



# Operating Instructions

## Terra Top FMSS / PCMS

Terra Top FMSS 27	4/8/1	27 MHz	No. 8380
Terra Top FMSS 35	4/8/1	35 MHz	No. 8381
Terra Top FMSS 40	4/8/1	40 MHz	No. 8382
Terra Top PCMS/FMSS 35	4/8/1	35 MHz	No. 8385
Terra Top PCMS/FMSS 40	4/8/1	40 MHz	No. 8386



### Contents

	Page
<b>Using the equipment for the first time</b> .....	6
1 Special features, transmitter, receiver, servo .....	2
2 Terra Top FMSS/PCMS transmitter .....	2
3 External features on the front face .....	2
4 External features on the reverse face .....	2
5 Opening the transmitter case .....	2
6 Internal features .....	2
7 Throttle function, trim .....	2
8 Converting the throttle ratchet .....	2
9 Servo reversing, unrestricted channel sequence .....	3
10 Changing the transmitter RF module .....	3
11 "Soft-Stick" - adjustable spring tension .....	4
12 Adjustable length sticks .....	4
13 Installing the transmitter support bars .....	4
14 Installing the Teacher/Pupil module .....	4
15 Teacher/Pupil operation .....	5
16 Channel expansion modules .....	5
17 Installing the channel modules .....	6
18 Connecting the modules .....	6
19 Neutral position change-over, 1,3 - 1,5 ms .....	6
20 Transmitter power supply connections .....	6
21 Connecting the receiver power supply .....	6
22 Using the equipment for the first time .....	6
23 Installing the receiving system in the model .....	7
24 Servo mounting .....	7
25 Practical notes .....	7
26 Suppression .....	7
27 Installation of the control surface linkages .....	7
28 Operating times .....	7
29 Charging the batteries .....	7
30 Changing crystals .....	8
31 Post Office Regulations .....	8
32 Sample licence application .....	8
33 Specifications .....	8
34 Supplementary instructions for Terra Top FMSS/PCMS .....	8
35 Converting the transmitter to PCM operation .....	8
36 Using the PCM module .....	9
37 Notes on Failsafe and Hold Mode (PCM only) .....	9
38 Special notes regarding PCM operations: .....	9
39 Guarantee conditions .....	9/10
40 Expansion using NF option modules .....	10

### 1 Special features

#### Terra Top FMSS/PCMS transmitter

- Modern case design for secure grip
- Dual-axis stick units with electronic trim and centrepoint ratchet detent
- Adjustable length sticks
- Adjustable centring spring tension (Soft-Stick)
- Large, clear transmitter battery meter
- Interchangeable transmitter RF module with plug-in crystal
- Servo reverse on all channels
- Unrestricted channel sequence
- Extensible to 8 channels
- Integral charge socket for transmitter battery
- Transmitter battery compartment accepts packs up to 1.2 Ah capacity providing 8 - 10 hours' operation
- Removable, collapsible aerial
- Optional support bars
- Teacher-Pupil operation
- Switchable servo neutral position: 1,3 - 1,5 ms
- Wells for optional standard and super modules
- 3 module wells for extra channels or optional modules
- Can be converted to PCM operation with the PCM-Tx module, providing the following functions:
  - Hold-Mode for channels 1 - 7
  - Failsafe function on channel 8
  - Switch-selectable PCM / FM operation

#### FMSS-R 8 receiver

- Compact 8-channel receiver
- Externally accessible plug-in crystal
- 10 KHz channel spacing
- Connector system accepts all Robbe servos and motor controllers
- Great range
- High interference suppression

#### RS 200 servo

- Single-chip electronics for high start-up torque and precision
- Robust gearbox
- Special, rugged potentiometer with six-point wiper
- High torque: 35 Ncm
- Indirect drive system (decoupled potentiometer)
- Special output shaft bearing

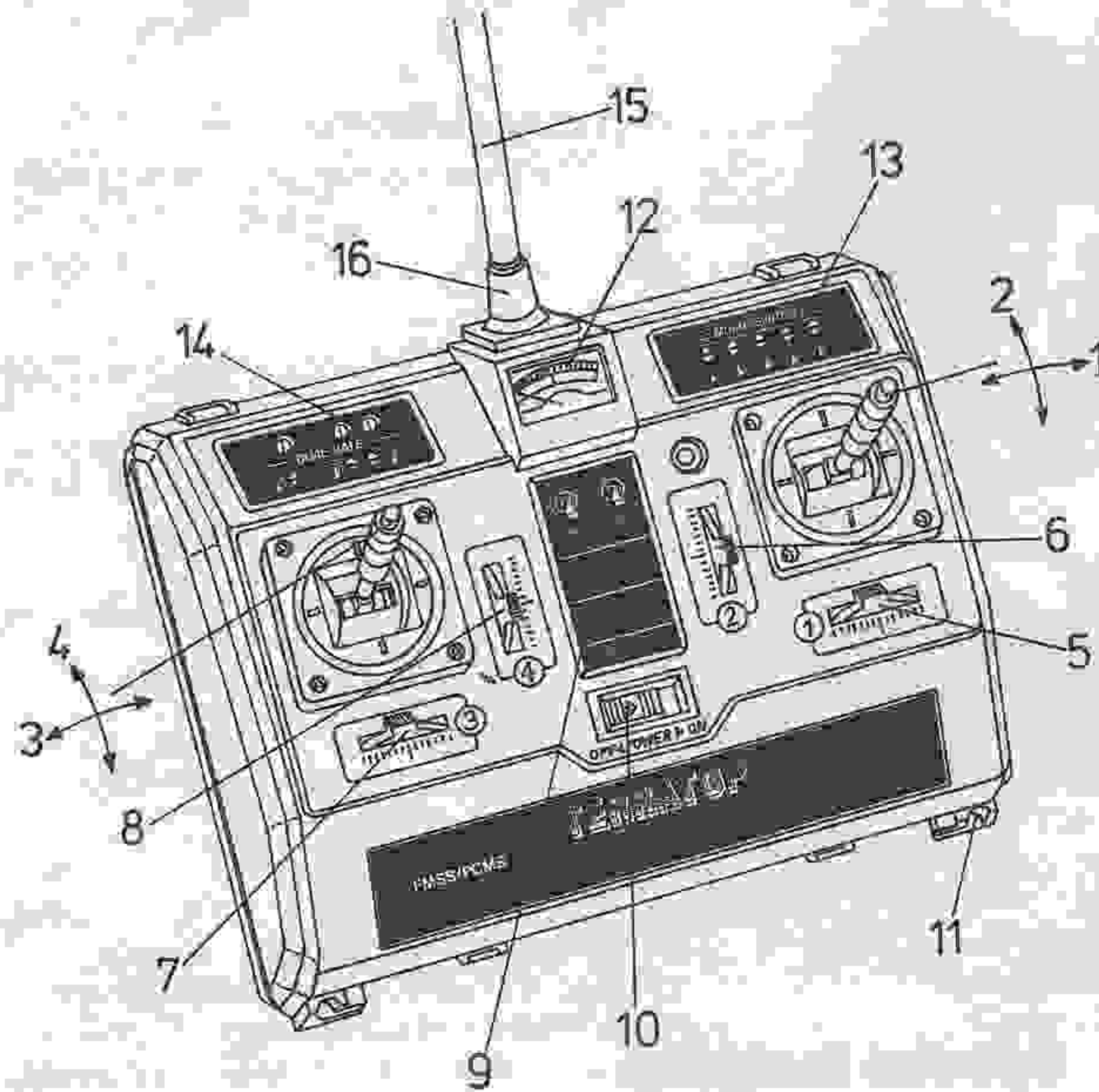


## 2 Terra Top FMSS/PCMS transmitter

The Robbe Terra Top is a thoroughly up-to-date radio control system built to the highest technical standards, both in terms of external design, mechanical components and electronics.

The elegant transmitter case is made of tough, fuel-proof plastic, and affords an excellent grip. The two dual-axis stick units are mounted in barrel-type shrouds, and each function possesses an electronic fine ratchet trim lever with centrepoint detent. The spring tension is adjustable separately for each of the four main stick functions (Soft-Stick). The sticks have minimal lost motion, even around neutral. The ON/OFF switch is set in a recess in the centre of the front plate to eliminate the danger of switching it on or off accidentally.

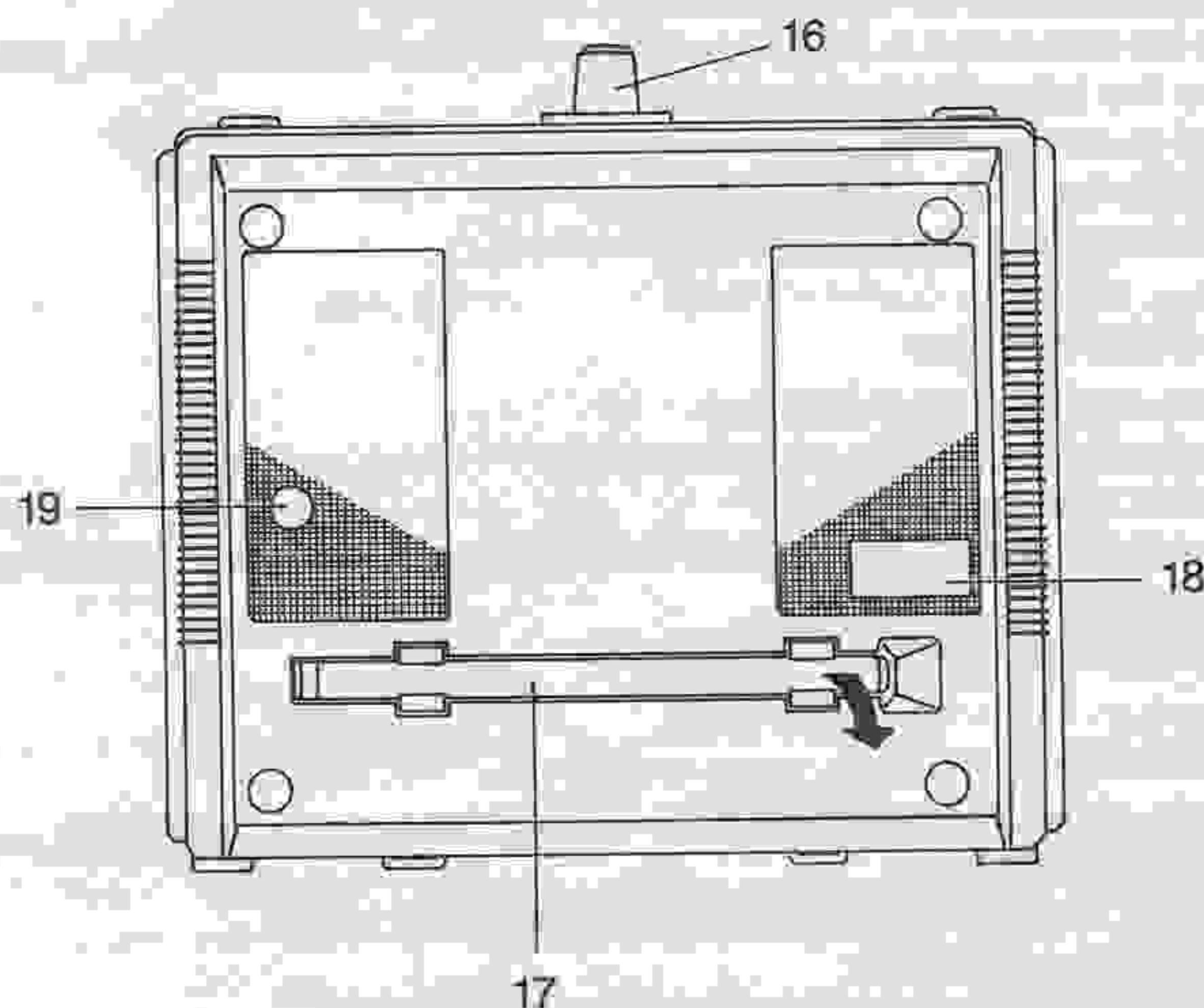
## 3 External features on the front face



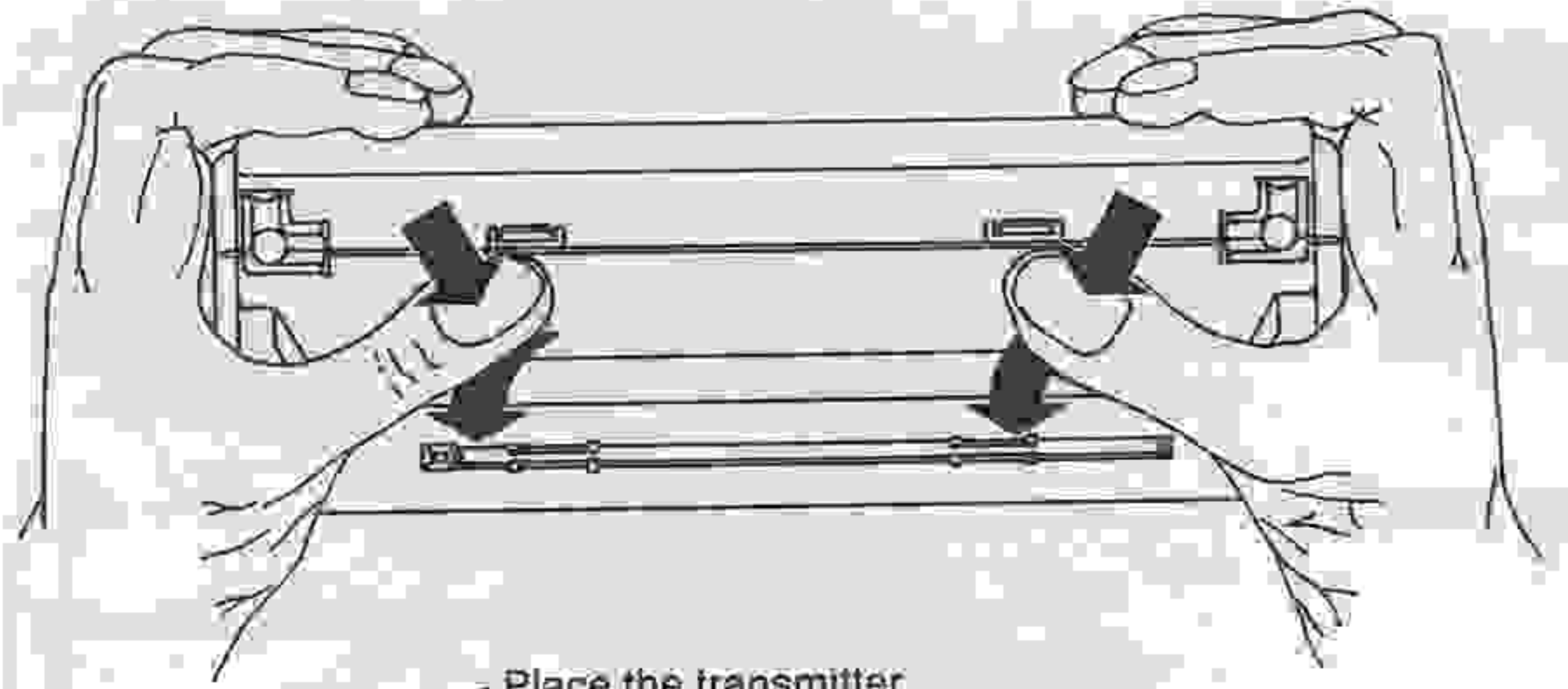
- |   |  |
|---|--|
| 1. Function 1 (rudder)                                | 10. ON/OFF switch                                    |
| 2. Function 2 (elevator)                              | 11. Transmitter support bar bracket                  |
| 3. Function 3 (aileron)                               | 12. Transmitter battery meter                        |
| 4. Function 4 (throttle)                              | 13. Option well 1, for mixer, Dual-Rates module etc. |
| 5. Trim for function 1                                | 15. Telescopic transmitter aerial                    |
| 6. Trim for function 2                                | 16. Transmitter aerial base                          |
| 7. Trim for function 3                                |  |
| 8. Trim for function 4                                |  |
| 9. Option well 3, for switched channel expansion etc. |  |

