor head servos in turn, and set the position of each servo in degrees. Switch to the input field using the selector key ◪, and switch GEOMETRY "ON".

The right-hand servo should be 60 degrees, the rear servo 180 degrees and the left-hand servo 300 degrees.



If you have followed these instructions carefully, all the correct roll-axis and pitch-axis movements will now be available on your model.

**3.** If you require virtual rotation of the swashplate for your helicopter, select the PHASE input for one of the rotor head servos.

Switch the input ON (input field ◪ and key [R]), move to the Degree input field with ◹, and set the desired swashplate rotation. If you hold the pitch-axis or roll-axis stick to one end-point, you will be able to see the change clearly.

This setting-up procedure produces the program required for your model. You can now set up the travels according to your own experience or the information provided by the helicopter manufacturer. Use an angle jig, or check the settings by eye.

# How to set up and use the Teacher/Pupil system



Teacher/Pupil operation (sometimes known as the "buddy-box" system) is the best method of learning to control a radio-controlled model, from the point of view of model longevity. "Teacher" and "Pupil" have one transmitter each, inter-connected by the Teacher/Pupil lead, Order No. 8 5121. Only the teacher's transmitter radiates an RF signal. The pupil's transmitter generates a signal, but it is not broadcast at Radio Frequency; instead it is transferred to the teacher transmitter through the cable, where it is "processed".

**For this reason it is vital that only basic signals come from the pupil's transmitter – *no* mixed signals at all! If mixed signals are sent to the teacher's transmitter, these signals would be processed twice.**

**Assign the transmitter controls of the pupil's transmitter as follows:**

**e.g. A controls aileron**
**B controls throttle, etc.**

**and continue:**

**Servo No. 1 controls aileron**
**Servo No. 2 controls elevator, etc.**

**If you are using a different transmitter, e.g. ROYAL mc, be sure to switch all mixers "OFF" at the pupil's transmitter.**

**The pupil's transmitter does not require an RF module. However, if one is fitted, it is automatically switched out of circuit when the lead is plugged in.**

The teacher's transmitter has to be fitted with a Teacher/Pupil switch, by means of which he can alternate between "pupil has control" and "teacher has control", and can therefore intervene whenever danger threatens.

Teacher/Pupil operation is basically restricted to the four main stick functions (more than this is unnecessary, and is not recommended in any case).

One special advantage offered by the PROFI mc 3030 transmitter is that **individual control functions** – e.g. just rudder, or just rudder and elevator – can be transferred, so that the pupil can "learn the ropes" in easy stages.

**We will assume from now on that the PROFI mc 3030 transmitter is the "teacher" unit.**

**The following types can be used as the pupil transmitter:**

Naturally, other PROFI mc 3030 transmitters; any other MULTIPLEX transmitter which is fitted with a "diagnosis" (closed loop, or direct servo control) socket.

These include "ROYAL mc"; "COMBI" and "COMBI 90", Cockpit" and "EUROPA-Sprint".

**The teacher transmitter must be fitted with a Teacher/Pupil switch.**

The following types of switch can be used:
ON/OFF switch, long toggle Order No. 7 5698
ON/OFF switch, short toggle Order No. 7 5697

The best locations for "quick access" to the switch are bays 1, 7, 6, 12 (see page 6). The plug from the switch must be connected inside the transmitter to the "L/S" connector; see page 7. It does not matter which way round you insert the connector, but make sure that the switch itself is the right way round. This is explained on page 77 under "Testing the transmitter controls".

**The two transmitters are inter-connected by the Teacher/Pupil lead, Order No. 8 5121.** The lead is simply plugged into both transmitter charge sockets.

**Caution:** The ROYAL mc Co-Pilot lead Order No. 8 5122 **cannot** be used!

## 1. Essential adjustments to the Pupil transmitter

**a.) If it is not a PROFI mc 3030 transmitter**

Set the transmitter to "PPM" transmission mode (assuming that it has two transmission modes). **Switch off any mixers, Dual Rates etc. which may be in force.**

Set all the transmitter stick trims to centre.

At this point you should also check which servo numbers (= channel numbers) are controlled by the transmitter sticks. To do this, operate the sticks and check at the receiver which servo moves and which receiver output it is connected to. Note down these four channel numbers; you will need them later when setting up the Teacher transmitter.

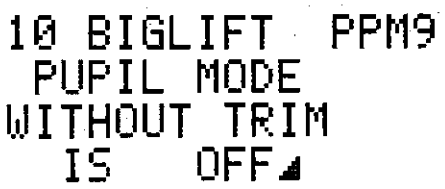
It is not necessary to reverse the transmitter controls, or swap plugs over. Similarly it makes no difference whether the pupil, for example, flies "aileron (helicopter: roll) right" or "left"; the same applies to "throttle (collective pitch) right" or "left". These individual preferences are taken care of later when the Teacher transmitter is set up.

**b) For PROFI mc 3030 transmitters:**

Here the setting up procedure is simple; you just need to set the transmitter to **"Pupil mode"**.

To do this move to the **"Pupil"** menu, with the key sequence M◪◪◪

You will see the following display (the top line is only an example):




Press ◪ and then ®. "OFF" is replaced by "ON". That's all there is to it. Leave the menu and return to the Status display with ⓂⓂⓂⓂ.

When you wish to return to "normal flight operations" later, switch back in exactly the same way.

**In the top line of the display the model name and "Pupil" will flash alternately. This is the transmitter's way of telling you that it is in "Pupil mode". This mode is maintained until it is switched out again – even if the transmitter is switched off in the meantime.**

Here again, you will need to check which servo (channel number) operates which control function. You can find this information in the "Assign servos" menu; there you will find something like this:

"Servo No. 3 controls RUDDER"; "Servo No. 2 controls ELEVATOR", and so on.

## 2. Essential adjustments to the Teacher transmitter

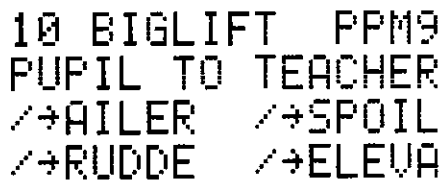
Here things get a little more complicated; the PROFI mc 3030 transmitter gives you so many options that you are forced to choose between them:

**You can in fact arrange the sticks of the teacher and pupil transmitters in a different layout. For example, the pupil can fly "aileron left", and the teacher "aileron right"; neither needs to depart from his usual ways.**

Even this is not so terribly difficult to set up; all you need to know is how your pupil usually flies.

There is a special menu for these adjustments in the Teacher transmitter: the "**Teacher**" menu.

You reach this menu with the key sequence Ⓜ◪◪◹. You will see this menu:




**Note:**
The "arrangement" and type of the four main stick functions in this menu are based on the model which has been selected as the "Teacher" model. The menu may therefore look slightly different in some cases. For example, the ailerons may be in a different "corner"; if the model is a helicopter the control functions will appear as collective pitch, roll, pitch and yaw.

Now you have to tell the transmitter which channel (= servo) numbers of the pupil's system are to be taken over by the 4 main control functions.
For example, press the ◩ key. The slash sign (/) before "–› AILERON" starts flashing.
If you now press the ⊞ key, the slash is replaced by a "1"; press again, and it becomes "2", etc. This means:

**Channel 1 (or 2, etc.) in the pupil transmitter will be taken over as the aileron signal in the teacher transmitter, and "replaces" the teacher's aileron stick.**

**If you leave the slash unchanged, nothing will be taken over, and control of ailerons remains with the teacher.**

**If it turns out that the control function is reversed when the pupil is in control, simply press the ® key while the channel number is still flashing. The "–›" arrow will be replaced by a white arrow on a black background (inverse video); this indicates that the direction of rotation is reversed when it is "taken over".**

Assign the remaining three control functions in the same way.
The four "arrow keys" are each used to activate one of the four control function assignments in the menu.

**Caution:**
When trying out the system, do not forget to set the Teacher/Pupil switch to "ON"; otherwise the system won't work at all!

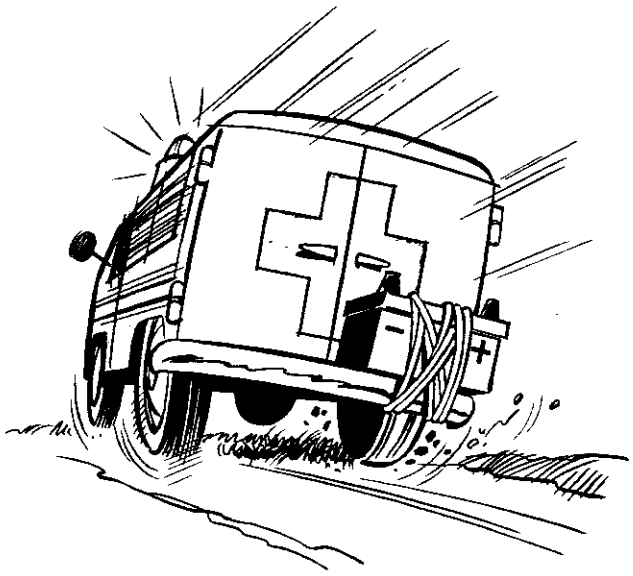
**And by the by ...**
It is vital to determine first which channel number on the teacher's transmitter controls which function. Alternatively, you can just try everything out when you set up the system.
(Although in that case you would not really "understand" what was going on).

**We recommend that you practise these adjustments several times before you go to the flying field. At the take-off strip you will not find the atmosphere quite as peaceful as in your workshop. You will undoubtedly have to change something or other at the flying site, for example, when you want to transfer more or fewer control functions to the pupil.**

# The Reserve Battery System

# Aids to testing

## "Personalising" your transmitter



## The Reserve Battery System

Many car drivers, despite having a large fueltank and an accurate fuel gauge, carry a reserve fuel can in their car: getting stuck with an empty tank is unpleasant, and can be dangerous.

If your transmitter "runs out of juice" while you are using it, then that is rather worse than unpleasant: it usually means the loss of the model, not to mention other dangers.

The reserve battery is a form of safety net to guard against such nasty surprises. It gives you a solid reserve operating period of about 15 minutes. That is enough to get any model safely onto the ground in one piece.

**How it works**

The reserve battery is automatically charged up whenever the main battery is recharged, through a special electronic circuit. It cannot be overcharged. In fact, you never need to think about it at all under normal circumstances.

If the voltage of your main transmitter battery falls to the danger point and the audible monitor signal sounds, then you can select your "utterly certain" safety system, by manually switching to the reserve battery. We chose this method of switching deliberately.

The monitor lamp will flash for all the time the transmitter is switched to the reserve battery. Because of the flashing lamp you are bound to be aware that the transmitter is being supplied from the reserve battery, if you switch on again later, for example.

**Charge current and charge period**

The automatic charge circuit for the reserve battery bleeds off a current of about 30 mA from the charge current which is supplied to the transmitter. As most chargers produce a constant current, the main transmitter battery is deprived of that 30 mA, and you should therefore charge for longer than normal. The charge period should always be calculated from the residual current which is fed to the main battery. Here is an example:

Current from charger = 200 mA.

Charge period increases by 30/200 = 0.15 = 15%

If you have a charger with switchable or selectable current ranges, you can, of course, increase the charge rate by about 30mA, and your normal charge period will be unchanged.

**Rapid-charging**

The reserve battery is always charged at the "normal" current, i.e. at the 14-hour rate – even if you rapid-charge the main battery. If you slow-charge the main battery in the normal way, then the reserve battery will always be fully charged.