## 4 External features on the reverse face

- |                                       |
|---------------------------------------|
| 16. Transmitter aerial base           |
| 17. Aerial storage well               |
| 18. Transmitter battery charge socket |



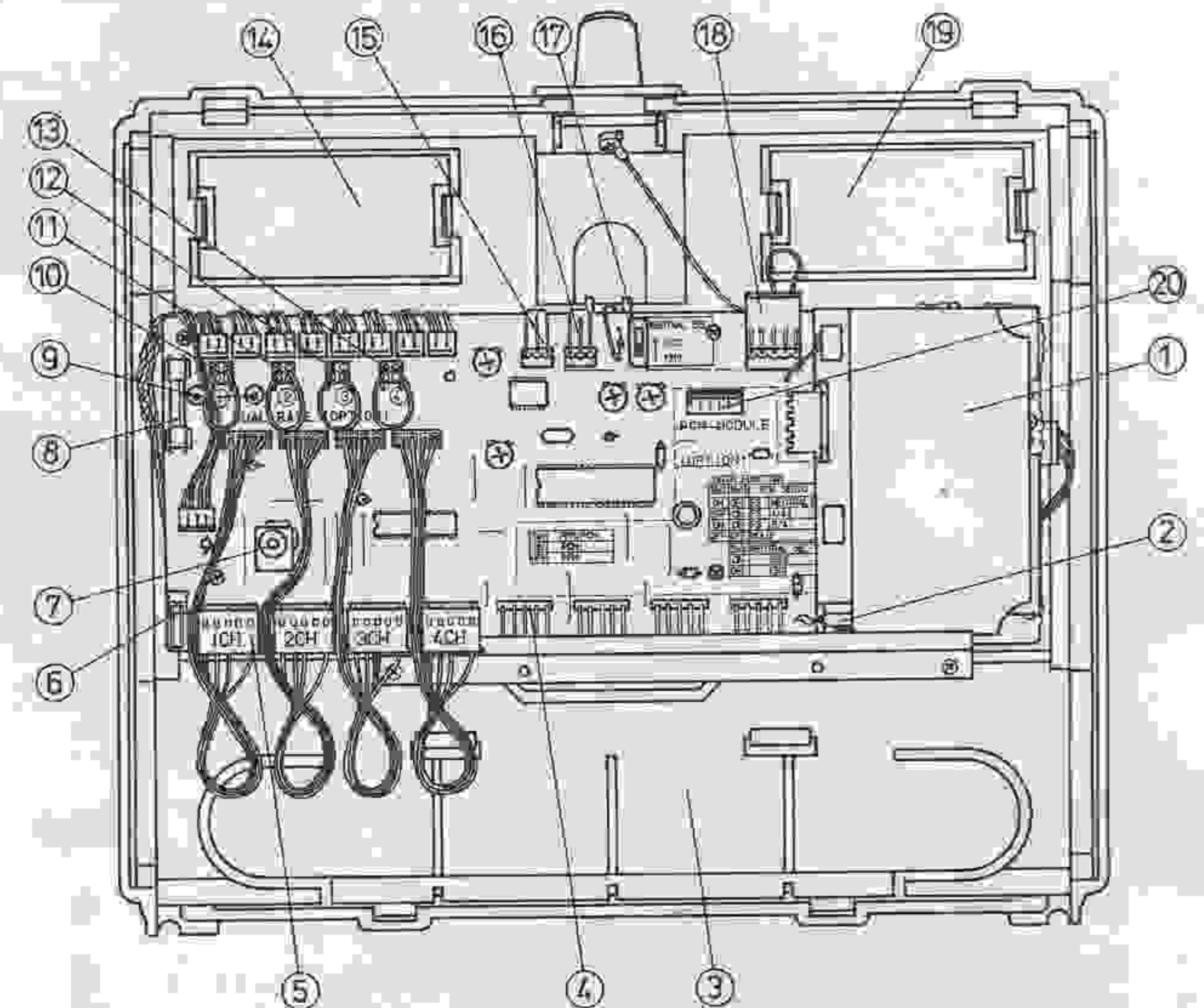
## 5 Opening the transmitter case



Place the transmitter on a firm surface

Press the back panel inward at the latch positions and lift it up and forward

## 6 Internal features



- |  |   |
|--|---|
| 1. Transmitter RF module, interchangeable                          | 12. Connector for Dual-Rate or PSW option, channel 3                            |
| 2. Interchangeable plug-in crystal                                 | 13. Connector for Dual-Rate or PSW option, channel 4                            |
| 3. Compartment for transmitter battery                             | 14. Option well 1 for extra modules   |
| 4. Connectors for optional extra channels 5 - 8                    | 15. Connector 1 for super-option modules  |
| 5. Connectors for stick unit channels 1 - 4                        | 16. Connector 2 for super-option modules  |
| 6. Connector for transmitter battery                               | 17. Servo neutral position selector switch: 1.3 / 1.5 ms                        |
| 7. Transmitter battery charge socket                               | 18. Connector for Teacher-Pupil operation and Multi-Switch / Multi-Prop systems |
| 8. Charge current fuse   | 19. Option well 2, for extra modules  |
| 9. Apertures for adjusting centring spring tension, channels 1 + 2 | 20. Connector for PCM Tx module, for converting to PCM operation                |
| 10. Connector for Dual-Rate or PSW option, channel 1               |   |
| 11. Connector for Dual-Rate or PSW option, channel 2               |   |

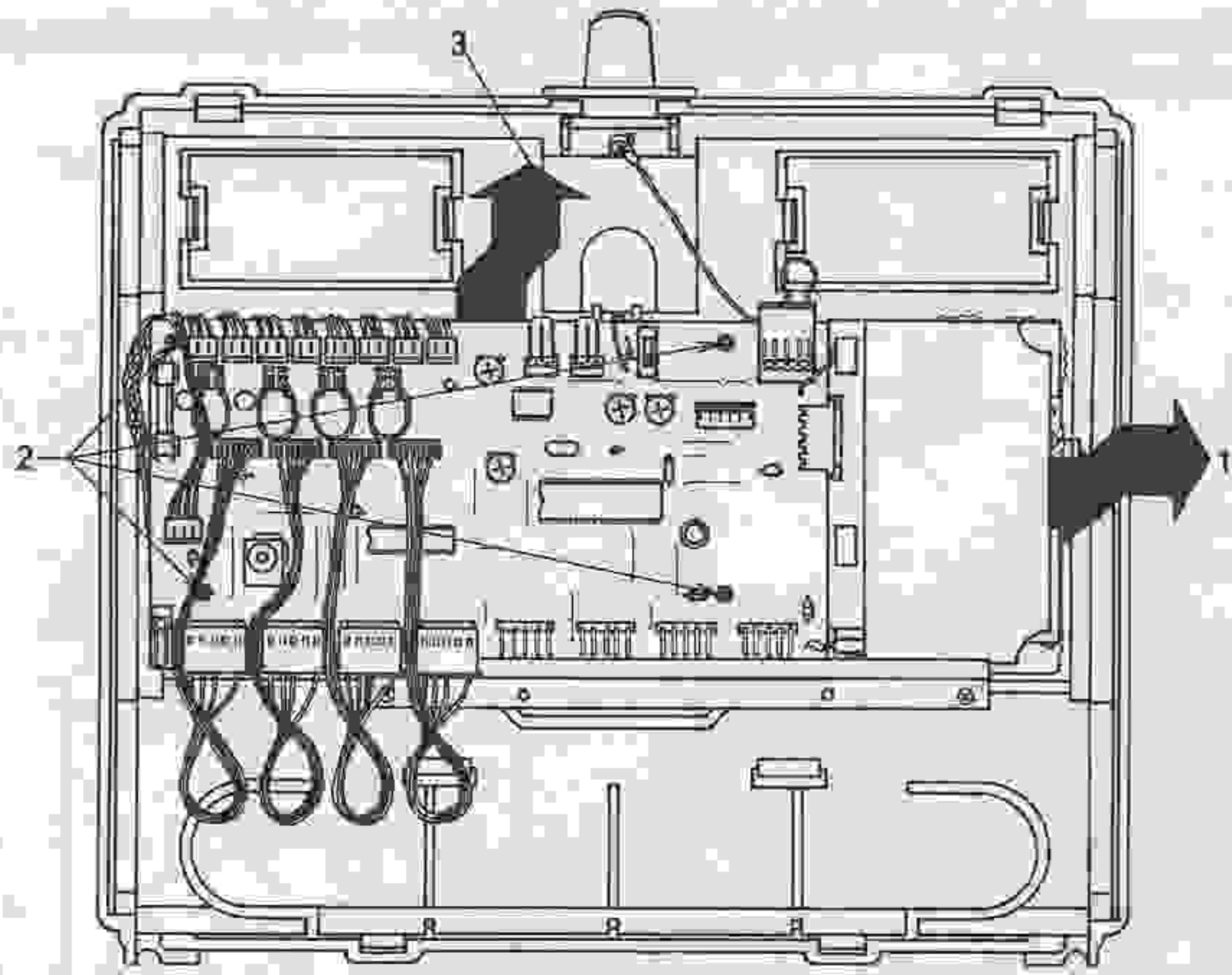
## 7 Throttle function, trim

The standard neutral position of sticks (1) - (3) is central. Channel (4) is not self-neutralizing; it is fitted with a ratchet for operation of the motor throttle. The ratchet can be shifted to channel (2) if you wish. Please follow the procedure shown in Fig. 2.

The trim levers (5) - (8) are used for fine adjustment of servo position after the servos and the mechanical linkages have been installed in the model. After the model's first test run the control surface linkages should be adjusted so that the trim levers can be moved back as close as possible to the centre position. This ensures that, if an alteration in the neutral position should occur during operations, the full trim range is still available to both sides of neutral. The ON/OFF switch (10) is used to switch the transmitter on and off. The meter (12) indicates the voltage of the transmitter battery once the unit is switched on. Above the meter you will find the aerial base into which the transmitter aerial is screwed. The aerial must be fully extended before using the set. It is stored in the well in the back of the transmitter case.

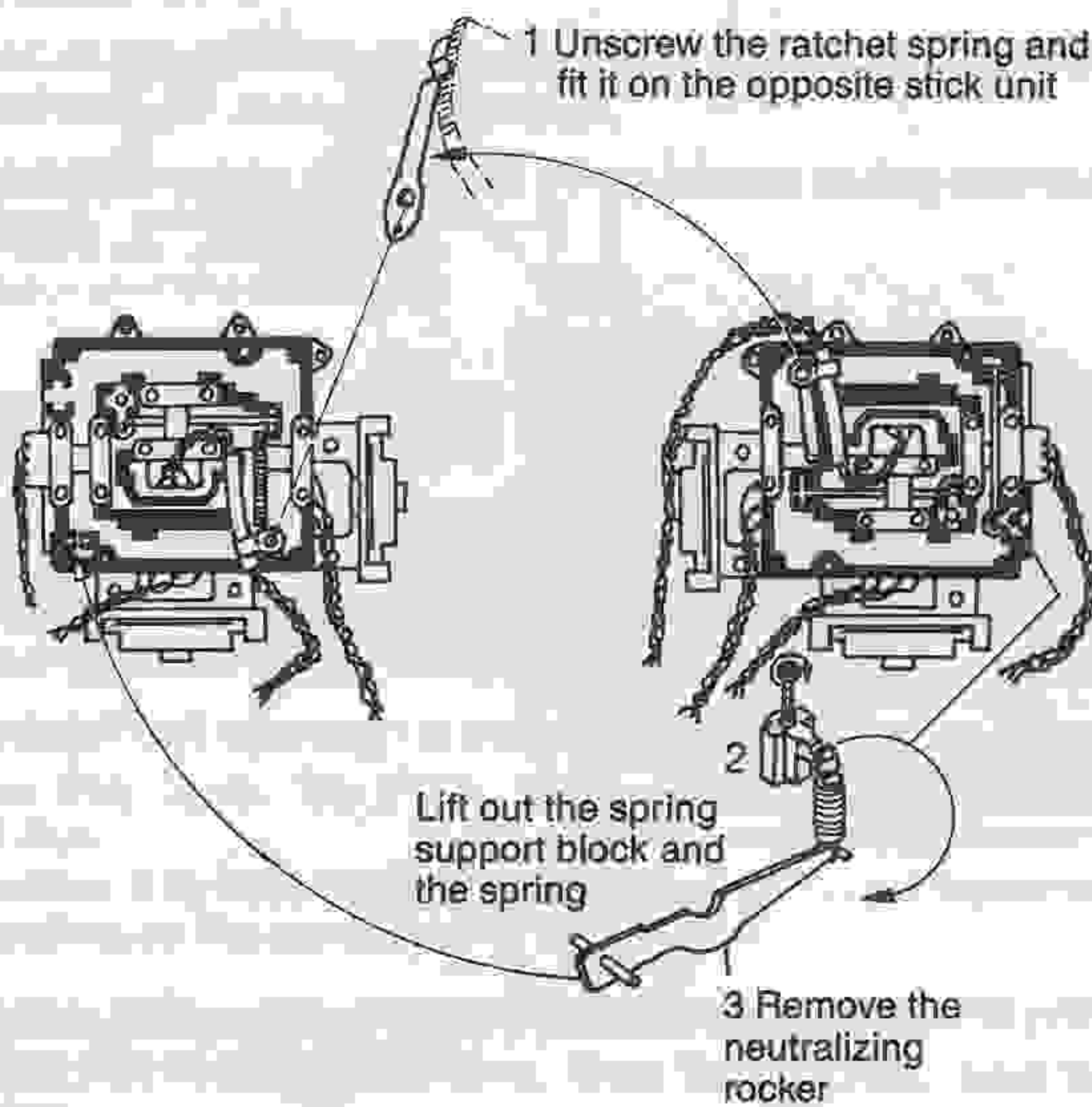


## 8 Converting the throttle ratchet

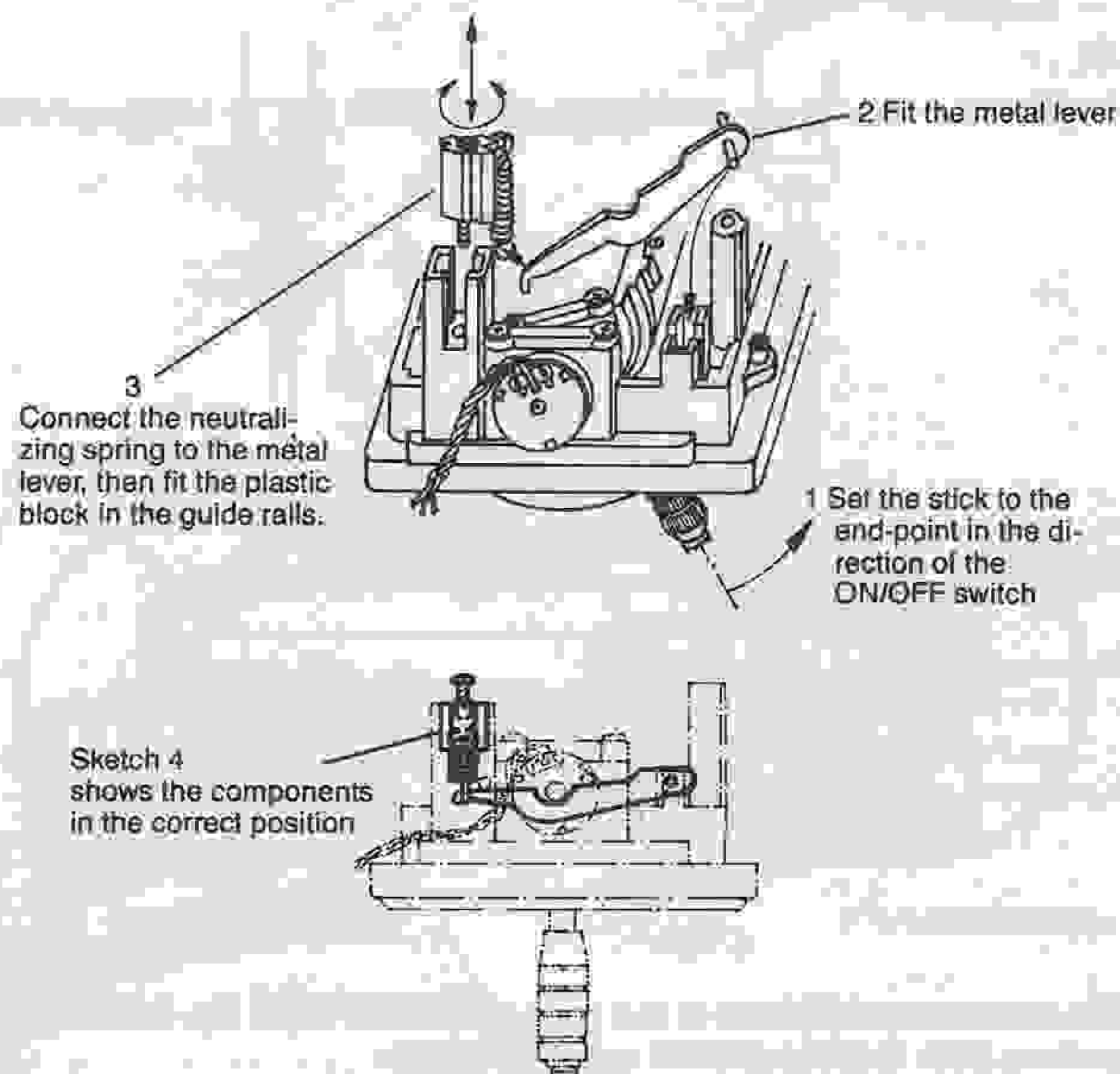


1. Raise the RF module on its right-hand outside edge slightly, and then lift it out in the direction of the arrow.
2. Undo the circuit board retaining screws 2.
3. Lift the circuit board out of the guide rails in the direction of the arrow.
  - Invert the circuit board, folding it up towards the aerial.
  - Convert the throttle (see below), then replace the circuit board in the guide rails.
  - Plug in the RF module; check that the latch engages.

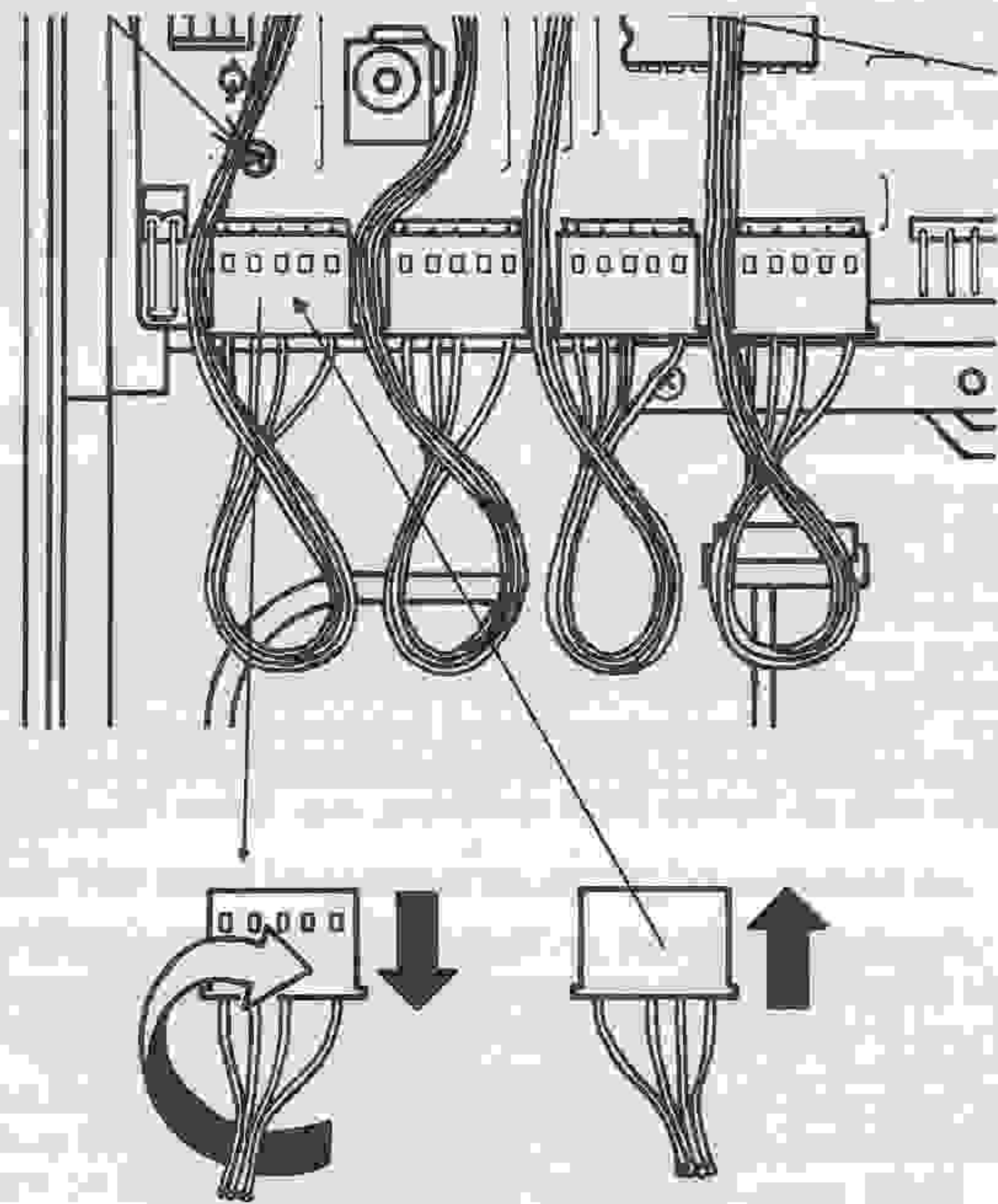
- a) Interchange the throttle ratchet and the neutralizing spring
- b) Please keep to the sequence 1 - 3



- c) Refitting the components just removed
- Please keep to the sequence 1 - 3



## 9 Servo reversing, unrestricted channel sequence



- Remove the channel plug, turn it through 180°, and plug it in again

As can be seen in Fig. 3, the stick units and the Terra Top channel extension modules are connected to the main circuit board by plugs and sockets. The Robbe Terra Top transmitter is designed to allow the servos for all functions to be reversed at the plug/socket connection. The appropriate channel plug is removed, turned through 180° and plugged in again on the same contacts. Each plug features a projecting lug on one side, which indicates whether that channel is reversed or not.

The standard arrangement of channel plugs in the transmitter corresponds to the standard sequence of outputs at the receiver.

If any channel plug is connected to the contacts marked "1" on the circuit board, then this function is available at the receiver from the output socket also marked "1". The same applies to channels 2, 3 and so on. The channel plugs are colour-coded to facilitate correct function selection.

### An example:

If you wish to control channel 4 (throttle, colour code yellow) via channel 8 (Failsafe - see Chapter 36), then the yellow plug must be interchanged with the plug for channel 8. The information for the throttle servo is now available from receiver output socket 8. Channel 8 is now available from receiver output 4. Thus any function can be transmitted via any of the channels 1 to 8.

The functions shown in Fig. 1 are colour-coded as follows (throttle left):

1 = rudder	= brown
2 = elevator	= red
3 = aileron	= orange
4 = throttle	= yellow

With the throttle on the right the colour code is as follows:

1 = aileron	= brown
2 = throttle	= red
3 = rudder	= orange
4 = elevator	= yellow

The switched channel extension module is colour-coded as follows:

5 = slider	= green
6 = slider	= blue
7 = switch	= white
8 = switch	= black

The numbers (1) - (8) indicate the sequence in which the functions are available at the receiver output socket block. We recommend that you keep to this standard sequence for your models - even though it is not strictly necessary - otherwise you may find yourself continually plugging in and removing servos at the receiver to find the correct output. It can be very convenient to install the servos in a model and afterwards change servo direction and channel sequence to suit, but normally it is better to keep to one standard arrangement to avoid confusion. This makes it much easier to swap the equipment from one model to another without having to change too many connections.



## 10 Changing the transmitter RF module

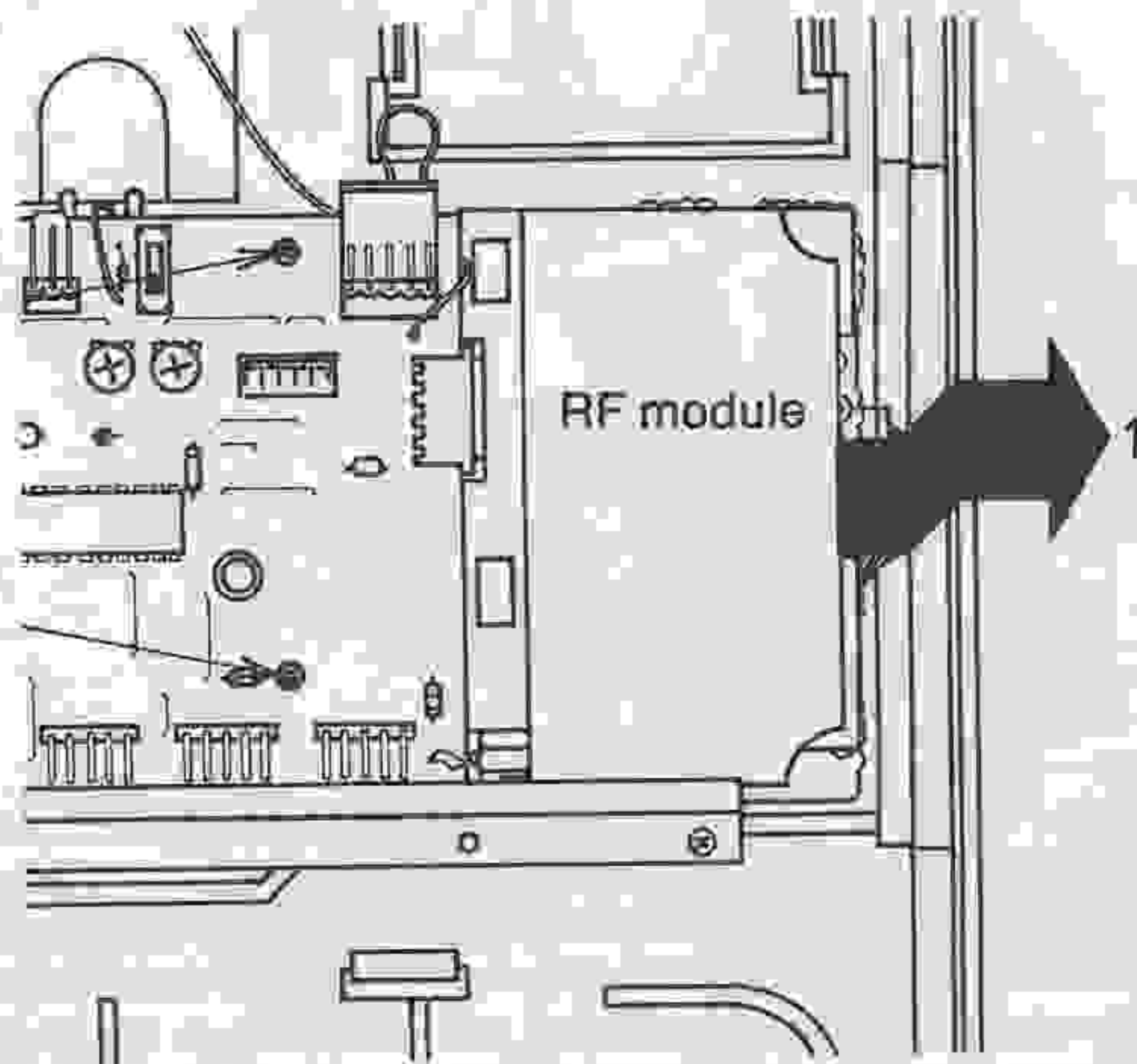
The Radio Frequency section (RF section) of the Terra Top transmitter takes the form of a module, which means that the transmitter can be converted to transmit on a different frequency band by changing the RF module.

The following RF modules (and thus frequency bands) are available:

- 27 MHz band PM 27 No. 8716
- 35 MHz band PM 35 No. 8717
- 40 MHz band PM 40 No. 8718
- 41 MHz band PM 41 No. 8719 (export only)

Please note that, in addition to the new transmitter RF module, a new receiver operating on the same frequency band is required. Equally important, the crystals for the transmitter module and the new receiver must carry the same channel number, otherwise the system will not work at all.

The Robbe Terra-Top FMSS/PCMS transmitter can be used in conjunction with all Robbe FMS receivers, e.g. Micro R7, FMSS R5.