However, if you usually use a rapid-charging technique, it may happen that the charge period is not sufficient to compensate for the self-discharge tendency of the reserve battery. This is more likely at high temperatures, or if you do not use the system for a considerable time. For this reason always give a slow charge every 10th cycle – which you ought to do in any case for other reasons. If you have cause to use the reserve battery, you must slow-charge the battery at least once before using it again.

**Installation**

Switch the transmitter off, then open the back and place it inverted on the workbench. The next step is to withdraw the battery cradle from the transmitter case, which is now facing you. Pull it upwards carefully, holding it at both ends (see Fig. 42).

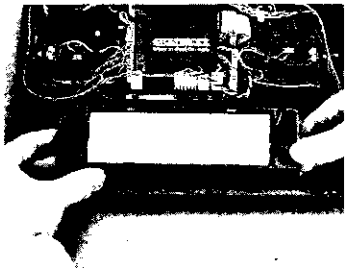


Fig. 42

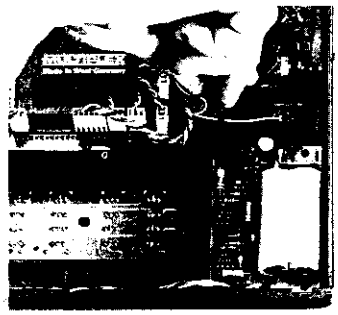


Fig. 43

Place the reserve battery unit in the bottom right-hand corner, over the mounting eyes provided for it, and retain it with the 4 screws and eyelets supplied (Fig. 43). Caution – make sure the eyelets are the right way round (Fig. 44).

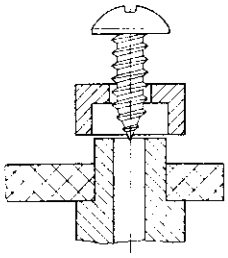


Fig. 44

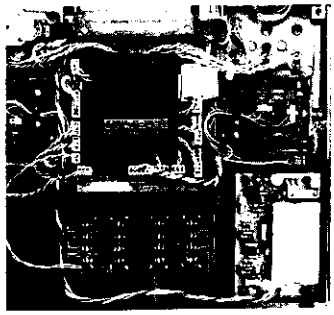


Fig. 45

Select one of the switch bays (we recommend bay 10), cut away one of the holes completely and install the change-over switch. Deploy the connecting cable from the switch to the battery as shown in Fig. 45. Take care here, to avoid damaging or jamming any of the wires.

Once you have checked that the wires are deployed exactly as shown in Fig. 45, especially where they run around the main battery, and that they cannot get tangled, replace the cradle and main battery (the lugs in the cradle must be connected to the mounting eyes in the casing).

Now you have to complete the connection between the reserve battery unit and the transmitter electronics.

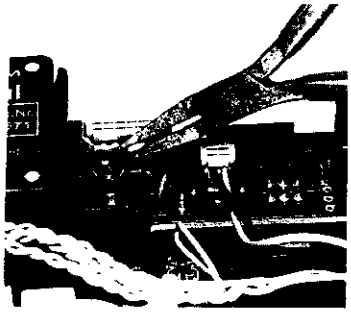


Fig. 46

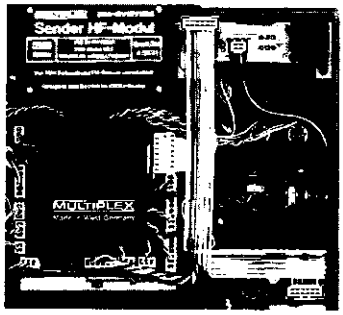



Fig. 47

To do this, please refer to Fig. 46. First pull out the bridging plug adjacent to the RF module; it is no longer needed. A ribbon cable is supplied in the set: insert one of the two plugs (either will do) on the ribbon cable into the vacant socket. Now bend the ribbon cable as shown in Fig. 47 and deploy it as shown. Insert the plug into the socket on the reserve battery unit.
It is not possible to connect this with reversed polarity, but please refer to Fig. 47 in any case.
Now check everything one last time. Convince yourself that the ribbon cable cannot obstruct the stick mechanics, and you are done. Close the transmitter. From this time on please be sure to slow-charge your transmitter as often as possible, so that you can be sure that the reserve battery is fully charged.

## The "Servo Test" menu

This menu allows you to "move" a servo or group of servos automatically, to check their operation.

This can be useful for range tests, or for checking that servos are running smoothly.

Servos are selected according to the transmitter control or control function, rather than by their receiver output number. For example, if you select "Aileron", all the aileron servos will run. In the test the servo or group of servos runs slowly to and from one end-point to the other. If the servos are involved in a mixing arrangement, they only move over the arc dictated by the mixing ratios.

**In short:**

**When the test is invoked, the servos respond as if you were slowly moving the corresponding transmitter control to and fro by hand.**

**How to carry out the "test run"**

From the Status display you reach the **"Servo Test"** menu with the key sequence [M] [◩] [◪].

You will see a display similar to this:

```
12 CORTINA  PPM9
-- SERVO TEST --
CONTROL: UNUSED
  STATE: OFF
```

Press the [◹] key. "AILERON" starts flashing. You can now "leaf through" with the [+] and [−] keys, and select the function you want. Once selected, press the [◪] key and "OFF" in the 4th line will flash.
Press the [R] key, and "OFF" is replaced by "ON". All the servos which respond to that function will now start running.
To end the test run, press [R] again; the status will return to "OFF". Leave the menu with [M] in the normal way.
If you switch your transmitter off at any time, the test procedure is automatically halted.

## The "Transmitter Control Test" menu

All the sliders and switched functions must be installed in a particular orientation. If they are installed the wrong way round, the aids to adjustment in the menus will be incorrect.

You will be aware by now that the transmitter only "recognises" the sliders and switches under their abbreviations E - I, S1 - S5 and LS, while you undoubtedly prefer to remember their English descriptive names.

**This menu is used to do two things:**

1. You can establish whether the sliders and switches are installed the "right way round", and/or connected to the main circuit board correctly. This is only usually in question when you install extra switches, but it also applies if you wish to relocate the switches to suit your personal preference.
2. You can find out quickly, and without opening the transmitter, where any particular switch (which you know by the designation printed on the sticker) is plugged in at the main circuit board, i.e. under what designation the transmitter "knows" it.

But first a minor correction: the term "transmitter control" test is not quite accurate, because you cannot test the two transmitter stick units – simply because there is no need to do so.
In fact, this menu can be used to test all the switches, i.e. even those which are not strictly "transmitter controls".
You will recall (page 14) the following:
Transmitter controls "move" something on the model directly: sticks and sliders are typical transmitter controls. But switches can also be transmitter controls if they are connected to "transmitter control" connections, or letters – inputs A - I (e.g. a switched channel switch – G or H). There are also coupling and change-over switches, which include Dual-Rates switches and the Teacher/Pupil switch. They are designated S1 - S5 and LS. Finally there is the "Memory" change-over switch, which has its own special function (see page 80), and which belongs to neither group. It is designated "M".

**Now we have jogged your memory, back to business:**
The TEST menu is under the "ADJUST TRANSMITTER CONTROLS" menu. From the Status display, you reach it with [M] and [◹]. Select the point TEST with the [◪] key. You will see the following display (the arrow directions do not concern us for the moment):

```
SW1 2 3 4 5 L M+
  ↑ ↑ ↑ ↑ ↑ ↑ 0
CTRL: E F G H I
DG = ↓ ↑ - - -
```

**Lines 1 and 2:**
In line 1 you will see the "names" of the coupling and change-over switches; the "M+" at far right stands for the "Memory" switch.
Operate the aileron Dual-Rates switch (far left): the arrow under "S1" will reverse.
This should tell you two things:
1. The aileron Dual-Rates switch is connected to "S1".
2. If the direction of the arrow and the position of the switch toggle are the same, then the switch is installed correctly.

Try the same with the other Dual-Rates switches and the Combi-Switch.
You should find this arrangement:

Dual Rates aileron = S1
Dual Rates elevator = S2
Dual Rates rudder = S3
Combi-Switch = S5

This is the "factory-standard" switch arrangement (although you do not need to keep to it – see page 38).
The arrows under S4 and L (short for LS) cannot be reversed, since nothing is connected to these inputs as standard.
When you operate the Memory change-over switch the "0" (centre position of switch) should change to a "1" or a "2".

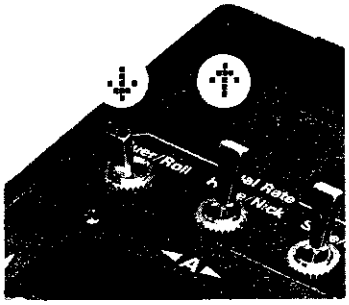


Fig. 48

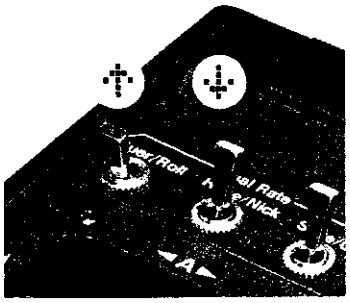


Fig. 49

**If you subsequently fit another switch, or move an existing switch to a new location, it may be that the arrow direction and the position of the switch toggle are not the same. In this case you must turn the switch itself round. Don't reverse the plug at the circuit board – that has no effect!**

**Now to lines 3 and 4:**
In line 3 you will see the transmitter control designations E - I; under each one, in line 4, either an arrow or a horizontal line. If you move the left-hand slider forward, the arrow under "E" should also point forward (up). When you move the slider back, the arrow should reverse.

If you move the slider slowly around its centre point, you will find a position at which the arrow is replaced by a horizontal line. This is the exact "electrical" centre point. Component tolerances may result in this position being slightly different from the scale printed on the transmitter, but in practice this makes no difference.

If no transmitter control is connected to one of the control inputs (G, H, I as standard) then this horizontal line will appear there at all times.

**If a transmitter control is fitted the wrong way round, i.e. the direction of the switch toggle is not the same as the direction of the arrow in the display, then reverse its plug at the main circuit board.**

**Please note this difference between the transmitter controls and the other switches, as described above!**

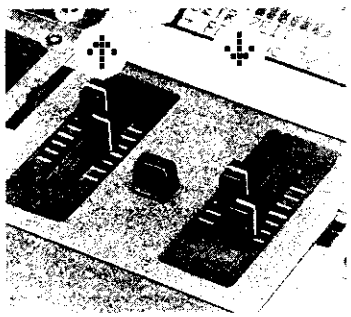


Fig. 50

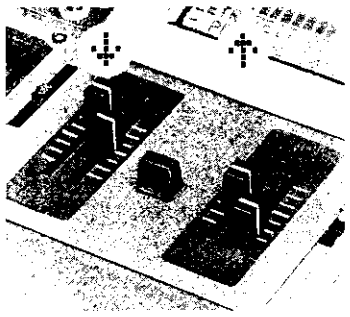


Fig. 51

It is quite difficult to describe these checks, but you will find that they only take a moment to carry out!

## "Personalising" your transmitter

**Your name in the display**
Your name can be entered in the bottom line of the LCD display, and it will then be on show there all the time, unless you invoke the stopwatch or the rev counter. However, you cannot enter your name yourself; it has to be done by the MULTIPLEX Service Department, or by a specially trained dealer.

```
09 FIESTA   PPM9
7.71V
OP.TIME   03:32
  ROGER PILOT
```

This is a useful feature for identifying your transmitter, and for deterring thieves.

If you would like this done, please contact your dealer or the MULTIPLEX Service Department.