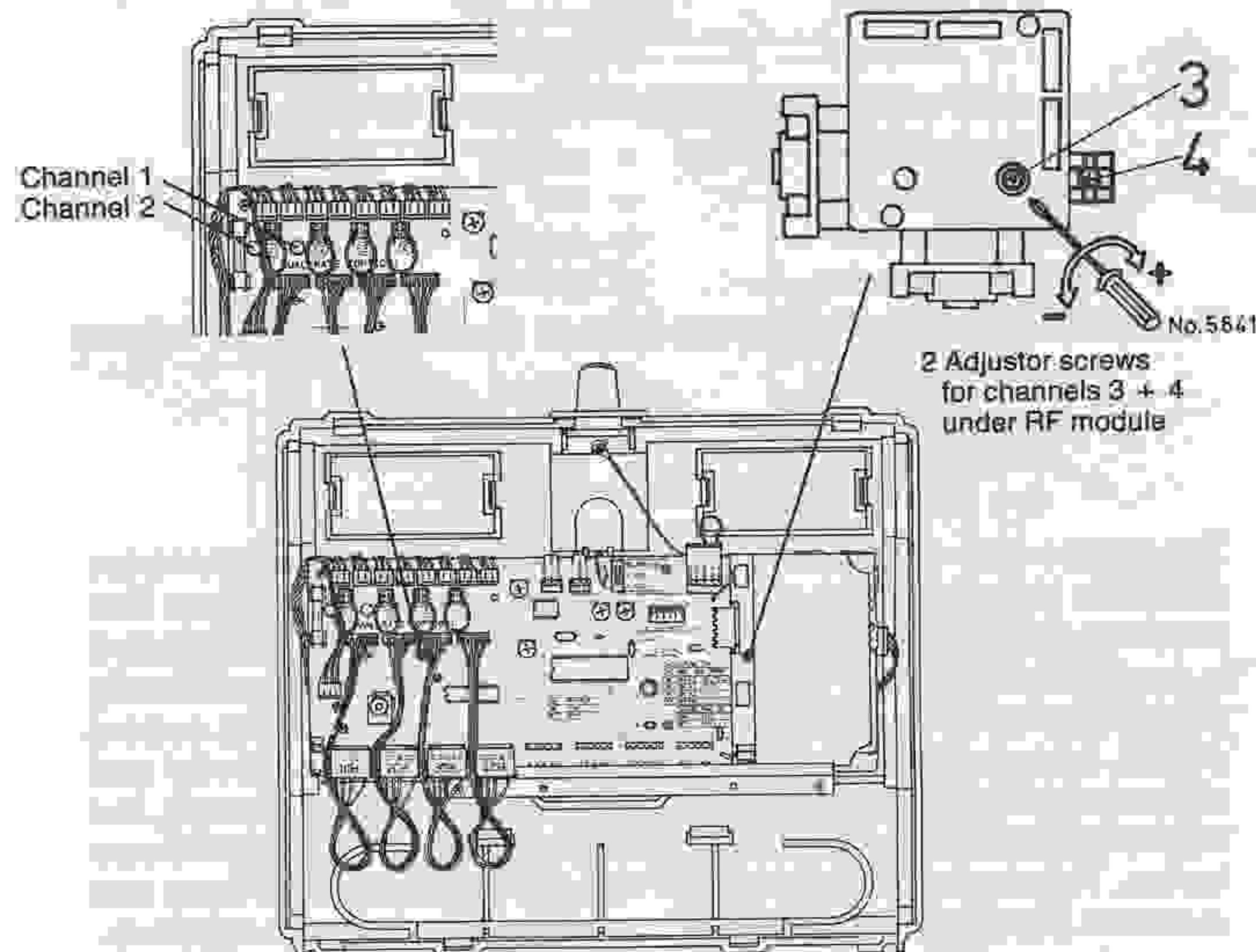
- Raise the right-hand edge of the RF module slightly
- Lift the module out in the direction of the arrow
- Note: Check that the latch engages when the new module is fitted

## 11 "Soft-Stick" - adjustable spring tension for the neutralizing springs

A special feature of the dual-axis stick units is the adjustable neutralizing springs, which can be reset as follows:

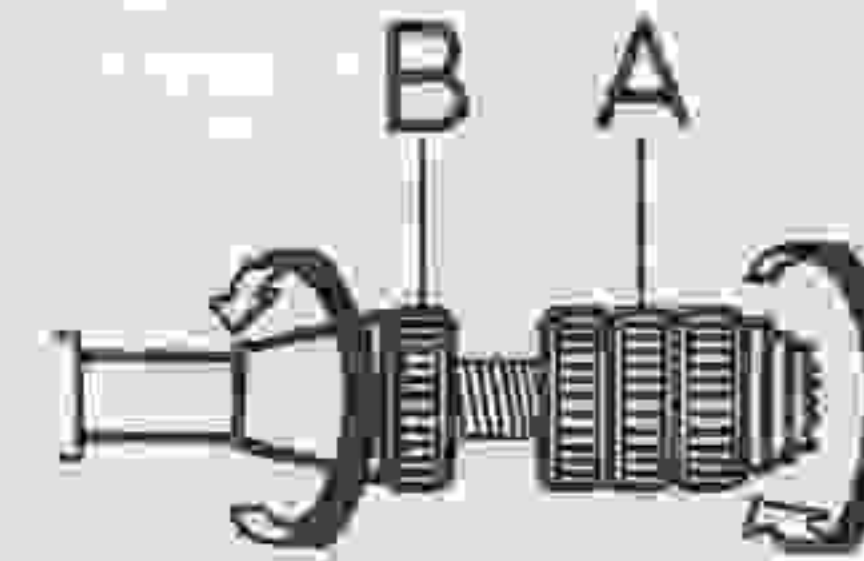
The spring tension can be set to any point between "soft" and "hard". To reset the tension, rotate the "Tension Adjust" screws. Rotating the screws clockwise increases spring tension, rotating them anti-clockwise decreases spring tension. The adjustor screws for functions 1 + 2 are reached through the apertures in the main circuit board.

The adjustor screws for functions 3 + 4 are accessible once the RF module has been removed.



## 12 Adjustable length sticks

Both sticks can be adjusted to any length within the adjustment range as described below:



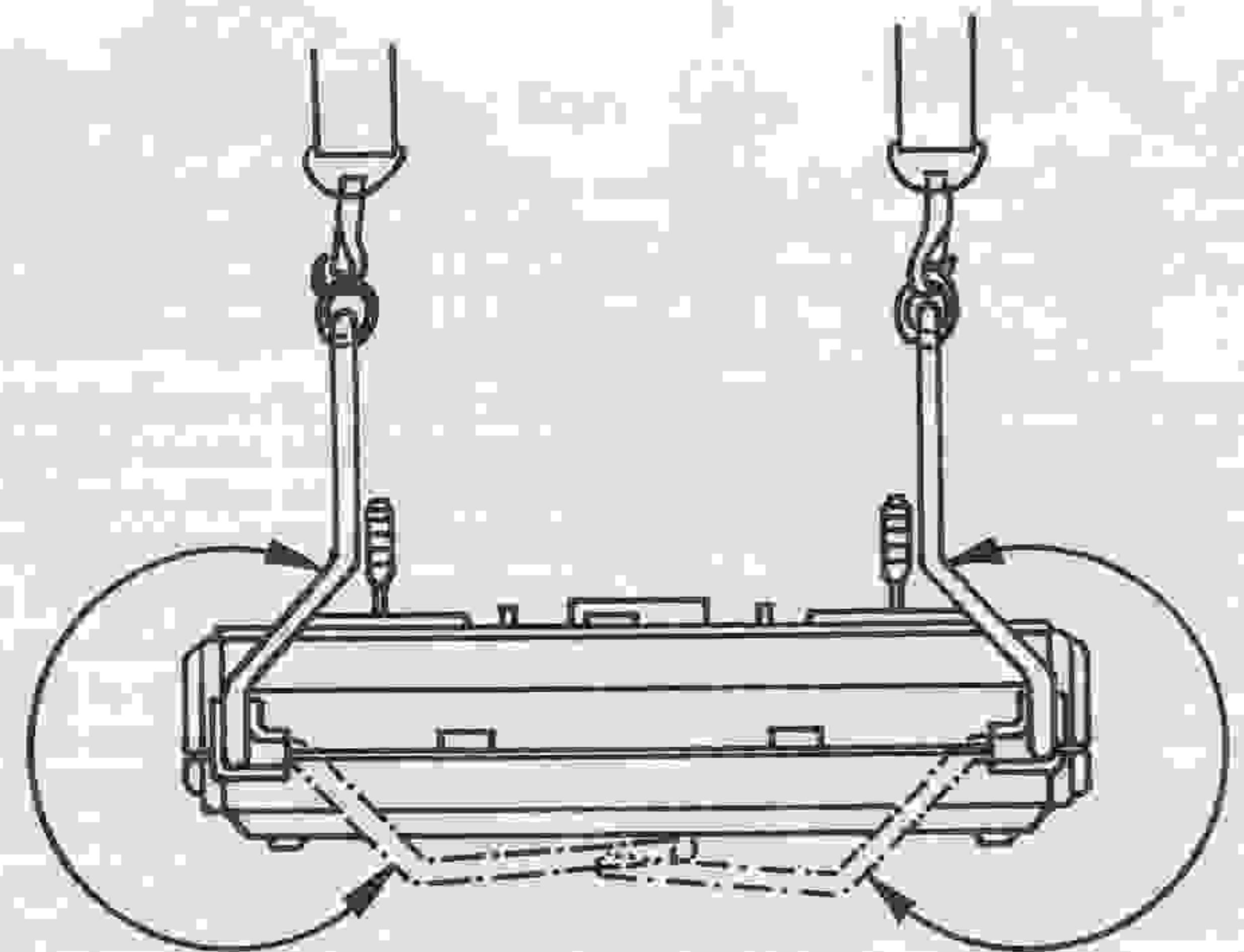
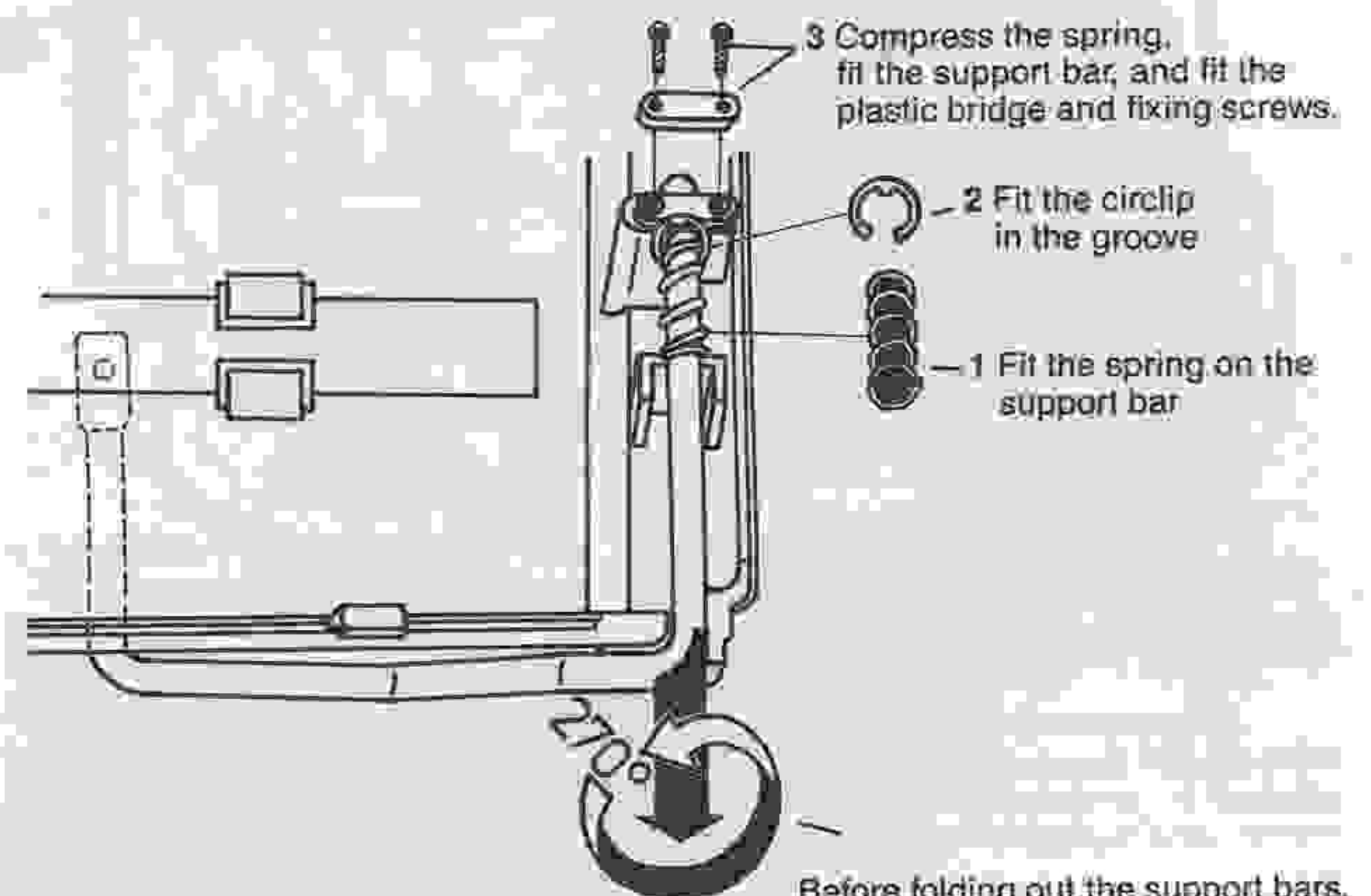
- 1) Loosen the locknut "A", then screw part "B" in or out to the required length
- 2) Tighten the locknut "A" against part "B".

## 13 Installing the transmitter support bars

A fully supported transmitter can improve fine control, and to this end the Terra Top transmitter can be fitted with support bars (No. 8074 or 8071) to accept the two-point neckstrap No. 8155.