**The sticks**
The transmitter is supplied with 3 pairs of stick ends: short, medium-length, and long.
Each one can be adjusted in length by about 10mm. Select the length which suits your preference.
To adjust or change the stick end, rotate the grip until you feel it "unlatch", then adjust the length or pull it off altogether. Slip the new grip into place, set it to the required length, then turn it through about 180 degrees (Fig. 52).

**Stick press-button**
The long and medium-length stick ends can be fitted with a press-button (momentary contact), as shown in Fig. 53. This can then be used either as a "transmitter control" or as a reversing or coupling switch.

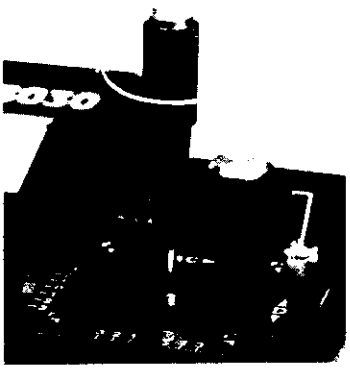


Fig. 52

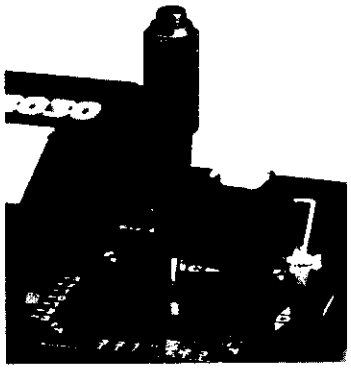


Fig. 53

Using the press-button:
As a transmitter control: actuating a tow-release mechanism
As change-over/coupling switch: operating the stop-watch

**Stick switch**

It is also possible to fit an ON/OFF switch to the stick end.
The advantage of this form of switch is that you can see and feel the current position of the switch at any time.
Applications:
Fixed wing: flap switch
tow release
Helicopter: auto-rotation switch
The press-button and switch can only be installed by the MULTIPLEX Service Department. Please contact us if you want the job done; addresses are in the appendix.

**Re-locating or installing switches**

The switches and their location on the standard transmitter have been chosen carefully to meet most modellers' practical requirements.

However, you are free to move the switches to suit your own preference. The transmitter is supplied with two blank switch panels and legend sheets to help you.

Additional switches are available in several versions. If you wish to rearrange the layout of your transmitter, please bear in mind the following points:

The Digi-Adjustor can only be fitted in switch bays 1, 2, 5 and 6 (see page 6); its mounting bracket obstructs one adjacent switch bay.

If you have switches with a short toggle installed, other switches with a long toggle should only be fitted in the row furthest from you.

If you want to change the switch layout you must first remove the existing switches; undo the knurled nuts using the special spanner supplied with the set. If you want to re-locate the Digi-Adjustor, undo the grubscrew and remove the rotary knob.

With the switches removed, you can press the existing switch panel out of the transmitter from the inside, by squeezing its central snap fixing and pushing it out.

If you wish to change the position of the Digi-Adjustor, you must remove the switch panel first. Please note that the washer on the fixing screw is not symmetrical, as the spacing of the switch bays in the right/left direction is different from the fore/aft direction. Turn the washer as necessary, and check that the shaft of the Adjustor is central in its hole. The fixing screw can be re-tightened when this is the case.

It is best to cut out the holes you need in the new switch panel before you install it in the transmitter. As the plastic is much thinner at the hole positions, this can easily be done with a sharp, pointed-blade modelling knife.

**Caution:** the switch panels only fit one way round – take care not to cut out the wrong holes! If necessary, the MULTIPLEX Service Department will help you out with a new panel.

Install the switch(es). Before tightening the fixing nut permanently and deploying the connecting leads, run through the "Transmitter Control Test" (see page 77), to ensure that the switches are installed the right way round. You will find more details about switches on page 7 ("Connectors on the main electronics circuit board") and page 14 ("Transmitter controls and switches").

The final job is to apply the self-adhesive stickers in the depressions next to the switches. Remove each sticker in turn, using a pair of tweezers or fine-nosed pliers, place it in the depression in the switch panel, and press it down firmly (Fig. 54). If we have not provided a sticker printed with your particular application, use the all-yellow stickers and write the inscription with a felt-tip pen.



Fig. 54

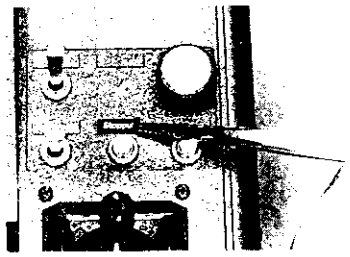


Fig. 55

**Hand supports, weather shield**

If you want to use the transmitter as a belly-mounted unit, hand supports with integral folding neckstrap bars (Fig. 56) are available. The supports are screwed to the sides of the transmitter.

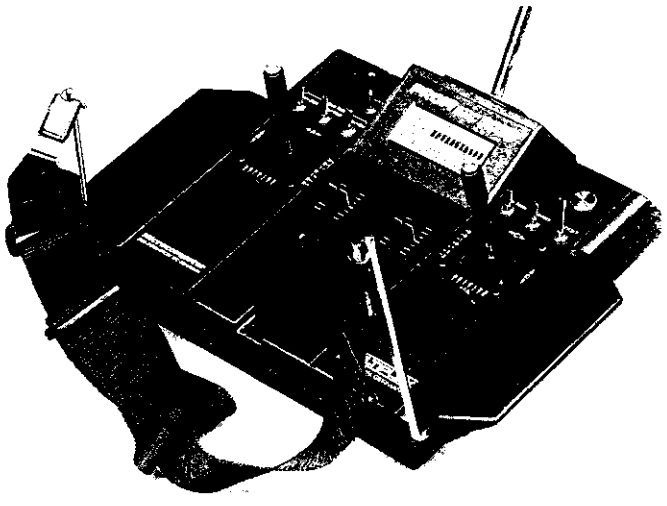
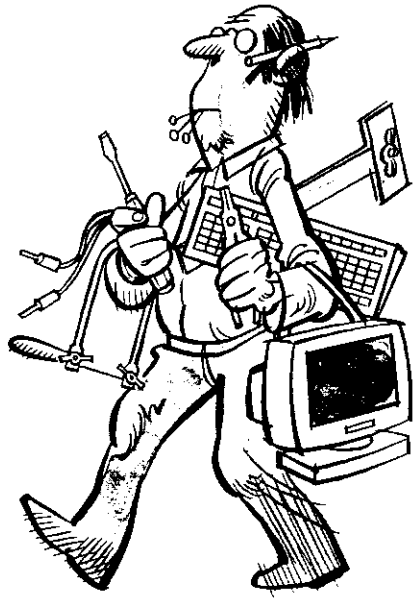


Fig. 56

For further details, please refer to the instructions supplied with the hand supports.
A weather shield is in preparation at the time of printing this manual.

# For Experts



## Switching memories "in flight"

This new, powerful facility is one further important step towards everybody's "dream radio control system".

**The principle is very simple:**

For one and the same model you provide two (or even three) separate memories. The "lists" stored in them are different. You can then switch between the different lists (or memories) at any time.

The differences between the lists can be as small or as great as you think fit – the scope of this feature is really limited only by your imagination. For example, the two lists could share the same "basic configuration", but have quite different adjustment values. On the other hand, you might wish to have a totally different list that you can call up.

For example, imagine a glider with a complex wing flap system. You could provide a "tow launch configuration", a "normal configuration" and a "speed configuration". The different configurations would have different movements of different pairs of control surfaces, and control surface throws would also be different. Fans of the flying wing layout will now be pricking up their ears.

Incidentally, such "configuration modifications" are also used in full-size aviation; "fly by wire" technology is the key there.

One further important application is "inverted flight switching" for a helicopter. In this case several control effects and basic adjustments have to be changed simultaneously.

The solution is obvious: one memory for normal flying, and one for inverted flight. Previous transmitters have always struggled with this problem, as so much has to be changed. In the case of the PROFI mc 3030 you can create a more or less completely "new" list for inverted flight, and there are virtually no restrictions on what you can do.

**And now to practice:**

There is little we can say specifically about the "second" or even "third" list; it all depends on your particular application. If you aim mainly at changing a few settings, then the simplest method is to copy the "starting list", then change the appropriate values. In other cases it may be necessary to create an entirely new list. Bear in mind that you are free to change every aspect of the second list, including modifying the mixers, re-defining the change-over switches, and so on.

One important condition: the memory to which you wish to change must be the next higher one in sequence, or – in the case of two alternative lists – the next-but-one in sequence.

Example: the "normal" memory for the model is No. 11. You can then change to No. 12 and No. 13.

You actually change memories using the **"Memory" switch**. If you move to the "Transmitter control test" (see page 73), the screen will show the memories to which you can switch in each position. At one end-point of the switch you will see the display "M+1", in the other "M+2".

In our example "M + 1" would be memory No. 12;
"M + 2" would be memory No. 13.

You may have to copy the contents of your memories to adjacent locations, in order to be able to switch between them.

Now there is one more safety feature to be overcome. If you could switch between one memory and its neighbour too easily, then one accidental movement of the switch would be fatal. For example, if the model in the adjacent memory happened to be entirely different from the one you were currently flying.

**For this reason we have determined that the name of the model must end (eighth character) in a number, if that memory is to be selectable in flight. Only then is it possible to switch between them.**

Example: Memory No. 7 contains "CORTINA1". If the model in memory No. 8 is "CORTINA2", then it is possible to switch between them. If Memory No. 9 contained "CORTINA3", then you would also be able to select that memory in flight.

If you try to switch memories without naming the lists in this way, you will just hear a brief beep when you operate the Memory Switch.

**Three further tips on this subject.**

1. In the example above you could use the names "CORT-TL1" instead of "CORTINA1", "CORT-NF2" instead of "CORTINA2" and "CORT-HS3" instead of "CORTINA3".

In this case TL stands for tow launch, NF for normal flight, and HS for high speed. The names will then remind you of which list serves which purpose. The final numbers must remain; but they are not very informative on their own.

2. If you change memories in the "normal" way from the keypad, please check that the Memory Switch is in the "basic" position. Otherwise the following will happen: you want to change to, say, Memory No. 13. Let's suppose that it contains a model list which you have set up as a "switchable" one. If the Memory Switch is in the wrong position, the transmitter immediately changes to the new memory, and instead of No. 13 you end up at No. 14 or No. 15. This can lead to considerable confusion.

3. Please don't use this feature for "simple" switching tasks; it always "costs" you one or two memories. For example, you could execute a simple change of camber-changing flap by switching memories; but it is just as easy to use the "Fixed Value" from the Transmitter Control options, and this alternative would not swallow up another memory.

## Servo assignment for wings with more than two control surfaces.

On page 33 we discussed the "traditional" assigning process for the aileron servos of models with wings featuring separately controlled, electronically differentiated ailerons. The recommended assignment is as follows:

Servo No. 1 = Aileron 1
Servo No. 5 = Aileron 2

For wings which have more than 2 control surfaces, all of which act as (mixed) ailerons, and all of which are to feature differential movements, this assignment can no longer be used.
Example: "Quadro-flap" arrangement (see page 91).

**In such cases the servos must be assigned "in sequential pairs".**

An example will make this clear:

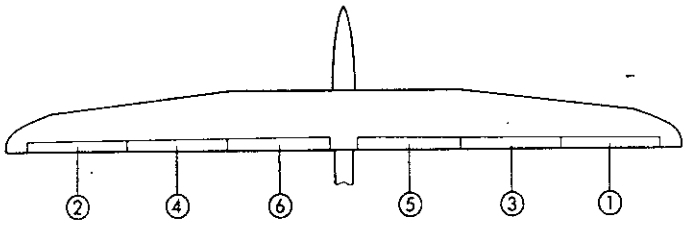



Fig. 57

In the drawing we show an "extreme" wing layout, with 3 control surfaces per wing, all of which are to work as ailerons, and all of which require differential movement.

We have already explained how you control the six servos (with the "QUADRO" mixer); we have also discussed selecting and adjusting the "Differential" option. Now all that remains is the order of the six servos at the assignment stage.

In our example, assigning "in sequential pairs" works out like this:

| | |
|---|---|
| Servo No. 1 controls QUADRO<br>Servo No. 2 controls QUADRO | Outboard pair of control surfaces |
| Servo No. 3 controls QUADRO<br>Servo No. 4 controls QUADRO | Centre pair of control surfaces |
| Servo No. 5 controls QUADRO<br>Servo No. 6 controls QUADRO | Inboard pair of control surfaces |

This should make everything clear. If you have only two servos per wing panel, (normal Quadro arrangement), simply stop at No. 4.

If you do not keep to this sequence, differential aileron movement will not be correct.

---

## The "Gx" switch

**What might that be?**

When assigning switches you are bound to have noticed that an extra switch is offered in addition to the "normal" switches S1 - S5 and L/S: if you are setting up an empty memory for the first time, this switch is designated "H".

In the standard designation "Gx" the "x" stands for the letters A to H. This might lead you to suspect that it has some connection with the transmitter controls, which also have the designations A to H.
And that's exactly right. The "Gx" switch does not exist in hardware form – it is a "software" switch – but it works in exactly the same way as a "normal" switch. You can assign this switch to any one of the transmitter controls A to H, and it then works in the following way:
If the associated transmitter control is set to one end-point, then the switch turns ON. It stays ON (even though the control is moved away from its end-point) until the transmitter control is moved to the opposite end-point. It then switches to OFF.
This sequence can be repeated ad infinitum: the switch comes ON again when the control is moved back to the first end-point, etc. (for the technically minded: extreme switch hysteresis).

But there's more yet! Gx can also be used as a momentary switch, as follows:

1. a fixed switching threshold is assigned to the Gx switch (between 5% and 95% of the transmitter control value).
2. If the associated transmitter control is moved past the switching threshold, then the switch is ON (transmitter control below threshold = OFF). When the Gx switch is in use, its effect can be reversed (as for any other switch) with the [R] key.

Before we consider the matter further, a little more on the designation of the switch. If you assign this software switch to, say, transmitter control B, then its name becomes "GB"; if you assign it to control D, then it is called "GD", etc.

**How to assign "Gx" to a transmitter control**

You will find the sub-menu "Gx" under the "Assign" menu. For your first experiment, move to this menu.
You will see a display similar to this:

```
01 TEST        PCM
-- SOFTSWITCH --
 ON A:  UNUSED
SW.POINT:
```

Press the [◥] key and leaf through with the [+] and [−] keys. The transmitter controls will appear in the sequence A to H, with the control functions to which they have been assigned. We will assume that you stay at "D: THROTTLE", and then leave the menu with the [M] key.
You have now assigned "Gx" to the throttle channel, and from now it it will be called "D".
If you now move to the "TIMER" menu and select the stopwatch operating switch, as described on page 16, you will find "D" offered amongst the other options.

Select it!

Effect: when you apply "full throttle" the stopwatch starts running; when you close the throttle fully, the stopwatch stops.
We will assume that you don't want the timer to be controlled only by full throttle and idle. To change this, press the [◪] key, and use the Digi Adjustor to select a

switching threshold between 5% and 95% (3% steps). This allows you (for example) to set the timer switching point exactly to the threshold at which the electric motor starts and stops running.

You may think that this example is not all that useful, but it does show the principle, and it gives an idea of just how versatile your transmitter is. You can use the "Gx" switch anywhere where you could use the switches S1 - S5; e.g. as a Dual Rates switch, as a coupling switch, and so on.

**Sample applications**
With an electric-powered model the motor is controlled by transmitter control B (MOTOR). The timer is controlled by "B". The stopwatch then stops automatically when you shut off the motor, thereby recording the length of the motor run.
On a glider you can couple the timer (e.g. in "countdown" mode) to the aero-tow release, or a (servo-operated) towhook. In this case, when flying a timed flight, you no longer need to worry about starting the stopwatch. If you assign "Gx" to spoilers or landing flaps, then you could automatically operate the Combi-Switch on the landing approach, or increase control surface throw, or switch out (or in) one mixing input or other. Bear in mind also that you can "reverse" the effect of this software switch, just like the other switches.
**"Gx" is a completely new feature for radio control transmitters. Many likely applications are just waiting for you to discover them.**

---

# The "SI" switch

We have already mentioned the "SI" switch on page 42, in connection with the transmitter control options "Fixed Value 1" and "Fixed Value 2". You may have noticed already that "SI" is offered in the menus when assigning the switches S1 - S2.

**What is "SI"?**
"SI" is another "non-hardware" switch, (i.e. a software switch), in this case coupled to the transmitter control input "I". However, it has different characteristics from the "Gx" switch described above:
Firstly, "SI" is a "three-position switch", i.e. it has an "idle position" in the centre, and a "working position" at both end-points.

If, for example, you connect a slider control to "I", and if the slider is set to centre, then "SI" is also at idle (OFF). If you move the slider to one end-point, then one side of "SI" switches on. If the slider leaves the end-point again, "SI" switches off immediately (note the difference from "GX"!).
At the other end-point of the slider the same applies; only in this case the other "side" of "SI" is switched on and off.
In this case "SI" has the same effect as if two end-point switches were fitted to the slider. With a little imagination you can use this feature for many interesting functions.

**The main application of "SI" is rather simpler, however.**
In this case a "real hardware" 3-stage switch is connected to input "I"; for example Order No. 7 5699 (short toggle) or Order No. 7 5700 (long toggle).

If this "hardware" switch (actually a transmitter control in this application) is operated, then of course it operates the "software" switch "SI" as well. The final effect is a 3-position change-over switch, which can be used with the switches S1 - S5; but which has 3 positions; compare this with S1 - S5, which are only simple change-over switches.
And that is exactly what we need to switch between 2 different "Fixed Values"!

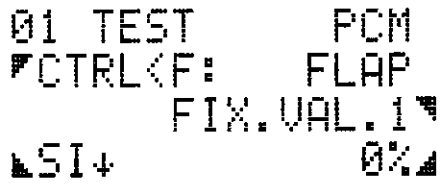
**The main application of "SI" is in conjunction with the transmitter control options "Fixed Value 1/Fixed Value 2".**

A further example will make everything clear: "camber-changing flaps with 2 switchable positions".

We will assume that transmitter control E is assigned to the "FLAP" function. Move to the "Adjust transmitter controls" menu, and from there to "CONTROL E: FLAP".

Press the ◥ key, and leaf through to the "Fixed Value 1" option.

Press the ◣ key ("switch corner"), switch ON with the ⓡ key, and then leaf through to "SI":




After pressing the ◪ key you can now set the first Fixed Value; for example, the "tow-launch" flap position.

While you are setting this up, operate the switch so that you can see the results of your efforts at the servo itself!

Now to the second Fixed Value:

Press the ◥ key again, leaf through with the ⊞ key to the "Fixed Value 2" option.

You will see this display:




Press the ◪ key and you can adjust the other flap position (e.g. speed). Here again, operate the switch during the adjustment procedure (opposite end-point), so that you can see the effect directly.

**Once you have finished the setting up process, the flaps can be controlled in the following way:**
Switch at centre:
The flap servo is controlled by the slider.

Switch at the end-points:
The flap servo runs to one or other of the pre-selected positions.

# Transferring programs between two transmitters

Let's imagine that you have worked hard at perfecting a list for your model "XYZ", and then one of your colleagues buys a kit of the same model. If he also possesses a PROFI mc 3030, you can share the fruits of your hard work with him by transferring a copy of your program to his transmitter. You may even find that your dealer, as a special service, will copy into your transmitter a suitable list for the helicopter he has just sold you.

**Programs (model lists) can be transferred in either direction between two PROFI mc 3030 transmitters.**

As you will see, this is a very simple matter. All you need is the transfer lead, Order No. 8 5120.

**You can transfer in either direction:**

From your transmitter to another transmitter ("Export").

From another transmitter to yours ("Import").

**First: "Export".**

Connect the two transmitters with the transfer lead, by inserting the plugs in the two charge sockets. Switch both transmitters on.

If only one of the two transmitters is switched on, the display of the other transmitter will show "Rev count 000". This has no significance, and disappears as soon as the other transmitter is turned on.

As far as your transmitter is concerned, "transferring" is the same as "copying to another memory", so move to the **"Copy Memory"** menu (see page 47). Release the "Mode" with the ◩ key; then leaf through with the ⊞ key to the "EXPORT" mode.

The display will look something like this (lines 3 and 4 are just an example):

```
-- FILE COPY ---
MODE:EXPORT
FR: 10:BIGLIFT
TO  01:<EXTERN>
```

Now you have to tell your transmitter which of its stored lists is to be transferred, and which memory in the other transmitter is to be used to store the copy. To do this press the ◪ key and then leaf through with the ⊞ and ⊟ keys until you reach the memory number you want. For example, we will use "No. 12 CORTINA".

Now enter the "destination" memory number for the other transmitter: press the ◩ key and leaf through again to the desired number.

It makes sense at this point to check one last time that the selected memory in the other transmitter really is "empty", or that the contents can safely be overwritten; because what is there at the moment will be lost permanently after the transfer is complete.

For our example we will nominate memory No. 3 in the other transmitter; that is where the program is to "arrive".

Your display should now look like this:

```
-- FILE COPY ---
MODE:EXPORT
FR: 10:BIGLIFT
TO  03:>EXTERN<
```

Everything clear so far?

If so, press the Ⓜ key, and you are done. The transfer is completed in a fraction of a second after you press the key.

If you now look in the other transmitter (for instance, change memories), you will find "CORTINA" in memory No. 3.

If the transfer does not take place for any reason (e.g. lead not plugged in, lead faulty, other transmitter not switched on), then your transmitter will show "Mode: – Error – " in line 2. Sort out the problem, then repeat the procedure.

**"Import"**

This is carried out in a similar manner, so we can deal with it in rather less detail.

Instead of the "EXPORT" mode we select "IMPORT". In line 3 of the menu you have to enter which memory No. of the other transmitter contains the program to be imported. Example: No. 9.

In line 4 your transmitter needs to know which of its memories the program is to occupy.

We will suppose that No. 7 contains the model "RAMBO" at the moment, which is no longer of interest to us. It can be overwritten.

Your display then looks like this:

```
-- FILE COPY ---
MODE:IMPORT
FR: 09:<EXTERN>
TO: 07:RAMBO
```

The transfer takes place when you press the Ⓜ key.

**Two further points:**

**1.** If you should wish to interrupt an import, export, copy or delete process after you have started, simply switch the transmitter off briefly. The data in the model memories will then be unchanged.

**2.** To ensure that import/export is possible between all versions of the transmitter, this function is only possible with memories 1 to 15 and Mx.

## The FIXED VALUE virtual "transmitter control"

If you wish to operate a servo with a stick (or a function switch), you do not need to "lose" a transmitter control for the purpose. Assuming, that is, that all you need are two fixed servo positions.