### Installation

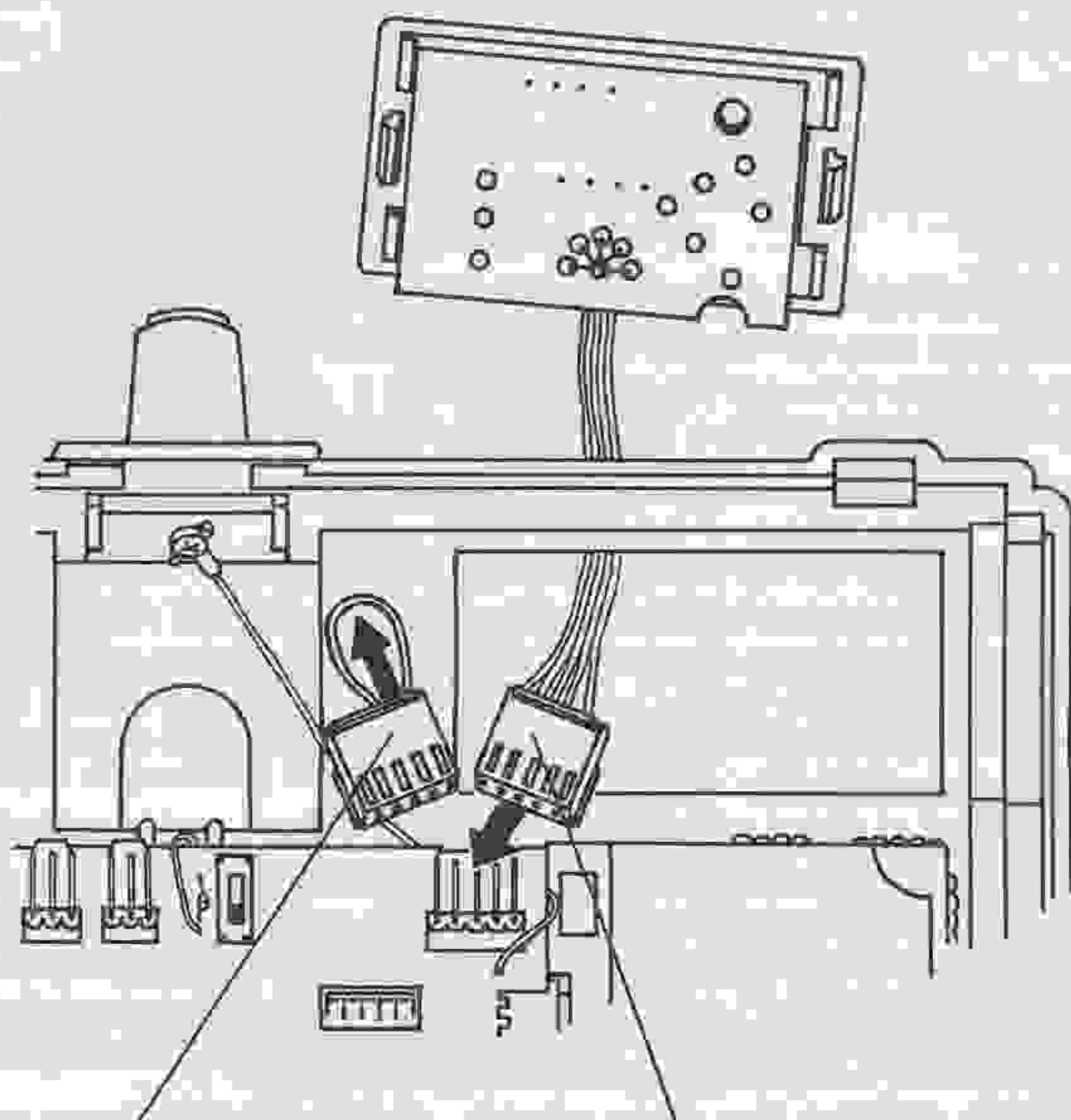
- Remove the transmitter case back panel
- Install the components, following the sequence 1 - 3, as shown below.



(We recommend the use of the stick extension units No. 8134 in conjunction with the transmitter support bars.)



## 14 Installing the Teacher/Pupil module



1 Remove the bridge plug

2 Plug in the module connector

Remove the transmitter back panel

Press out the blind cover from the option well 2 from the inside of the transmitter case.

**The L/S (Teacher/Pupil) module can only be installed in the right-hand well, as seen from the rear.**

Install the module, and press it gently into the casing until the latches engage.

## 15 Teacher/Pupil operation

Teacher/pupil operation is possible with two transmitters operating in the same mode (FMS or PCMS). Both transmitters must be fitted with a Teacher/Pupil module, which are interconnected with the Teacher/Pupil lead No. 8013.

Teacher/Pupil operation is possible with the following systems:

Terra FM, Terra Top FMS, Supra FMS, Supra PCM, Promars, CM-Rex.

**Caution:** It is essential that the teacher and pupil transmitters are operating on the same type of modulation.

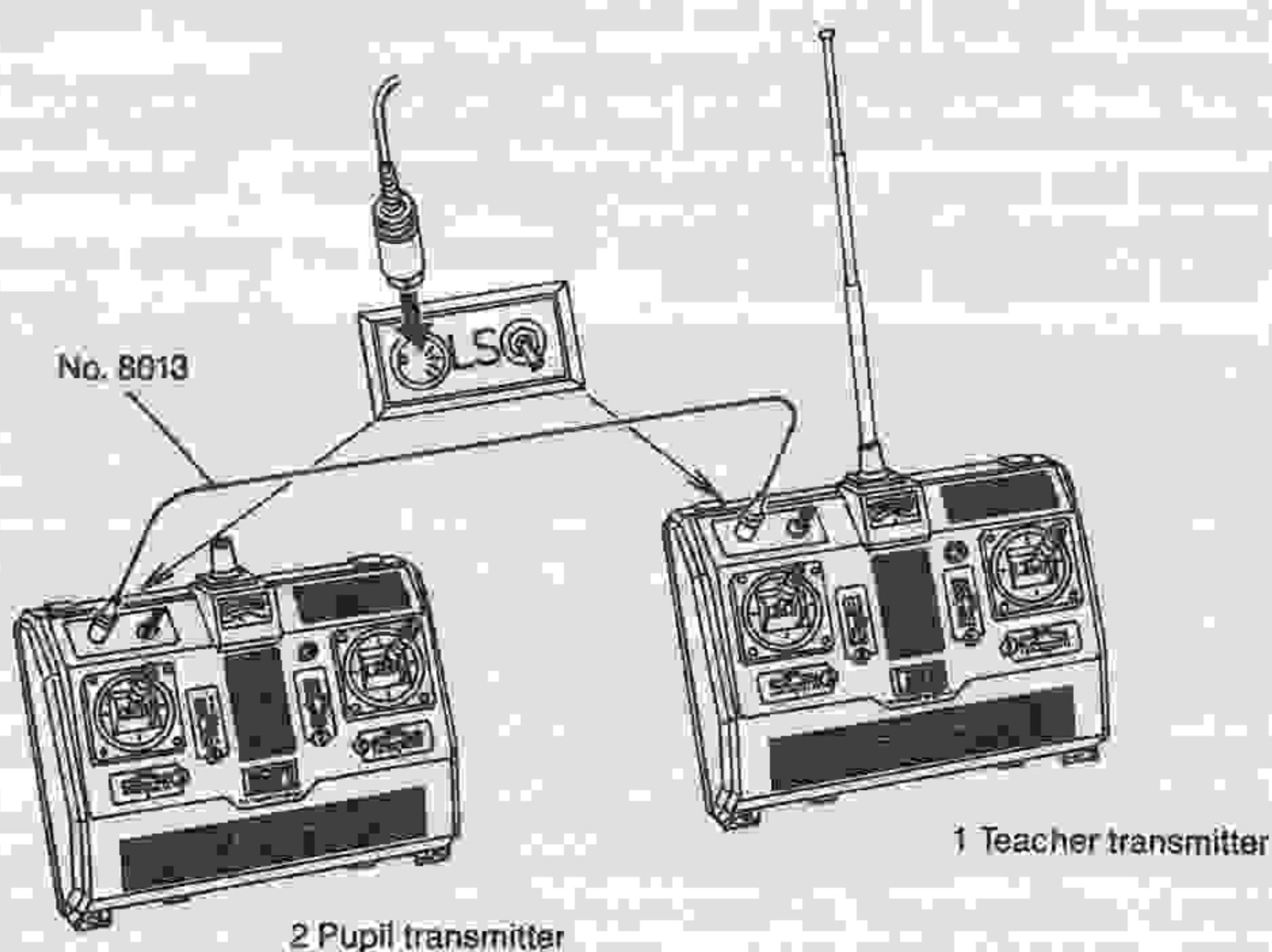
**Teacher transmitter FM (PPM) - Pupil transmitter FM (PPM)**

(Supra FM, Promars FM, Terra, Terra Top, CM Rex, Terra Top (new) FMSS)

**Teacher transmitter PCM - pupil transmitter PCM**

(Supra PCM, CM Rex, Terra Top new (with PCM Tx module))

### Arrangement of the teacher and pupil transmitters



## Important:

Please make absolutely sure that both transmitters are programmed identically before you attempt teacher/pupil operations, to avoid the danger of reversed or wrongly matched controls when the pupil assumes control.

One exception to this rule: it is possible for the one transmitter to be set up for throttle left, the other for throttle right, but even then it is essential to check that the throttle servo operates in the same direction.

## The system in use:

The Teacher transmitter must be fitted with an RF module on the same frequency band as the receiver in the model, and a crystal bearing the same channel number as the receiving system. In other words, a perfectly normal radio control system.

The Pupil transmitter needs neither an RF module nor a battery. However, teacher/pupil operations are still possible with an RF module and battery in the pupil transmitter, but the pupil transmitter must not be switched on.

**Essential: The pupil transmitter must not be switched on.**

With the Teacher transmitter switched on, the tutor can transfer control to the pupil's transmitter by operating the switch on the L/S module. This switches all control from the teacher's transmitter to his pupil.

When the switch is released it automatically returns to its original position, thus switching control back to the teacher's transmitter. The L/S switch on the pupil's transmitter is not used.

## Important:

The transfer switch on the teacher's transmitter must be held in the 'on' position all the time that the pupil has control.

## 16 Channel expansion modules:

The cover plates in the option wells 1-3 can be removed and replaced with a channel expansion module, which increases the number of channels from 4 to 6 or 8.

Three modules are available:

**Switched/Prop module No. 8965**

1 switched channel (3-position), 1 proportional channel (rotary lever)

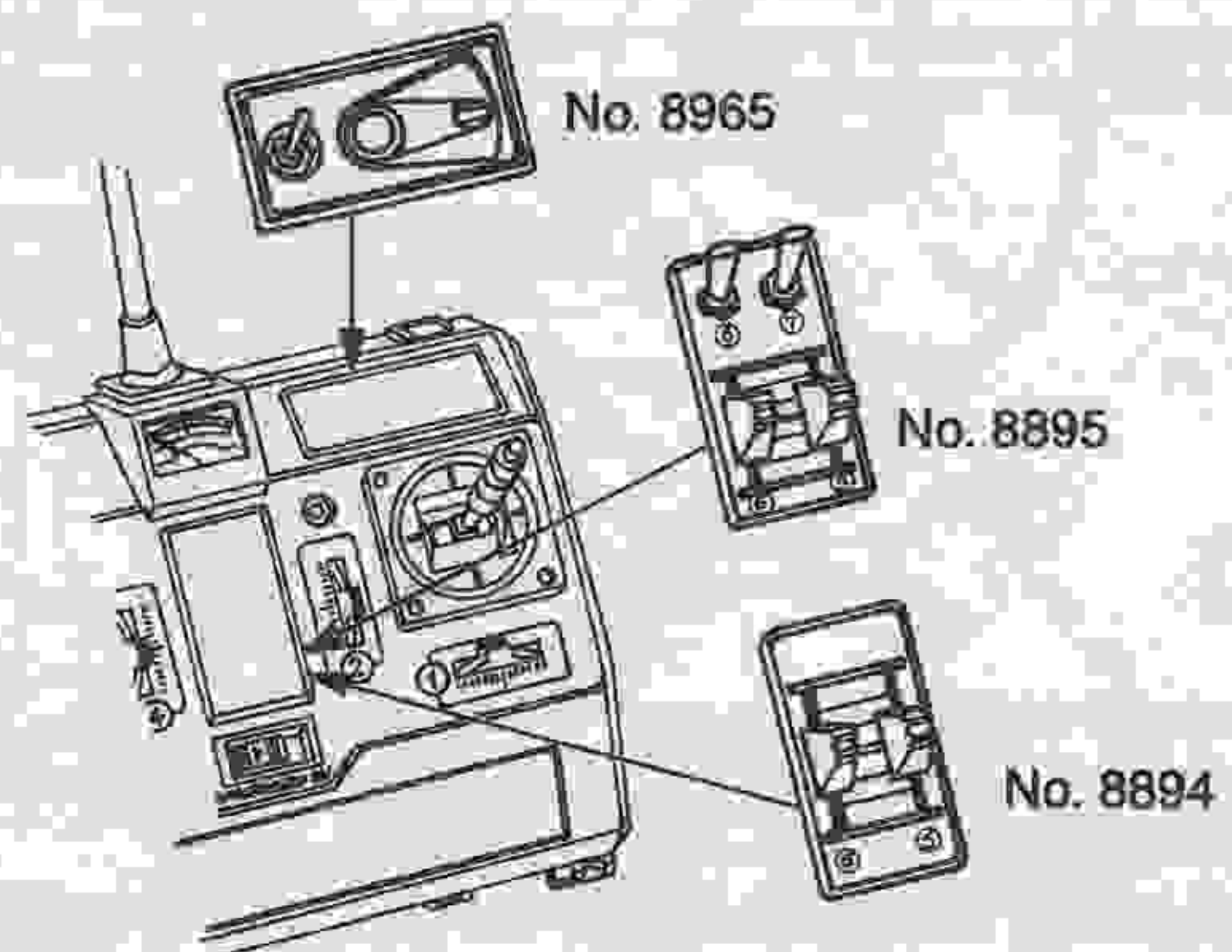
**NF-Prop module 2 channel, No. 8894**

2 proportional channels with linear sliders

**NF-Prop module 2 + 2 channels, No. 8895**

2 proportional channels with linear sliders and 2 switched channels (3-position)

The NF modules may be installed in any of the three option apertures, but the sliders should only be installed in the central aperture 3, so that both the upper option wells can still be used for further extra functions.





## 17 Installing the modules

Press out the blind cover plates from the option wells 1, 2 or 3 from the inside of the transmitter.

Fit the module into the well from the front of the transmitter, and press it in gently until the latches engage.

## 18 Connecting the modules

The sliders and switches are differentiated by colour-coded plugs:

Switched-Prop module	Rotary lever	= black plug
	Switch	= white plug
NF-Prop module, 2 channel	Slider 5	= white plug
	Slider 6	= black plug
NF-Prop module 2 + 2 channels	Slider 5	= green plug
	Slider 6	= blue plug
	Switch 7	= white plug
	Switch 8	= black plug

The NF module connectors are plugged into the contacts on the main circuit board marked 5CH - 8CH (see also Chapter 3 & 4: "Unrestricted channel sequence").

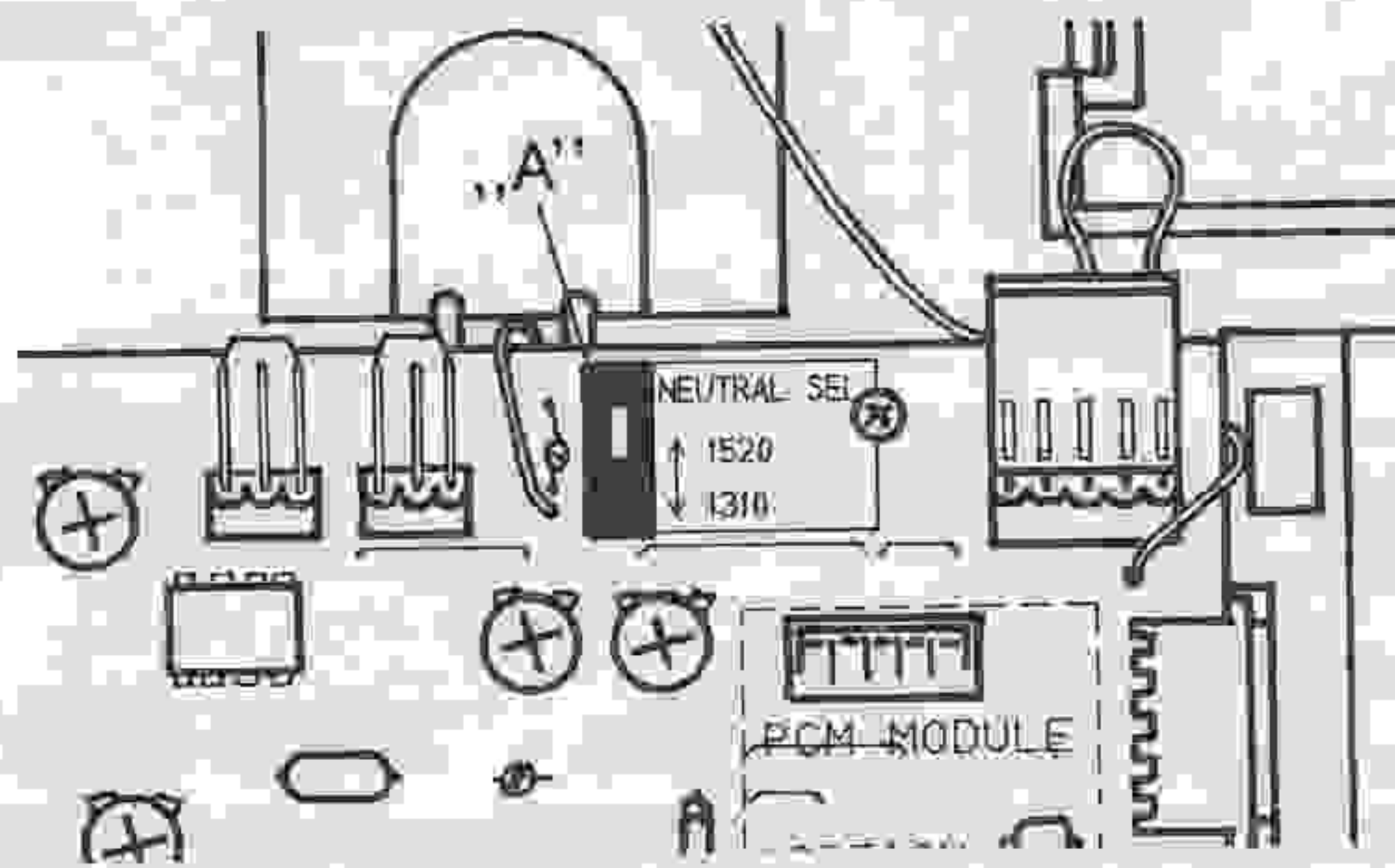
## 19 Neutral position change-over, 1.3 - 1.5 ms

For FM operation the servo neutral position can be switched between 1520  $\mu$ s (1.5 ms) and 1310  $\mu$ s (1.3 ms). To change the setting, simply operate the "Neutral" switch on the main circuit board.

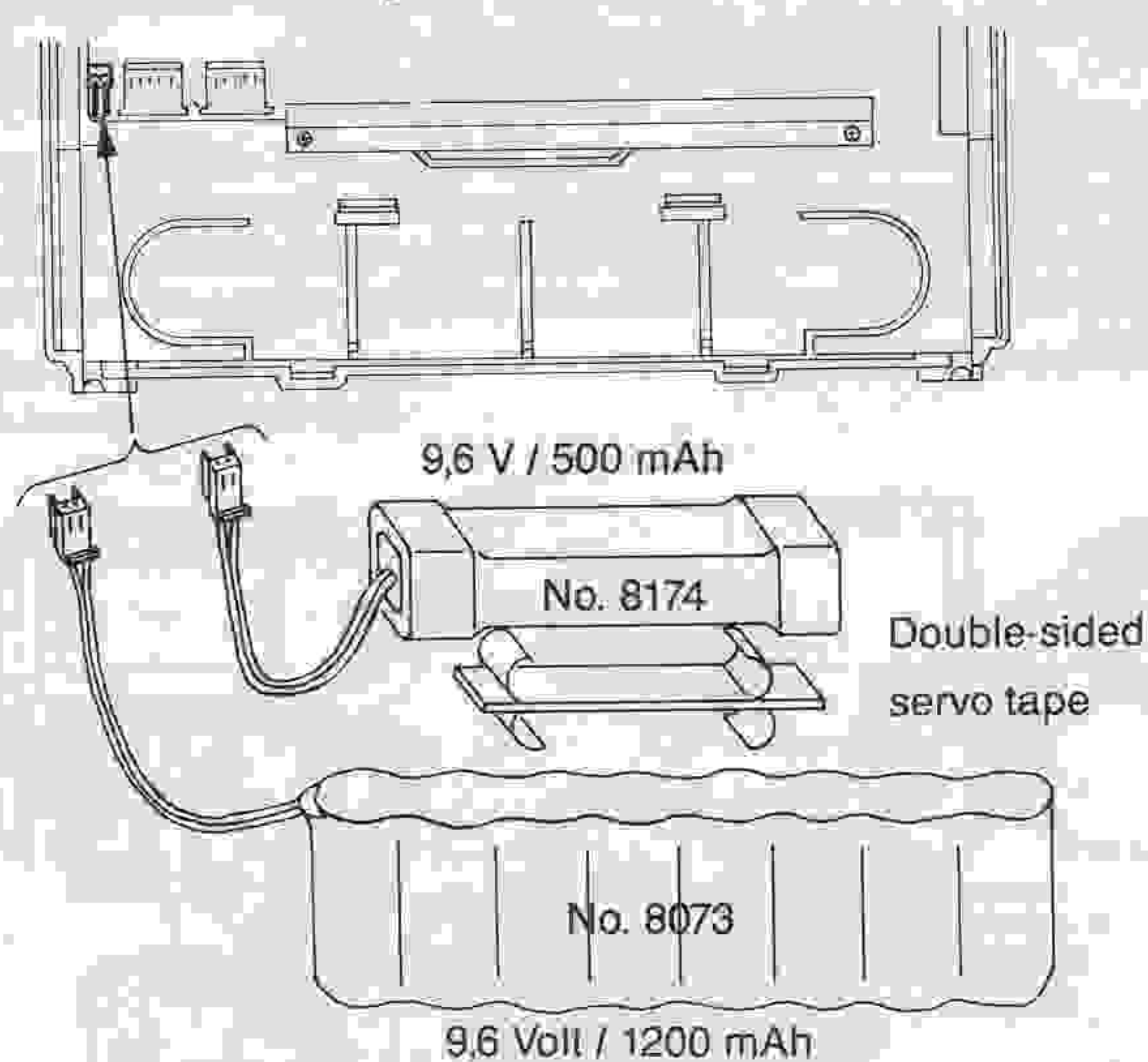
The servos included with the equipment are set to 1.5 ms neutral position.

Switching to 1.3 ms is only necessary if the transmitter is operated with older servos (pre-1986).

In the long term it is preferable to convert all your servos to the new neutral position timing (1.5 ms), to avoid constantly altering the switch.



## 20 Transmitter power supply connections



- Remove the transmitter back panel (Fig. 1c)
- The battery compartment is designed to accept three different sizes of battery:
  - 1 Seven dry cells (pencells - UM3 or similar) can be fitted in the battery box supplied;
  - 2 The battery box can be replaced by a 9.6 V/500 mAh NC battery (No. 8174), which provides about 2 - 3 hours' operation;
  - 3 A 9.6 V/1200 mAh battery (No. 8073) can be installed, which provides about 6 - 8 hours' operation.

The 500 mAh battery is fixed in the battery compartment using double-sided foam tape (servo tape), while the 1200 mAh battery is installed on edge in the compartment and held in place by the back panel.

With the battery installed, switch the transmitter on and observe the meter.

- Meter needle in silver area: Dry cells or NC pack correctly connected
- Meter needle does not deflect: Switch off immediately and check battery for correct polarity; charge up NC pack.
- Meter needle in red area: Dry cells discharged; replace with new cells. Recharge discharged NC pack.

Please see Chapter 29 for notes on charging batteries.

## 21 Connecting the receiver power supply

The battery box supplied with the set accepts four dry cells of pencil size (UM3 or equivalent).

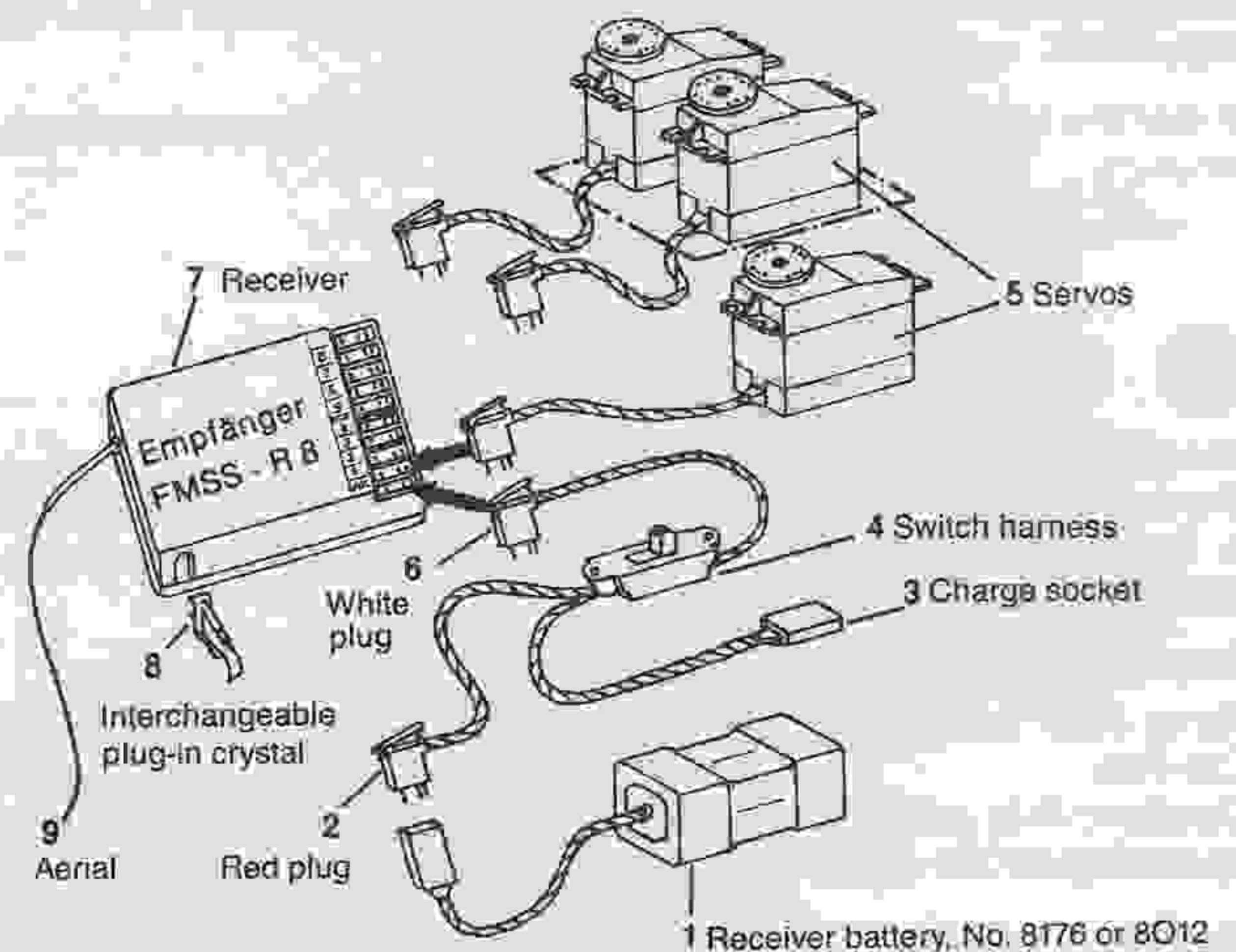
Unscrew the front end of the battery box using a screwdriver or coin. The dry cells must be installed with correct polarity - please observe the markings on the battery box. The positive terminal of the cells must correspond to the positions in the battery box marked "+".

When screwing the battery box back together, take care that the guide lugs of the two halves engage correctly.

Connect the battery box to the switch harness, and the switch harness to the receiver. The white plug on the switch harness is plugged into the receiver socket marked "AK", and the red plug into the red socket on the battery box lead.

We recommend the use of our factory-assembled battery packs, e.g. No. 8174 (4.8 V/500 mAh) or No. 8012 (4.8 V/1200 mAh).

**Note:** A nickel-cadmium pack is essential when using the equipment in PCM mode.



## 22 Using the equipment for the first time

- First install the receiver and transmitter power supplies as already described.
  - Connect the white plug on the switch harness to the receiver socket marked "AK", with the lead pointing away from the receiver.
  - Connect the red plug to the red socket on the battery box lead (check plug polarity with the guide lug).
  - Connect the servo supplied to receiver output socket "1".
- Keep to the correct sequence of switching on!**
- First switch the transmitter on,
  - Then switch the receiver on.

If you have connected up the equipment exactly as described above, the servo will now run to the position which corresponds to the setting of the right-hand transmitter stick. When the stick is moved from side to side, the servo will follow the movement.

At very close range the equipment will operate without the transmitter aerial fitted, but at any greater distance the transmitter aerial must be screwed in place and extended fully. The flexible wire receiver aerial must also be unwound.

- Keep to the correct sequence of switching off!**
- First switch the receiver off,
  - Then switch the transmitter off.



## 23 Installing the receiving system in the model

The 100 cm. long flexible wire aerial is permanently attached to the receiver, and may not be shortened or lengthened.

The aerial should be extended in a straight line, and as far as possible away from electric motors, servos, metal pushrods or power supply conductors.

In model aircraft the aerial should be led out of the fuselage by the most direct route, and tensioned to the fin tip (not forgetting some form of strain relief). If the aerial is longer than the distance to the fin, simply leave the excess wire hanging freely.

Any reduction in aerial length will reduce effective radio range.

### Note regarding carbon fibre fuselages (CFRP)

As carbon fibre has a tendency to screen or suppress radio frequency signals, we recommend that the receiver aerial should not be deployed inside the fuselage, nor attached to the outside parallel to it.

### Note regarding servo extension leads

The use of extremely long servo extension leads in large models, or in conjunction with several servo leads in the wing (e.g. for separate ailerons and camber-changing flaps) can result in problems with the receiver, as they tend to act as an aerial for interference signals. For this reason it is essential to use genuine Robbe spiral-wound servo extension leads and Robbe servos, which offer very low resistance.

**As an additional check, please carry out a range check on the ground before the first flight.** If the installation is correct, radio range should be about 80 - 100 m. with the transmitter aerial fitted, but completely collapsed. If this is not the case, check over your installation, or contact the Robbe Service Centre.