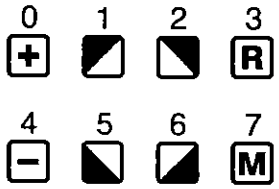
**Assign first:**
Move to the ASSIGN/SERVO menu with M◪◥◥. Select the servo you wish to use, press the ◪ key, and assign it to the FIXED VALUE "transmitter control". When you assign the "genuine" transmitter control, FIXED VALUE will not appear.

**Set up as follows:**
Move to the ADJUST/SERVO/TRAVEL+REVERSE menu with the sequence M◩◩, and select the servo which you have assigned to FIXED VALUE. Press ◪and select the switch with which you wish to activate FIXED VALUE. Finally press ◥, and set the servo position for the first switch position.

The servo position for the second switch position is determined in the menu ADJUST/SERVO/CENTRE. To be able to do this, you must first go back by one menu level with the M key, and activate Centre adjustment with ◥. Now move the physical switch to the other end-point, press the ◪ key, and set the desired second position for the servo.

## The code lock

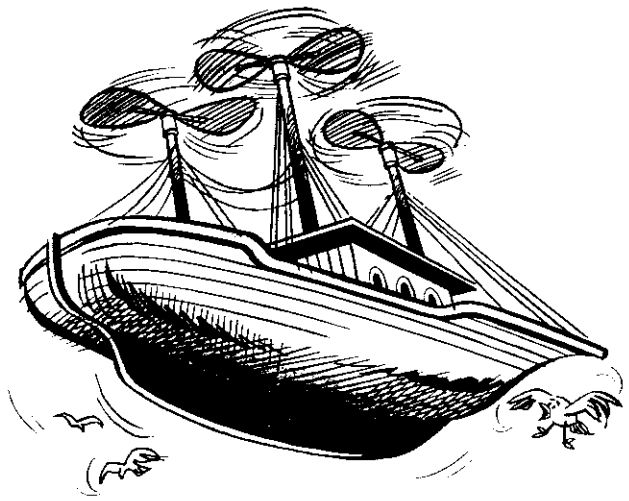
At the time your dealer enters your name, he (or the MULTIPLEX Service Centre) can activate a code lock. The code consists of four numeric digits (numbers) between 0 and 7. The keys on the keypad correspond to the figures shown in the diagram below.




Once the code lock has been activated, every time you return to the top menu level (Status display) you will be asked whether you want to "LOCK" the transmitter or not. If you answer LOCK YES/NO with YES (◥), then every time you attempt to move to a menu, the display requests you to ENTER CODE. Thus the only persons who are able to make changes to your transmitter are those who know the right four keys to press.

**Caution!**
**If you switch off the transmitter with the lock open, it will still be open next time you switch on.**

# The MULTINAUT-plus system



This expansion system is intended principally for model boats which are fitted with a large number of auxiliary working systems.

**But even if you are a model aircraft flyer, it may well prove worth your while finding out what can be done with this system. Especially if your interest lies in large scale models.**

If it's going to be scale – then let's make a proper job of it! After all, the real thing has navigation lights, landing lights, an on-board starter, . . .

Just imagine for a moment what could be crammed into such a model:

For the basic functions you need four control channels. Add differential ailerons, and it's five. Plus retractable undercarriage, landing flaps, and steerable nosewheel. Now we're up to eight functions.

You want to start your model's engine from the transmitter?

Then you will need three further functions in addition to throttle: glowplug battery switch, start, mixture adjust. We're already up to 11 functions. And what about the towhook, the parachute eject system, navigation lights and landing lights? Suddenly we seem to need all of 15 functions.

And no doubt you could think up a few more.

**But how are we to control all that?**

This is where the **MULTINAUT-plus system** comes in. It is an expansion system for transmitter and receiver. The minimum system consists of one transmitter control module and one receiver module, which is connected to the receiver in the same way as a servo.

These two basic modules alone are enough to solve our problem: glowplug, starter, navigation lights and landing searchlights are connected directly to the four integral relays in the receiver module. Each relay can switch loads of up to 10 Amps; no problem there!

Mixture adjustment and undercarriage are catered for with the two additional proportional functions.

**A quick idea of how it all works**

The additional control signals from the transmitter module travel to the receiver "piggy-back" style on one of the normal control functions. This function is therefore slower in transmission speed, but in practice this makes little difference, as we are only talking about fractions of a second.

To prevent the risk of jerky servo movements, the MULTINAUT-plus receiver deliberately slows down and smoothes out the movement of servos connected to it. This can be ideal for certain functions, for example, for scale-speed flap extension; this is why we use one of the MULTINAUT-plus proportional channels for the flap function.

**Incidentally:**

There are four more switched channels available. Fit a relay expansion unit to the receiver module, and these can also be used for similar purposes. What will you use them for? Have you no imagination?!

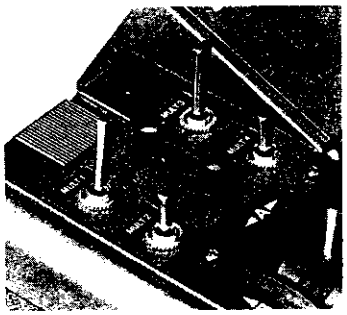


Fig. 58

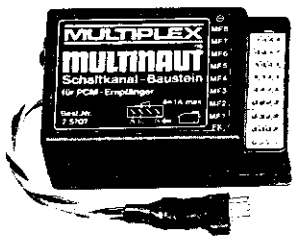



Fig. 59

**Installation**

The MULTINAUT transmitter module is installed in one of the two switch wells; it takes up all six of the switch bays on that side. Any switches already in place there will need to be shifted to the other side. More details are provided in the operating instructions supplied with the MULTINAUT-plus system.

**The assigning procedure**

After installing the module, you need to tell the transmitter which servo output at the receiver end the MULTINAUT receiver module is to be connected to. All you have to do is assign that servo function to "MULTNAUT".

You also have to inform the transmitter which socket (G, H, or I) the MULTINAUT transmitter module is connected to.

This is done under "SERVO: TRAVEL + REVERSE". Leaf through the list of servos until "MULTNAUT" appears. Next to "INPUT:" you will see G instead of the name of a control. Enter here the input to which the transmitter module is connected; it must be one of the inputs G, H or I.

Now the transmitter module has to be switched on. Select the field below, and switch "OFF" to "ON".

That's it.

**And finally**

If one transmitter module is not enough: just install a second one.

# II. The receiving system



## Connecting servos and batteries

The receiver is the "heart" of the receiving system. Servos, motor controllers, switch modules and MULTI-NAUT-plus receiver modules are connected directly to it.
The receiver battery is connected to the receiver via a "switch harness" (Fig. 60).

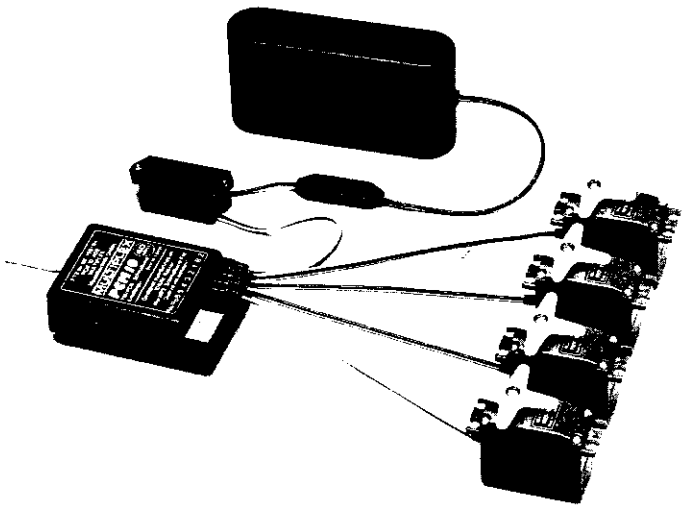


Fig. 60

The receiver servo output sockets are numbered from 1 to a maximum of 10, depending on the number of servos which can be connected. Each servo output corresponds to one control function.
For reasons of space, certain output sockets on the smaller receivers are combined, so that two servos can be connected to one socket. This type of socket is marked, for example, "8/9". Only one servo can be connected directly, and this is always the lower number; in this case channel 8.

What if you need both functions? In this case you need an **expansion adapter** (Order No. 8 5060), which consists of a plug and two sockets. The plug is connected to the receiver socket; the two servos are connected to the two sockets on the adapter (Fig. 61).

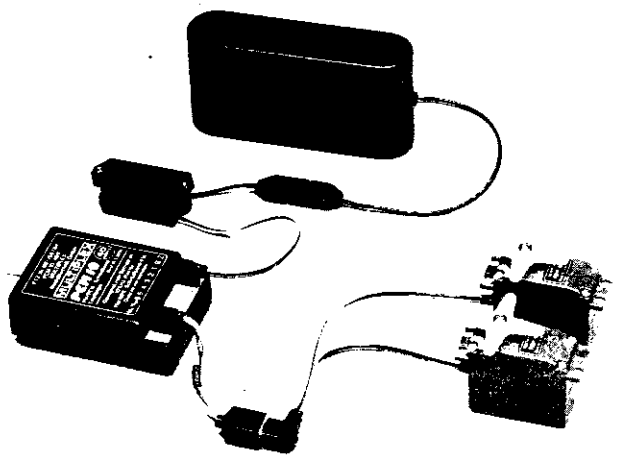


Fig. 61

**The switch harness**
This is plugged into socket "**B**". The switch incorporated in the harness is used to turn the whole receiving system on and off. The switch itself can be installed in the model's fuselage side.
Switch harnesses are available in several forms; please refer to the main MULTIPLEX catalogue for details. Some versions are fitted with a separate socket for charging the receiver battery. On the switch harness supplied with the set (Order No. 8 5100) the charge socket is integral with the switch casing. This means that the battery can be recharged without having to open up the model (Fig. 62).

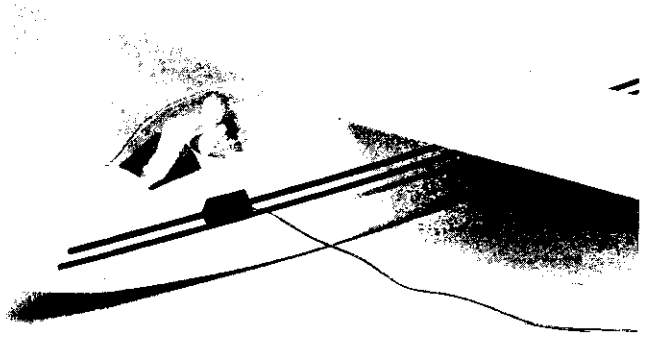


Fig. 62

## PPM or PCM?

**PCM** (Pulse Code Modulation) is the more "intelligent" of the two transmission methods. In the case of PCM the information is encoded by the transmitter. The receiver is able to recognise interference, and continues to send the last "good" signals to the servos until it again receives a signal from the transmitter (see Fail Safe). Thus PCM eliminates servo jittering.
On the other hand, this interference suppression can

lead to the PCM pilot failing to notice interference until much later than with a PPM system.

**PPM** (Pulse Position Modulation) still has the advantage if you require ultra-fast control response from your model, because the information is broadcast by the transmitter at a faster rate than by a PCM transmitter.

## Which types of receiver can be used?

**PCM**

All MULTIPLEX PCM receivers can be used with your new transmitter.

**PPM**

When set to PPM, the transmitter broadcasts either 7 or 9 channels (see page 18 for method of switching). This means that you can use **all MULTIPLEX FM PPM receivers** (and all FM PPM receivers which can decode at least 7 channels) with this transmitter.