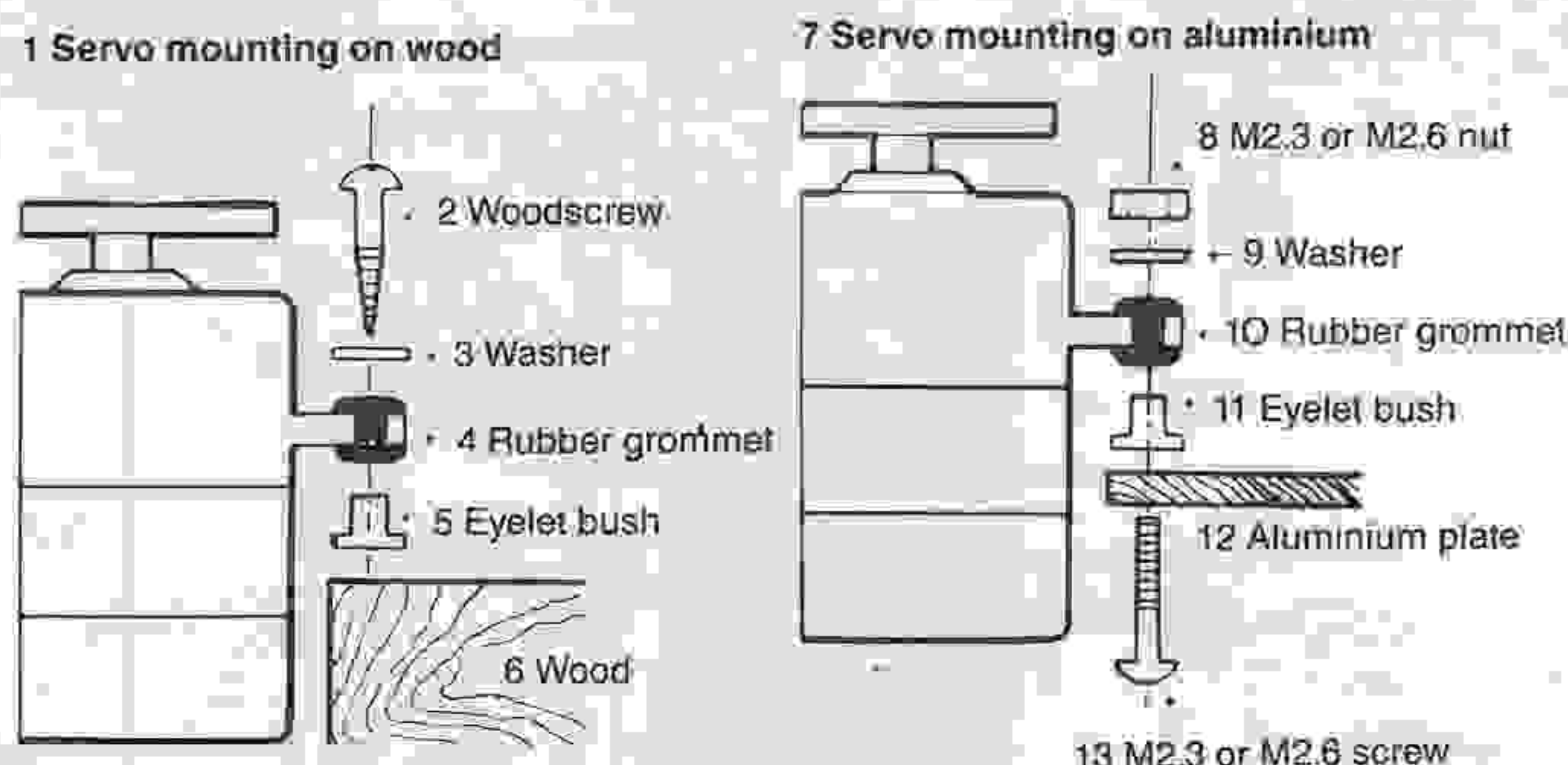
## 24 Servo mounting

We recommend that you use Robbe quick-release servo mounts when installing the servos in a model. The rubber grommets supplied with each servo should be pressed into the recesses in the servo mounting lugs, and then the servo fitted into the mount. The grommets act as a guard against vibration damage.

**Robbe quick-release servo mounts offer the following advantages:**

- rapid fitting and removal when moving servos from model to model;
- easy installation of the mount;
- optimum vibration damping.

In models where vibration levels are low the servos can be mounted as shown below, using the rubber grommets supplied together with fixing screws.



## 25 Practical notes

If the movement of the servos slows down perceptibly, or if the transmitter meter needle enters the red area, cease operations at once and charge up the batteries.

Always extend the transmitter aerial fully before controlling the model.

The field strength produced by the transmitter is at a minimum in a straight line formed by the imaginary extension of the transmitter aerial; for this reason it is fundamentally **incorrect to point the transmitter aerial directly at the model** in an attempt to obtain ideal reception conditions. When several radio control systems are operated simultaneously on closely-spaced channels, the operators or pilots **should always stand together in a group**. Any pilot who insists on standing well off to one side endangers his own model as well as those of his colleagues.

In model boats the receiving system should be installed in such a way that the receiver and its aerial are located as far as possible away from electric motors and other metal components. We recommend a steel whip aerial about 80 cm. long. Whip aeriels have also proved ideal for use in RC model cars. We recommend our whip aerial No. 3355.

## 26 Suppression

To avoid "noise" interference metal parts in the control linkages must not touch each other. Use plastic quicklinks for the throttle linkage. If a metal-to-metal connection is unavoidable, connect the two parts electrically by soldering a flexible earthing strap between them.

All electric motors used in a radio-controlled model must be individually suppressed in order for the radio to operate reliably, as all such motors produce spark interference between the commutator and the carbon brushes, which can affect operation of the system.

For this reason we strongly recommend the use of suppressors on all electric motors used in an RC model, e.g. our suppressor filters Order No. 8306 or our suppressor set Order No. 4008. Each motor must be separately suppressed.

## 27 Installation of the control surface linkages

Mechanical systems should be designed and installed with the aim of providing smooth, free-moving linkages with minimum lost motion. Stiff linkages and control surfaces mean excessive current consumption, reduced operating times, and reduced overall system accuracy.

It is especially important that each servo output arm is able to move to its full extent, that is, that the linkage should not obstruct the servo at any point. Bear this point in mind when checking the holes in the fuselage through which pushrods run, and the fitting of control surface hinges.

This point is of particular importance with regard to the throttle linkage. The "full throttle" setting must be determined by the stick position, and not by the throttle itself hitting its end-stop, otherwise the throttle servo will be almost constantly under full load. The stalled servo then consumes a very high current, and the receiver battery will be flattened unnecessarily quickly.

The same applies to the idle setting.

## 28 Operating times

When the transmitter battery (500 mAh) is fully charged the transmitter offers an operating period of about 3 hours. The same applies to the receiver battery, but in this case the operating period varies widely according to the number of servos connected, the friction in the control linkages, and the frequency of commands. An average operating period is around 2 hours, depending on the number of servos. When a servo's motor is running it consumes between 150 and 600 mA, but only about 5 - 8 mA when stationary.

Once the servo has reached the position corresponding to the stick setting, the motor is switched off and the servo current drops again to about 5 - 8 mA only (idle current). This is true whether the servo is at neutral, one end-point, or any point in between.

For this reason please take care to make your control surface linkages as free-moving as possible, and check that the servo is not obstructed in its movement.

## 29 Charging the batteries

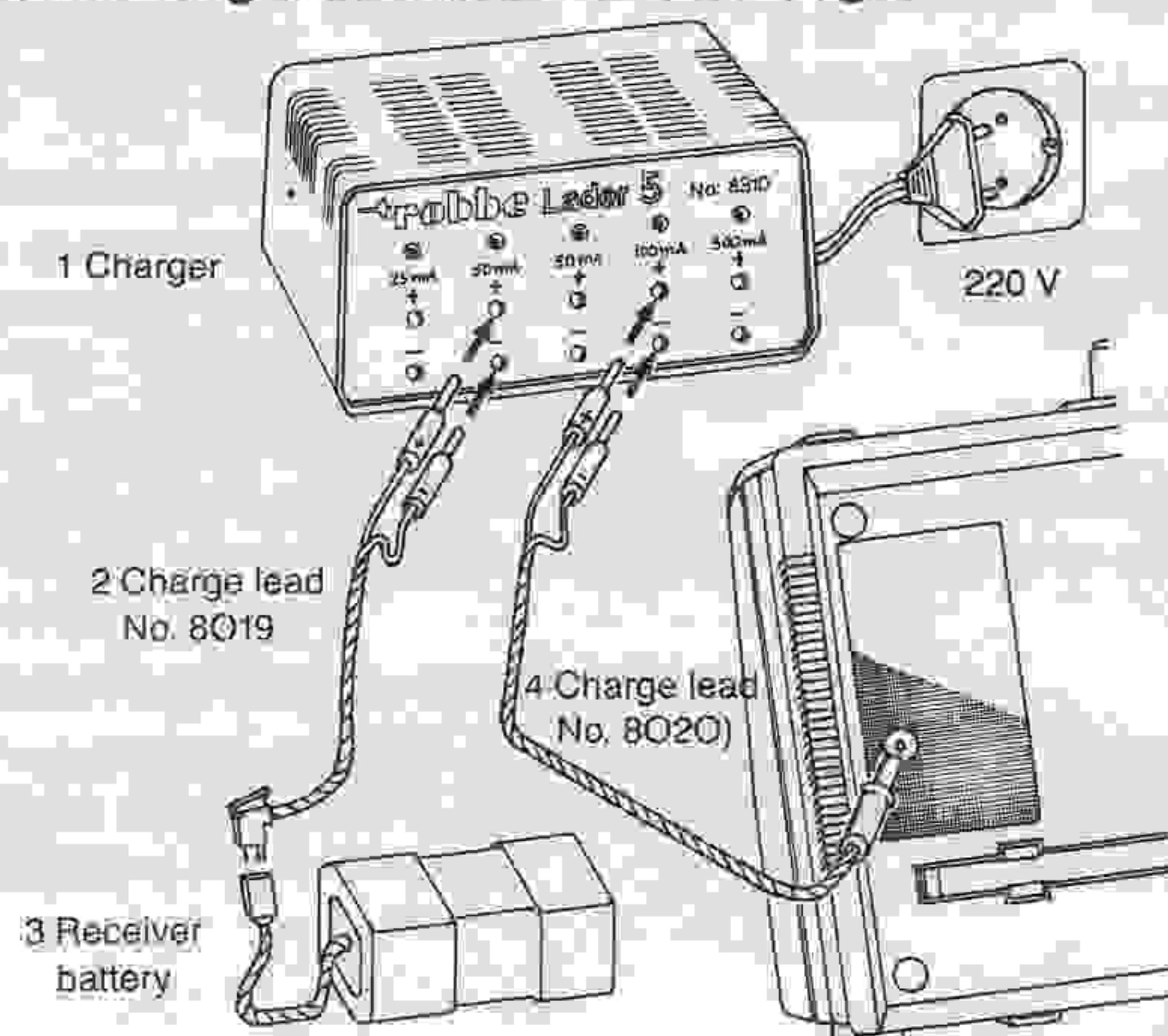
When the receiver system battery voltage is dropping low, you will notice that the servos run markedly more slowly.

The transmitter battery needs to be recharged when the transmitter meter needle enters the red area.

The transmitter battery No. 8174 has a nominal voltage of 9.6 V. and a capacity of 500 mAh. The receiver battery No. 8176 has a capacity of 500 mAh and is rated at 4.8 Volts.

Before using the radio system for the first time you should charge both batteries for **24 hours at 50 mA**. The transmitter and receiver must both be switched off during the charging process. We recommend the Robbe Charger 5 general-purpose charger (No. 8310), together with the charge leads No. 8019 and 8020.

### Connecting the batteries to the charger





The transmitter and receiver batteries can be rapid-charged (in less than 30 minutes) using the Robbe Automax 8 (No. 8203). Please refer to the instructions supplied with the chargers and batteries.

After this initial 24 hour charge subsequent charges only require 14 hours at a charge current of 50 mA.

The 9.6 V/1200 mAh transmitter battery is charged for 14 hours at a current of 100-120 mA.

**Note:** A 3A fuse is included in the transmitter battery charging circuit when the transmitter charge socket is used. If a charge current of over 3 A is applied, or if a short-circuit takes place, the fuse will blow.

If you charge up the system fully but then do not use it for two or three weeks, we advise that the batteries should be recharged as they will have lost their full capacity after this time in any case, as nickel-cadmium batteries self-discharge steadily, and will no longer have full capacity after this time.

This should be your guiding principle: charge too much rather than too little, but do not overcharge to the point where the batteries become warm to the touch.

When the system has been used for any period of time, we advise that you give the system an overnight charge as standard procedure i.e. about 12 hours at 50/100 mA.

### 30 Changing crystals

The transmitter and receiver crystals are of the plug-in type, and are easily changed.

In the 27 MHz band channels 4, 9, 14, 19, 24 and 30 are permitted. In the 35 MHz band: channels 61-80; in the 40 MHz band: channels 50-59 and 81-92.

The Order No. for a transmitter crystal (FM Tx) is: 8503/.... (channel No.), and for a receiver (FM RX) crystal: 8504/.... (channel No.).

Transmitter crystals are engraved FM Tx and receiver crystals FM Rx, followed in each case by the channel number. **The channel numbers of the transmitter and receiver crystals must be the same, otherwise the system will not work at all.**

**Please take care not to mix up the transmitter and receiver crystals.**

### 31 Specifications:

#### Transmitter

Modulation	Frequency Modulation (FM) (convertible to PCM)
Frequency bands	27, 35, 40 MHz
Frequency channels	6, 20, 22
Channel spacing	10 kHz
Operating voltage	9.6 - 10.5 Volt
Power supply	7 dry cells or 8 NC cells
Current consumption	approx. 120 mA
Number of channels	4, all with trims
Special features	Servo reverse on all channels Interchangeable transmitter RF module Switchable servo neutral position 1.3 - 1.5 ms on FM Teacher/Pupil operation

#### FMSS R8 receiver

Modulation	Frequency Modulation (FM)
Frequency bands	27, 35, 40 MHz
Frequency channels	6, 20, 22
Channel spacing	10 kHz
Operating voltage	4.8 - 6 Volt
Power supply	4 dry cells or 4 NC cells
Current consumption	8 mA
No. of channels	8
Dimensions	72 x 44 x 19.5 mm.
Weight	65 g
Sensitivity	approx. 2 uV

#### PCMS-R9 receiver

Modulation	PCM/FM
Frequency bands	27, 35, 40 MHz (30 MHz export)
Frequency channels	6, 20, 22
Channel spacing	10 kHz
Operating voltage	4.8 - 6 Volt
Power supply	4 NC cells
Current consumption	20 mA
No. of channels	9
Dimensions	63.5 x 44.5 x 24 mm.
Weight	55 g
Sensitivity	approx. 2 uV
<b>Servo</b>	<b>RS 200</b>
Control movement	2 x 45° including trim
Operating voltage	4.8 - 6 Volt
Current consumption	8 - 635 mA
Speed	0.18 sec./45°
Torque	35 Ncm
Resolution	1%
Dimensions	41 x 40.5 x 20 mm.
Weight	53 g