## Fail-Safe ("emergency position" for servos)

**Only available with PCM-DS receivers!**

After about 0.8 seconds of interference the throttle servo runs to the 25% position, and all the other servos are automatically reset to centre. Fail-Safe is a feature of the receiver, and **must be switched on** before it can work.

## Single-superhet or double-superhet?

If you operate your model in the vicinity of a powerful VHF radio transmitter (frequency range 103 to 105 MHz), conventional radio control systems (single-superhet) in the 35 MHz band can suffer from interference. In technical terms: the powerful transmitter produces adjacent-channel interference to the single-superhet receiver. The double-superhet receiver utilises different technology which eliminates the problem altogether.

## Arrangement of battery, servos and receiver

The diagram below shows the most favourable arrangement of the RC system components in the model. We recommend that you decide exactly how your system is to be installed in the new model before you start construction.

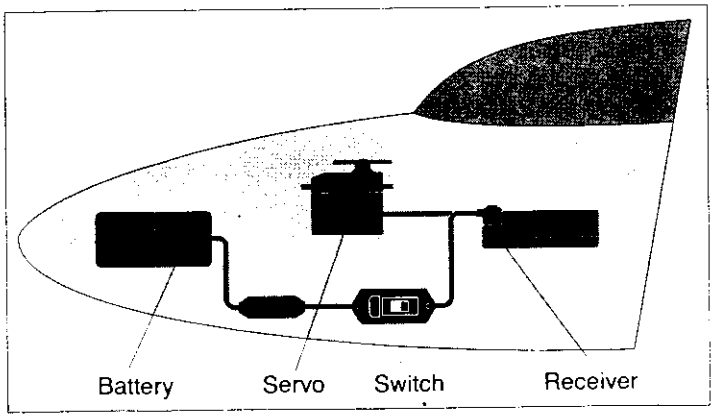



Fig. 63

## The receiver

When installing the receiver in the model, please observe the following points:

- Keep the receiver well away from powerful electric motors and electric ignition systems.
- Lead the receiver aerial out of the model by the shortest possible route.
- Protect the receiver from vibration by wrapping it in foam rubber and stowing it loosely in the model.
- Never alter the length of the receiver aerial.
- Deploy the receiver aerial in as straight a line as possible. Never leave it coiled up in the model.
- If your model incorporates carbon fibre reinforcements, do not deploy the receiver aerial inside the fuselage (signal screening).
- Do not stick the receiver aerial to any part of the model which is reinforced with carbon fibre (signal screening).

## Range testing

Range testing can make a significant improvement to safety levels when you are operating your model. We have cooked up a standard recipe for range testing based on our own experience and measurements. If your system passes this test, you can be sure you are on the safe side.

1. Collapse your transmitter aerial fully.
2. Ask an assistant to hold your model about 1 m above the ground.
3. Check that there are no large metal items (cars, wire fences etc.) close to the model.
4. Make sure that no other transmitters are switched on (even on different channels) when you carry out the test.
5. Switch on your transmitter and receiver. When the transmitter is 80 m from the model the equipment should be able to pass the following test:

   **PPM** system: the control surfaces should still respond immediately to stick movements, and make no uncontrolled movements at all.

   **PCM** system: the control surfaces should still respond promptly to stick movements. The inherent interference suppression of a PCM system prevents servos jittering. If the signal received is not strong enough, then a PCM receiver will continue to pass the last received signal to the servos. The servos will then either not respond to stick movements, or will hesitate before responding.

If your model is fitted with a motor, repeat the test with the motor running.

## Interference suppression with magnetic/electronic ignition systems

- Screen the ignition lead with a metal tube, fixed (earthed) to the motor crankcase close to the ignition coil.
- Use screened plug connectors at all times.
- Never power the ignition system from the receiver battery.

- Keep a distance of at least 15 cm between the ignition system and all the RC system components (including the receiver battery).
- Keep the leads from the ignition battery and the other components as short as possible, and sufficiently thick (min. 0.5 sq mm).
- The ignition switch should be rated at a minimum of 10 A (minimum voltage drop).

## Notes on servos

The servo torque for a particular control surface can usually be calculated with sufficient accuracy using the following rough formula:

0.75 x control surface area (in sq cm/100) = torque (in cm/kg).

In large models it is often necessary to extend servo leads. If you intend fitting extension leads, please note that they affect reception conditions. If the lead is more than 60 cm long you must use a separation filter. If other servo leads run parallel to these long leads for a distance of more than 25 cm, then the shorter leads should also be fitted with separation filters. There are two alternative methods:

**Separation filters for direct connection**
(Order No. 8 5083)
This lead is simply connected between the receiver output and the servo connector.

**Extension lead with separation filter**
(60 cm: Order No. 8 5087, 120 cm: Order No. 8 5083)

**Extension lead set with separation filter**
(max. 2 m: Order No. 8 5138)
This is a kit which can be used to connect servos which are built into wings or other parts of the model.

## Airborne power supplies

**Receiver battery**
You can use the following rough formula to calculate the receiver battery capacity required in a particular model:

0.2 Ah x No. of servos = battery capacity in Ah

For example, a model with 5 servos should be fitted with a 1 Ah receiver battery. A good idea is to go one step further and select the "next size up", provided that weight and space are not a problem.

**Switch harnesses**
The switch harness is connected to the battery and the receiver. Some switch harnesses (e.g. Order No. 8 5100) have an integral charge socket. If the switch is installed in the model's side you can recharge the receiver battery without having to open the model.

**SAFETY System**
Large and valuable models call for a powerful receiver power supply with an adequate margin of safety. Such models are often controlled by six or more powerful servos, and if control surface loads are high, currents of up to 10 A are quite possible for brief periods. Normal power supplies are not designed for this magnitude of load, and that is why we developed the SAFETY System.

**The SAFETY System comprises the following items:**

Two 6-cell battery packs with high-current socket
1400 mAh — Order No. 15 5305
600 mAh — Order No. 15 5310
Two monitors — Order No. 7 7145
SAFETY System controller with switch — Order No. 8 5164
Special battery extension lead — Order No. 8 5146

The diagram below shows how the SAFETY System is wired up.

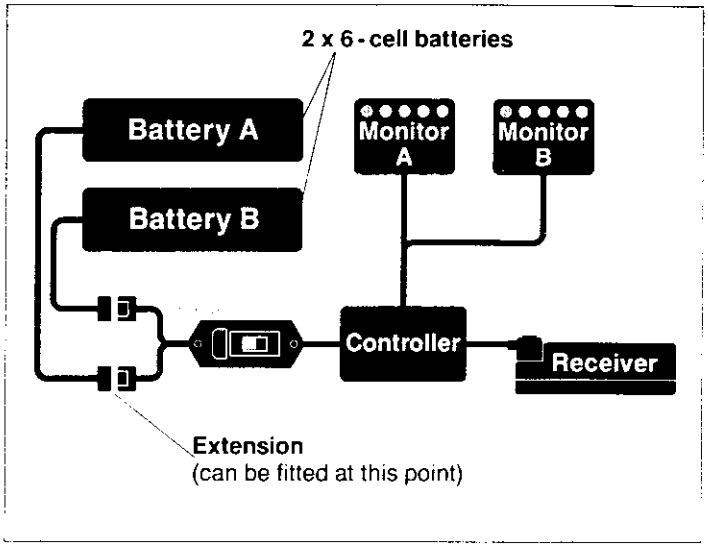



Fig. 64

## Diagnosis (closed loop) operation

For checking and making adjustments, the transmitter and receiving system can be linked by the Diagnosis Lead (Order No. 8 5105). The model must be fitted with a switch lead with integral charge/diagnosis socket (Order No. 8 5100). The RF module in the transmitter is switched out of circuit automatically, and can even be removed.

**Closed-loop operation:**
...saves power; as no RF signal is produced or radiated by the transmitter its current consumption drops to about 33% of the normal value;
...disturbs nobody, because the RF module is not functioning.
...cannot suffer interference, because RF signals are ignored by the receiver.

**Important:**
You can only carry out closed-loop checking if none of the stick functions has been released as a Pupil function (see pages 74/74: Teacher/Pupil operations).
When you pull out the plug from the transmitter, the RF module is switched into circuit again, which could interfere with your fellow modellers.
**So: be sure to switch the transmitter off before disconnecting the plug!**

## Care of the transmitter

**Storage**
Protect your PROFI mc 3030 from:
- mechanical damage
- ambient temperatures above 60 degrees C (sunshine in a car)
- damp, solvents, model fuel, exhaust residue
- dust (in the workshop).

Please bear in mind that condensation may form on and in the transmitter if you move it from your warm workshop to a cold car or vice versa. Condensation may prevent the transmitter working properly. If you are not sure, carry out a careful range test, and let the transmitter warm up or cool down thoroughly. The transmitter should be completely dry inside.

## The transmitter battery

Please note that new battery packs do not achieve their full capacity until after about 10 charge/discharge cycles.

- Charge new, rapid-charge batteries (or packs which have not been used for a long time) at least three times at the normal (slow) rate before rapid-charging them.
- Do not rapid-charge a battery unless you are certain that it was designed for it.
- Charge up batteries only when the ambient temperature is in the range 0 to 40 degrees C.
- Avoid placing mechanical stress on the power leads and on the cells themselves.
- Replace old batteries in good time.
- NC packs fall into the category of **dangerous waste**, and must be disposed of properly. Don't just chuck them in the rubbish bin!

**Storing batteries**

If you do not use your transmitter for a long period, take special note of the following points:

**State of charge**

Experience shows that NC packs should be stored in a discharged (empty) state.

**Self-discharge**

NC packs lose about 1% of their charge per day under unfavourable conditions, i.e. after three months' storage they are generally completely flat.

**Maintenance charging**

The transmitter battery can be kept topped up, ready for use at any time, by charging it constantly at about 70 mA. The MULTIPLEX Combi-Charger Order No. 14 5540 includes a 70 mA output.

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## Types of servo

The **right servo for every application**

Servos are the muscles of your radio control system. They move the control surfaces and steering linkages, operate throttle arms and brakes, switches and release mechanisms. For most purposes a high-quality "all-round" servo is quite good enough. These servos usually offer the best price : performance ratio.

**Principal differences in servos:**

**Type of output**

Most servos are of the "**rotary-output**" type. The output arm rotates, usually through an angle of +/– 45 degrees. For special purposes – e.g. for retractable undercarriages – there are **high-power servos** which move through +/– 90 degrees. In some types of installation a **linear–output servo** offers distinct advantages. The fundamental disadvantage is that it is not possible to alter servo travel by fitting a longer or shorter output lever, as is the case with rotary servos.

**Power (torque)**

Servo power is determined by the power of the motor and the reduction ratio of the gearbox. Greater power requires a more powerful motor (which consumes more current) or a higher gear reduction ratio (which slows down its response).

If speed is unimportant – e.g. for a retractable undercarriage – the slow **Power Servo** is the best solution.

In large, heavy models our **Profi Servos** come into their own. They offer outstanding power combined with high speed. If several Profi servos are used in a model, you should always select a receiver battery with a larger than normal capacity.

**Speed**

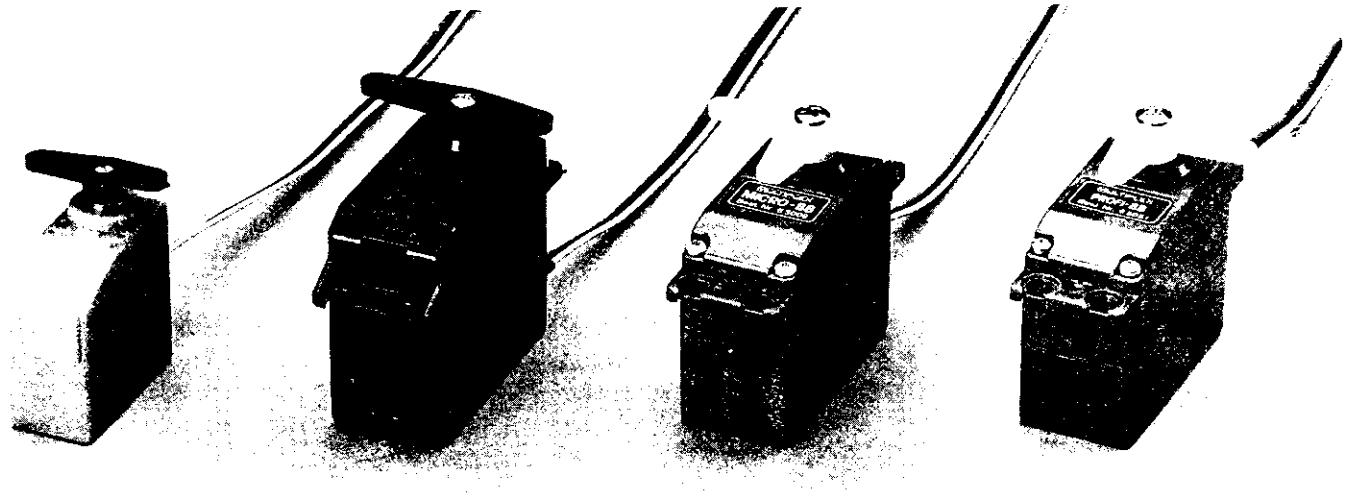
Servo speed, as in a car, is a function of gearbox ratios. A low reduction ratio gives high speed, at the expense of power. For most applications our standard servos are quite fast enough. Only extremely high-speed models require specialised Speed Servos.

**Resolution (accuracy)**

This is where the precision of a servo manifests itself. Our top models achieve a resolution figure of 0.2%.

**Dimensions and weight**

For some purposes – especially for wing installation – by far the most important requirement is minimum size, combined with plenty of power. For such cases we recommend our **Pico Servo**.



A variety of servo types

Fig. 67

## Cleaning the transmitter

If you need to clean your transmitter, take great care that no fluid gets inside the case.
Use a mild household cleaner to clean the case. On no account use an abrasive or solvent-based cleaner.
The best way of removing dust is to use a soft paint-brush.

## Maintenance

Your PROFI mc 3030 transmitter contains no parts which require user maintenance. However, we do recommend that you carry out a range check and a check of all functions.

# III. Some basic model technology

## Specialist terms referring to fixed-wing aircraft

**Spoilers:**
A vague term used for any part of the control system which primarily produces drag (and sometimes affects wing lift). For example: airbrakes, rotating trailing edge brakes or camber-changing flaps which can be deflected more than 30 degrees negative or positive.

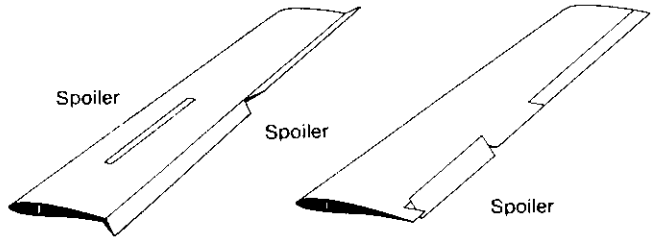



Fig. 65

**Camber-changing flaps (or simply flaps)**
Control surfaces at the trailing edge of the wing, used to vary the camber of the wing section, and thus also the characteristics of the wing, to suit particular flight requirements. Positive deflections (flaps down) produce an increase in the wing's lift coefficient (slow flight), with a slight increase in drag. Small negative deflections, around 2 - 3 degrees, reduce drag for high-speed flight. If flaps are deflected more than about +30 degrees, drag rises considerably. Flaps make a useful landing aid (spoilers, crow system).

**Flaperons:**
Full-span control surfaces at the wing trailing edge, which double as ailerons and camber-changing flaps.

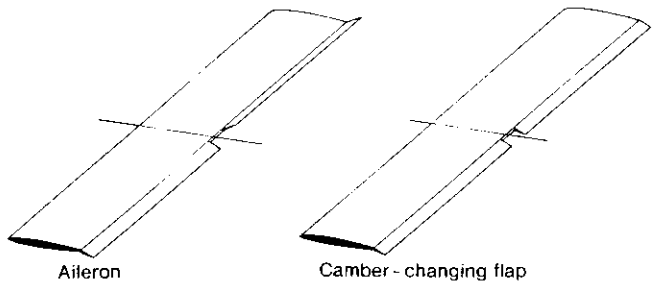



Fig. 66

**Delta ("elevons"):**
Full-length control surfaces at the wing trailing edge, on models without a tailplane (delta, flying wing). The elevons double as ailerons and elevators.

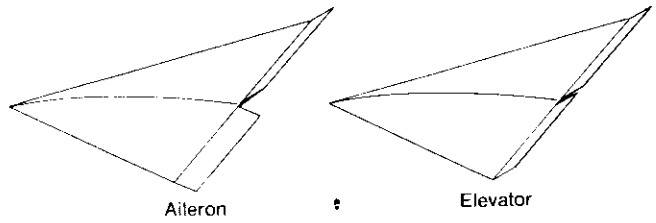



Fig. 67

**Quadro:**
Full-length control surfaces (flaperons) divided into two separate flaps per wing. Each control surface doubles as aileron and camber-changing flap.

Dividing the flaperon into two makes it possible to set up the functions of aileron and camber-changing flap more efficiently in aerodynamic terms, particularly on long-span wings (better lift distribution and improved aileron response).
In the interests of good aileron response, the aileron movement of the outboard control surface should be greater than that of the inboard surface; on the other hand, the flap movement of the inboard control surface should be greater than that of the outboard surface, to ensure docile stall behaviour.

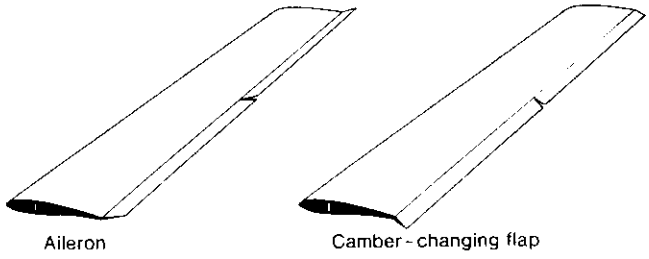



Fig. 68

**Crow system (aileron brakes)**
An extension of the "Quadro" mixed function, utilising the mixed control surfaces as "spoilers". The inboard control surfaces are set to a positive braking position (flap down), the outboard surfaces to a negative braking position (flap up). Used on high-performance gliders (F3B class) which are not fitted with proper airbrakes or spoilers.

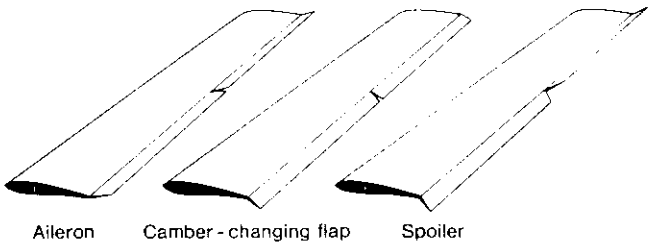



Fig. 69

**Snap-flaps:**
Mixed function: elevator → camber-changing flaps. Often used on aerobatic models to reinforce the effect of the elevator. If up-elevator is applied, the camber-changing flaps are deflected down; the result is an increase in the wing's lift coefficient. Down-elevator is accompanied by up-flap, and the wing's lift coefficient is reduced. The overall effect is that the aircraft is capable of very tight looping manoeuvres – ideal for the "square" figures.

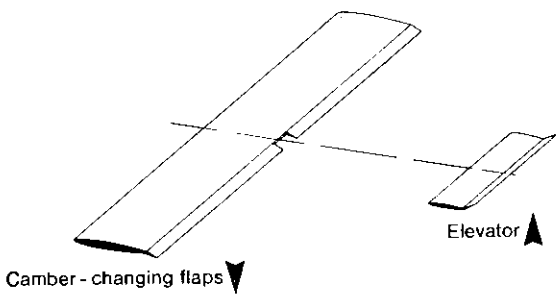



Fig. 70

**V-tail (or "butterfly tail")**
Combined elevator and rudder in the form of a "V". When elevator is applied, both control surfaces move in the same direction. When rudder is applied, they move in opposite directions.

**Differential:**
Term used for unequal aileron movements, intended to compensate for the "negative" roll effect, otherwise known as adverse yaw.
If ailerons move an equal amount up and down, the aileron on the outside of the turn produces a yawing moment in the opposite direction to that of the turn, due to the increase in drag; an increased rudder movement is then required to counter the yaw.

This makes for difficult control characteristics and a loss of efficiency, which can be very noticeable in large span model gliders.

Unequal aileron movements (much more up movement than down) can reduce this effect greatly, or even eliminate it altogether.
The effect of adverse yaw varies from model to model, depending on the aircraft's geometry and wing sections. For this reason it is always necessary to carry out practical tests. As a good starting point we recommend 100% up-movement, and 50%-70% down-movement.

## Some helicopter terms

**Swashplate:**
This component mixes and transfers all control movements from the fixed control mechanisms to the rotating rotor blades.

**Collective pitch variation:**
Generally known as collective pitch, or simply "collective".
Variation in the pitch angle of all rotor blades at the same time, to control lift.
If no change is made to cyclic pitch, the resultant lift force is coincident with the rotor shaft.

**Cyclic pitch variation:**
Generally known as "cyclic pitch", or simply "cyclic".
A variation in rotor blade pitch which alters over the course of one rotation. The effective result is that the plane of the rotor blades is tilted, and the resultant lift force is no longer coincident with the rotor shaft. It is used for:
pitch-axis control:
The resultant lift force of the rotor is tilted forward or back (when viewed from behind the model, looking forward). Corresponds to up- and down-elevator on a fixed-wing aircraft.
roll-axis control:
The resultant lift force of the rotor is tilted to right or left. Corresponds to aileron movement on a fixed-wing aircraft.

**Tail rotor:**
Produces a force which counteracts the torque of the main rotor in single-rotor helicopters. Used for yaw control, corresponding to rudder control in a fixed-wing aircraft.

**Gyro:**
The gyro registers unwanted yaw-movements, and sends appropriate corrective signals to the tail rotor control system. As every control command involving the main rotor results in a change in main rotor torque, the gyro is an important aid to the pilot.

**Gyro suppression:**
This system reduces or entirely suppresses the effect of the gyro, so that the pilot can effect fast, intentional movements around the yaw axis.

**Pitch/throttle curve:**
In an ideal helicopter the rotor speed would remain constant at all motor power settings; this is achieved by opening and closing the throttle whenever collective pitch is increased or decreased. The relationship between collective pitch and throttle can be considered in the form of a graph, or "curve"; the throttle signal is derived from the collective pitch signal.

"3-point curve":
Corner points for minimum collective, hover collective and maximum collective pitch.
"5-point curve":
As above, but with two additional points between the corner points mentioned above. The 5-point curve allows the rotor power requirements to be matched more accurately to the motor's power output characteristics.