### 32 Supplementary instructions for Terra Top FMSS/PCMS converted to PCM operation:

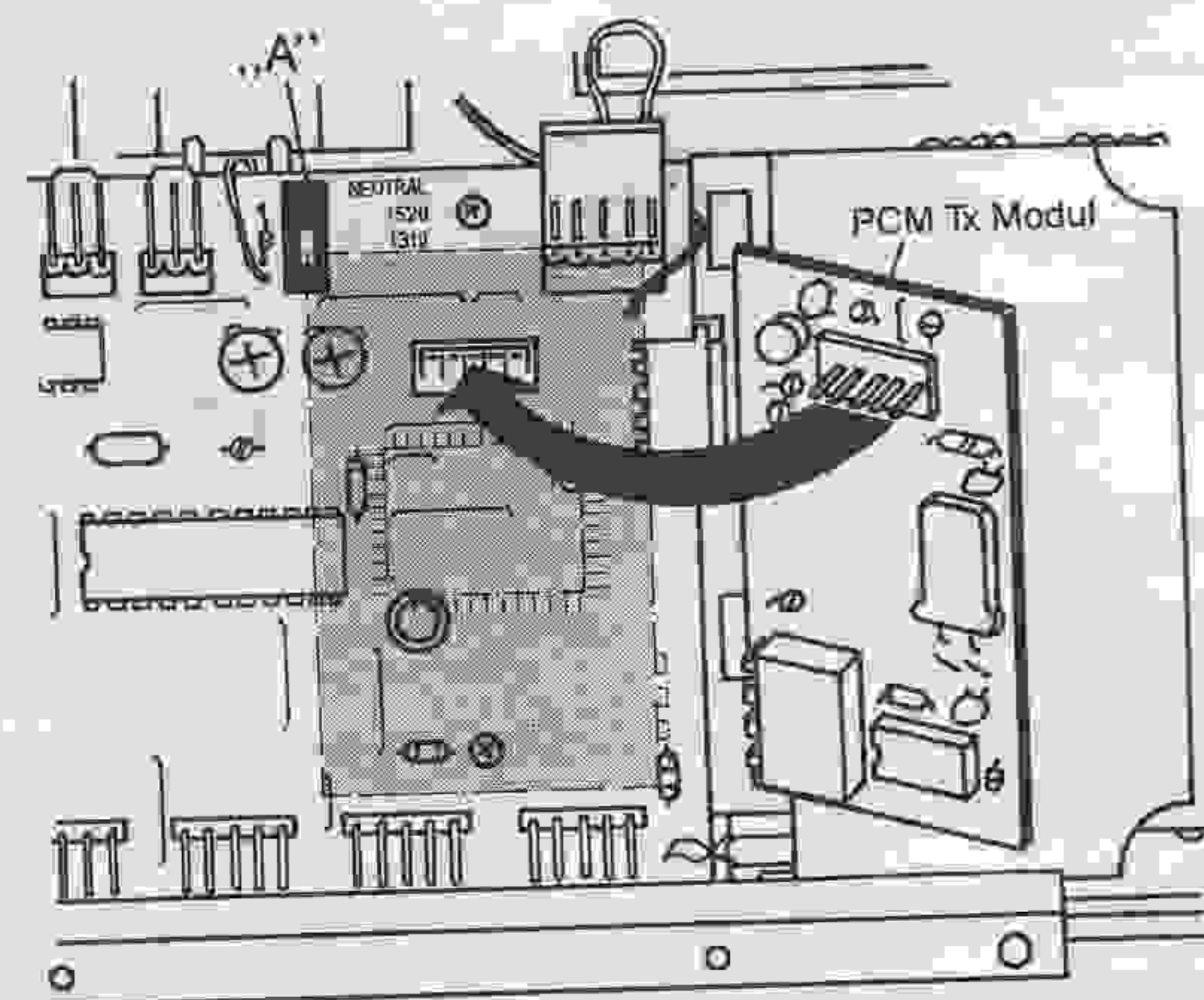
The basic system can be converted to PCM operation for use with a PCM receiver. The parts required are as followed:

PCM Tx module No. 8841	
PCMS R9 PCM receiver	30 MHz No. 8723
	35 MHz No. 8724
	40 MHz No. 8725
	41 MHz No. 8726 (export only)

### 35 Converting the transmitter to PCM operation:

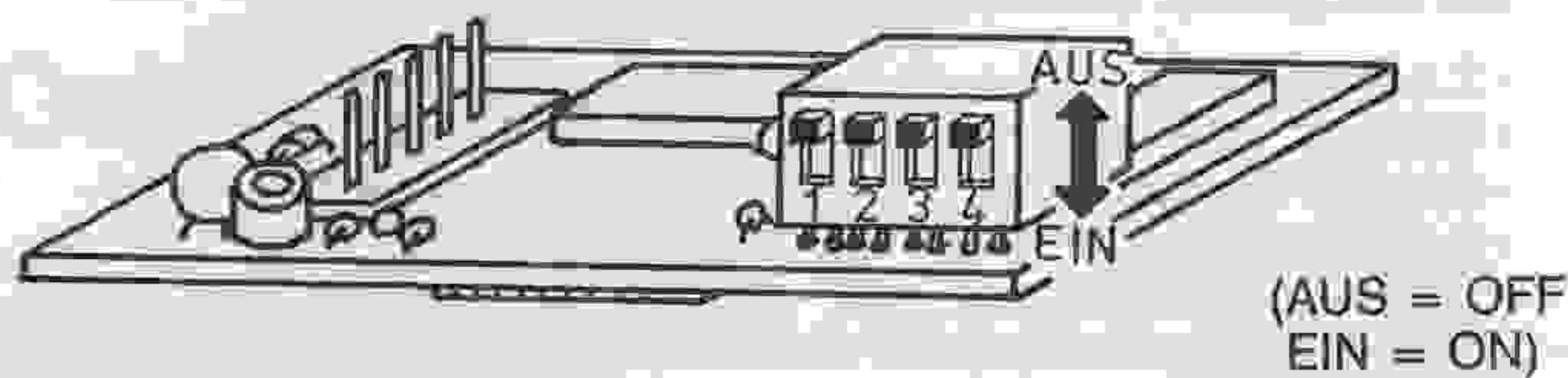
The PCM Tx module is plugged into the connector in the transmitter as shown in the illustration below.

The "Neutral" switch for servo centring **must** be set to the 1520 us position.





## 36 Using the PCM module



The four-way switch bank on the PCM Tx module circuit board has the following functions:

**Switch 1:** ON = PCM modulation  
OFF = FM (PPM) modulation

**Note:** It is only possible to switch from PCM to FM or vice versa when the transmitter is switched off.

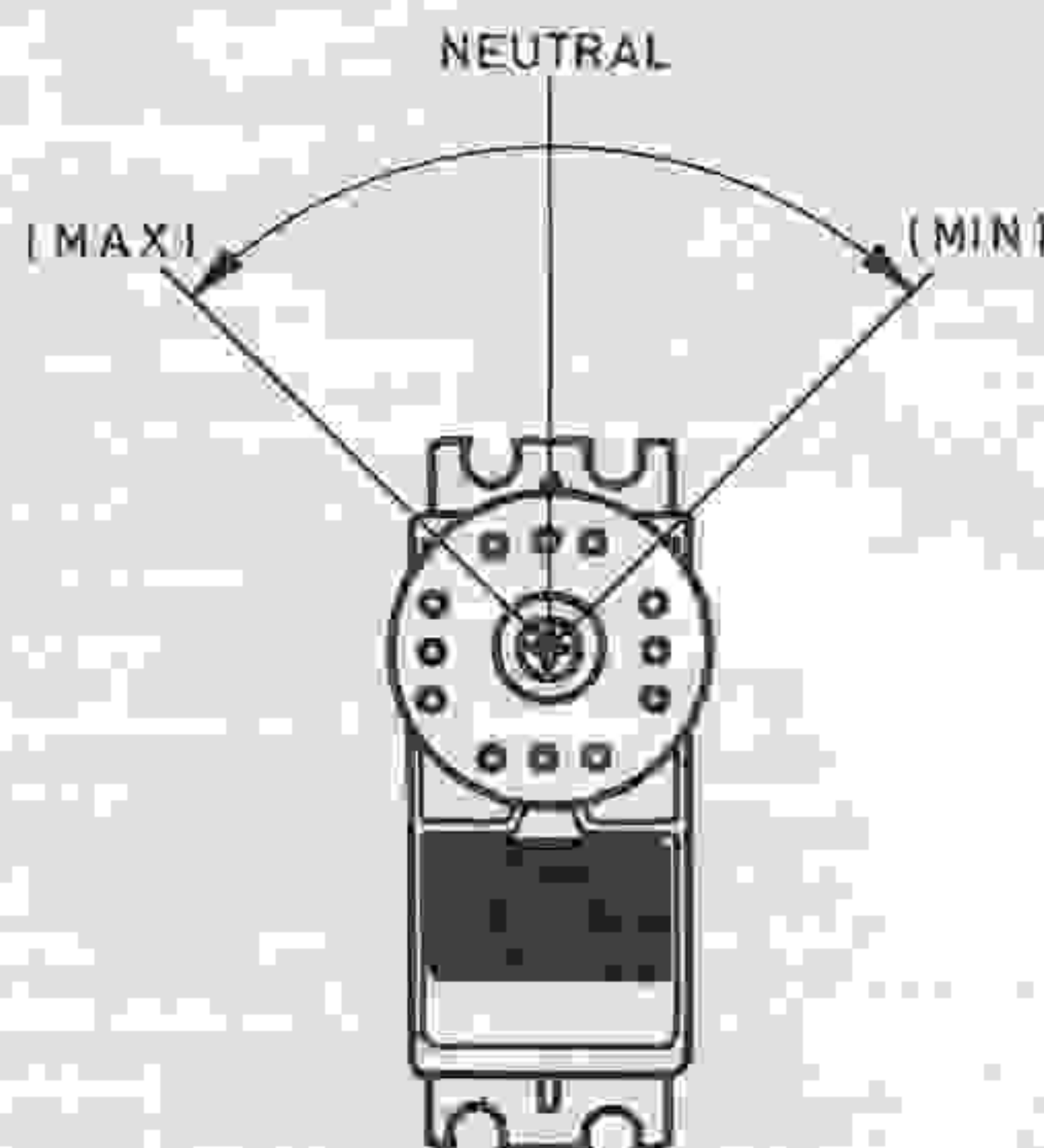
**Switch 4:** ON = 1.5 ms servo neutral position  
OFF = 1.3 ms servo neutral position

**Note:** It is only possible to alter the servo neutral timing for FM operation. For PCM operation the neutral position is set to 1.5 ms.

For PCM operation switch 4 on the PCM Tx module circuit board and switch "A" on the main circuit board must be set to the 1520 us (1.5 ms) position. It is only possible to switch to 1.3 ms for FM operations.

**Switches 2 + 3:**

Switch 2	Switch 3	Function
On	Off	Failsafe position to servo neutral setting
Off	On	Failsafe position servo minimum
On	On	Failsafe position servo maximum
Off	Off	Failsafe switched off, Hold Mode



## 37 Notes on Failsafe and Hold Mode (PCM only)

When the radio transmission of control signals from the transmitter to the receiver is disturbed for any reason, the receiver recognizes the interference and suppresses it, thus ensuring that the servos do not carry out any uncontrolled movements. Instead of the "dirty" signal, the servos are fed the last signals which the receiver recognized as "clean".

### a) Hold Mode

In this mode the servos remain in the last "good" position for as long as the interference persists, i.e. until an undisturbed signal is received again.

**Channels 7 and 8 are programmed to operate in Hold Mode at all times.**

### b) Failsafe

After a period of one second the servos run to a predetermined position.

With the Terra Top FMSS/PCMS radio control system this position can only be pre-programmed for channel 8.

The following 3 servo positions may be pre-selected:

#### Left - neutral - right

A servo or flashing light connected to channel 8 will now be activated if the Failsafe should be tripped, and can be set up to warn the pilot of the interference.

In the case of powered model aircraft we recommend that channel 8 should be used for the throttle (motor returns to idle), and in the case of gliders the airbrakes should be set to extend. As failsafe programming is only available via channel 8, the corresponding control lever (i.e. channel) must be connected to channel 8.

#### Example:

Throttle left, throttle with failsafe function.

- **Transmitter:** yellow channel plug from 4 CH to 8 CH.

- **Receiver:** connect throttle servo to output socket 8.

The same procedure is adopted for flaps, airbrakes or similar functions.

Channel 8 can also be programmed to operate in Hold Mode (see Chapter 36).

## 38 Special notes regarding PCM operations:

- Switch the receiver on first, then the transmitter, and wait for 60 seconds before controlling the model.
- The PCM receiver should only be used with NC battery packs.
- Standard FM transmitter and receiver crystals are used for PCM operations.
- The Robbe Terra Top PCM system can also be used in conjunction with all receivers supplied with other Robbe PCM systems (CM-Rex PCM, Supra PCM).
- Channels 1 - 7 operate in Hold Mode, channel 8 can be used in Hold Mode or Failsafe.
- For PCM operations in conjunction with the Multi-Switch or Multi-Prop system, it is necessary to use a PCM adaptor (No. 8048), which is connected to the decoder.

## 40 Expansion using NF option modules:

Thanks to the modular construction of the Terra Top FMSS / PCMS radio control system, it is possible to expand the basic set by adding option modules. These units can be installed in one or both of the option wells.

The following option modules are available:

### Dual Rate module No. 8959

Switchable servo movement reduction (50 - 100%) for any 3 channels.

### Exponential module No. 8958

Switchable exponential function (progressive servo movement) for any 2 channels.

### Mixer Module No. 8964

Electronic mixer for mixing two channels, e.g. for V-tail or delta aircraft.

### Differential module No. 8960

Mixing module for controlling separate ailerons (2 servos) in model aircraft.

3 possible applications:

- Normal function - ailerons work in parallel;
- Differential movement - aileron movement adjustable from 0 - 100%;
- "Split" operation - only one aileron is deflected at any time.

### Genoa module No. 8314

A specialized module to facilitate the control of foresails such as the spinnaker or Genoa. Ideal for the Robbe "Atlantis" model sailing boat.

### Multi Switch Module No. 8963

Switched channel expansion module, which divides one transmitter channel into 6 switched channels. Ideally suited to complex model boats.

### Multi Prop Module No. 8957

Proportional channel expansion module, which divides one transmitter channel into 6 proportional channels. Ideally suited to extra functions in any model.



### Super Heli Module No. 8893

Super-option module for the advanced helicopter pilot, offering the following functions:

- Throttle pre-select
- Auto-rotation switch
- Collective pitch adjustment - minimum 10
- maximum
- hover
- auto-rotation

- Auto-pilot suppression
- Collective pitch - tail rotor mixer
- Roll - collective pitch mixer for Heim mechanics (Robbe Ecureuil, Avantgarde).

### Super Mix Module No. 8899

A super-option module for the advanced pilot of powered model aircraft and gliders. It offers the following functions:

- 2 x Dual Rates
- Elevator - camber-changing flap mixer (snap-flap)
- Camber-changing flap - elevator trim compensation
- 2 servo movement limiters (ATV) for flaps
- Aileron - rudder coupling (0 - 100%)
- Aileron differential: normal - differential - "split"
- Flaperon mixer (aileron - camber-changing flaps)

**Robbe Modellsport**

We reserve the right to alter technical specifications (2/86)