**Throttle pre-select (Idle-Up):**
Throttle setting for rotor idle speed under "no-load" conditions.

**"Schlueter" control system:**
A separate servo is used for each of the three functions collective pitch, pitch-axis and roll-axis.
Characteristic feature: the swashplate cannot move axially; collective pitch is controlled by means of a pushrod located inside the hollow rotor shaft.

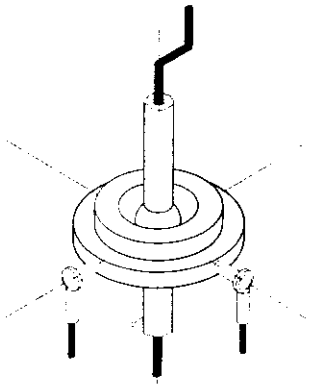


Fig. 71

**"Heim" control system:**
The functions collective pitch and roll are mixed electronically and passed to two servos. These servos control the swashplate in the "right/left" and "up/down" directions.
The pitch-axis function is mechanically de-coupled from collective pitch. A separate pitch-axis servo controls the pitch-axis movement of the swashplate.
Special feature: mechanical flare compensation is possible.

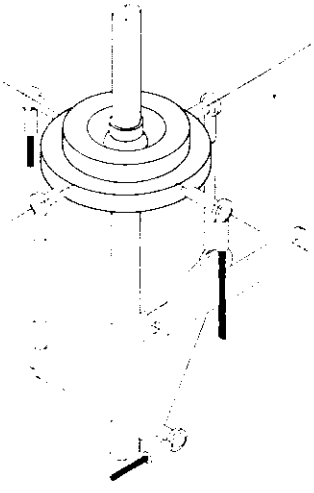
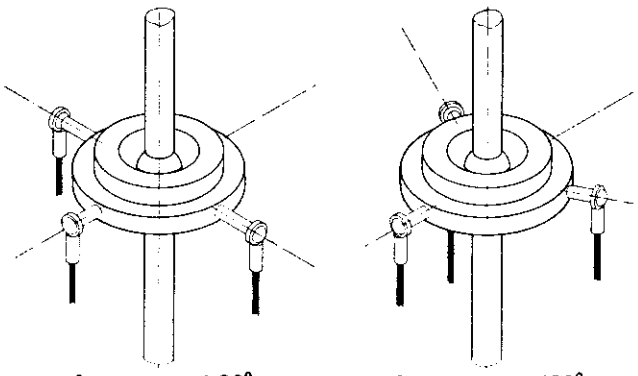


Fig. 72

**"CPM" control system (HEAD MIX):**

Abbreviation for Collective Pitch Mixing. The control signals for collective pitch, pitch-axis and roll-axis are electronically "composed" and sent to the servos. Between servos and swashplate there are no mixer levers or similar mechanics, so mechanical complexity is minimised.



**Arrangement 90°** **Arrangement 120°**

Fig. 73

**Virtual swashplate rotation:**

If a 3- (or more-) bladed rotor is mounted on a swashplate intended for a 2-bladed system, then the tilt of the swashplate no longer corresponds to the inclination of the rotor disc, as it is not possible in design terms to locate the mechanical linkage to each blade of a multi-blade rotor at a point 90 degrees in advance of its highest point. If the swashplate control system cannot be rotated through the appropriate angle to match the blade system, the pitch-axis and roll-axis servo signals can be mixed electronically to achieve an apparent (virtual) rotation of the swashplate.

# Frequency bands, channels, crystals and spot frequencies

Four frequency bands are available for the control of models in the U.K.:

27 MHz band
35 MHz band
40 MHz band
459 MHz band

The latter band is used very little at present; the PROFI mc 3030 transmitter and receiver are only available on the first three bands.

The easiest way of imagining frequency **bands** is to compare them with the wavebands on your radio. Think of long wave (LW), medium wave (MW), and so on.
On your radio you can probably change bands by pressing a knob. With radio control equipment we can't do that: the transmitter has an RF module which has to be changed. The receiver, on the other hand, must be swapped for a new one.

A **channel**, or spot frequency, is a narrow section of one frequency band. Going back to our radio analogy, a spot frequency corresponds to one radio transmitter, or station. Instead of the frequencies themselves, which are difficult to remember, we use standardised channel numbers.

The **crystals** in the transmitter and receiver determine the frequency and the channel. They must therefore be matched to each other with extreme precision. That is why:

**Always use genuine MULTIPLEX crystals in your MULTIPLEX radio control equipment!**

The channel number is always printed on one face of the crystal. next to it you will see either an **"S"** (Sender = transmitter) or an **"E"** (Empfaenger = receiver). Transmitter crystals are enclosed in a transparent blue casing, and "normal" receiver crystals in a transparent yellow one.

**Caution:**
Ordinary receiver crystals cannot be used with double-superhet receivers. **Double-superhets require** special types (**DS crystals**). They are fitted with an integral colourless plastic holder (Fig. 66).

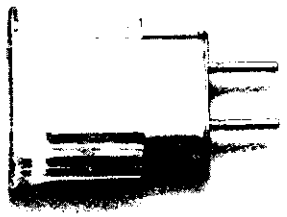


Fig. 66

# Bands, channels and frequencies at a glance:

## Crystals for the 27 MHz band

| channel | transmitter frequency | narrow-band transmitter crystal, Order No. 16 5420 channel MHz | narrow-band receiver crystal, 16 5422 channel MHz | Belgium | Austria | Denmark | France | Italy | Luxemburg | Norway | Netherlands | Sweden | Switzerland |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 4 | 26.995 | 13.4975 | 26.540 | ● | ● | ● | ● | ● | ● | ● | | | ● |
| 5 | 27.005 | 13.5025 | 26.550 | ● | | | ● | | ● | ● | | | |
| 6 | 27.015 | 13.5075 | 26.560 | ● | | | ● | | ● | ● | | | |
| 7 | 27.025 | 13.5125 | 26.570 | ● | | | ● | | ● | ● | | | |
| 8 | 27.035 | 13.5175 | 26.580 | ● | | | ● | | ● | ● | | | |
| 9 | 27.045 | 13.5225 | 26.590 | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● |
| 10 | 27.055 | 13.5275 | 26.600 | ● | | | ● | | ● | ● | | | |
| 11 | 27.065 | 13.5325 | 26.610 | ● | | | ● | | ● | ● | | | |
| 12 | 27.075 | 13.5375 | 26.620 | ● | | | ● | | ● | ● | | | |
| 13 | 27.085 | 13.5425 | 26.630 | ● | | | ● | | ● | ● | | | |
| 14 | 27.095 | 13.5475 | 26.640 | ● | ● | ● | ● | ● | ● | ● | ● | | ● |
| 15 | 27.105 | 13.5525 | 26.650 | ● | | | ● | | ● | ● | | | |
| 16 | 27.115 | 13.5575 | 26.660 | ● | | | ● | | ● | ● | | | |
| 17 | 27.125 | 13.5625 | 26.670 | ● | | | ● | | ● | ● | | | |
| 18 | 27.135 | 13.5675 | 26.680 | ● | | | ● | | ● | ● | | | |
| 19 | 27.145 | 13.5725 | 26.690 | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● |
| 24 | 27.195 | 13.5975 | 26.740 | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● |
| 30 | 27.255 | 13.6275 | 26.800 | ● | ● | ● | ● | ● | ● | ● | ● | | ● |

## Crystals for the 35 MHz band

| channel | transmitter frequency | Order No. 16 54 30 MHz | Order No. 16 5432 MHz | B | A | DK | E | F | FL | N | NL | S | CH |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 61 | 35.010 | 17.505 | 34.555 | ● | ● | ● | | | ● | ● | | | |
| 62 | 35.020 | 17.510 | 34.565 | ● | ● | ● | | | ● | ● | | | |
| 63 | 35.030 | 17.515 | 34.575 | ● | ● | ● | | | ● | ● | | | ● |
| 64 | 35.040 | 17.520 | 34.585 | ● | ● | ● | | | ● | ● | | | ● |
| 65 | 35.050 | 17.525 | 34.595 | ● | ● | ● | | | ● | ● | | | ● |
| 66 | 35.060 | 17.530 | 34.605 | ● | ● | ● | | | ● | ● | | | ● |
| 67 | 35.070 | 17.535 | 34.615 | ● | ● | ● | | | ● | ● | | | ● |
| 68 | 35.080 | 17.540 | 34.625 | ● | ● | ● | | | ● | ● | | | |
| 69 | 35.090 | 17.545 | 34.635 | ● | ● | ● | | | ● | ● | | | |
| 70 | 35.100 | 17.550 | 34.645 | ● | ● | ● | | | ● | ● | | | |
| 71 | 35.110 | 17.555 | 34.655 | ● | ● | ● | | | ● | ● | | | |
| 72 | 35.120 | 17.560 | 34.665 | ● | ● | ● | | | ● | ● | | | |
| 73 | 35.130 | 17.565 | 34.675 | ● | ● | ● | | | ● | ● | | | |
| 74 | 35.140 | 17.570 | 34.685 | ● | ● | ● | | | ● | ● | | | |
| 75 | 35.150 | 17.575 | 34.695 | ● | ● | ● | | | ● | ● | | | |
| 76 | 36.160 | 17.580 | 34.705 | ● | ● | ● | | | ● | ● | | | |
| 77 | 35.170 | 17.585 | 34.715 | ● | ● | ● | | | ● | ● | | | |
| 78 | 35.180 | 17.590 | 34.725 | ● | ● | ● | | | ● | ● | | | |
| 79 | 35.190 | 17.595 | 34.735 | ● | ● | ● | | | ● | ● | | | |
| 80 | 35.200 | 17.600 | 34.745 | ● | ● | ● | | | ● | ● | | | |

## Crtystals for the 40 MHz band

| channel | transmitter frequency | narrow-band transmitter crystal Order No. 16 5440/ch. | narrow-band receiver crystal Order No. 16 5442/ch. |
|---|---|---|---|
| 50 | 40.665 | 20.3325 | 40.210 |
| 51 | 40.675 | 20.3375 | 40.220 |
| 52 | 40.685 | 20.3425 | 40.230 |
| 53 | 40.695 | 20.3475 | 40.240 |
| 54 | 40.715 | 20.3575 | 40.260 |
| 55 | 40.725 | 20.3625 | 40.270 |
| 56 | 40.735 | 20.3675 | 40.280 |
| 57 | 40.765 | 20.3825 | 40.310 |
| 58 | 40.775 | 20.3875 | 40.320 |
| 59 | 40.785 | 20.3925 | 40.330 |
| 81 | 40.815 | 20.4075 | 40.360 |

| channel | transmitter frequency | narrow-band transmitter crystal Order No. 16 5440/ch. | narrow-band receiver crystal Order No. 16 5442/ch. |
|---|---|---|---|
| 82 | 40.825 | 20.4125 | 40.370 |
| 83 | 40.835 | 20.4175 | 40.380 |
| 84 | 40.865 | 20.4325 | 40.410 |
| 85 | 40.875 | 20.4375 | 40.420 |
| 86 | 40.885 | 20.4425 | 40.430 |
| 87 | 40.915 | 20.4575 | 40.460 |
| 88 | 40.925 | 20.4625 | 40.470 |
| 89 | 40.935 | 20.4675 | 40.480 |
| 90 | 40.965 | 20.4825 | 40.510 |
| 91 | 40.975 | 20.4875 | 40.520 |
| 92 | 40.985 | 20.4925 | 40.530 |