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## 16-channel multiswitch decoder

Operating instructions





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## Safety instructions

- Read these instructions completely and carefully before installing or commissioning this module. Keep these instructions in a safe place for future reference.
- The module must not be operated with mains voltage (230 V). There is a danger to life!
- The power transistors can become very hot under load. Be careful when touching them! Risk of burns!
- If the module is overloaded, there is a risk of fire due to high heat development!
- The module must be protected from moisture, splash water and heat.
- The module is not a toy! Keep the device away from children.
- Do not use the module if it is damaged.
- Do not operate the module in an environment where flammable gases, vapours or dust are present.
- Repairs may only be carried out by a specialist.
- Faulty switching functions can never be completely ruled out due to transmission errors in the remote control or software/hardware errors in the module. Always operate the module and its functional model in such a way that no danger to you or third parties can arise from such faulty switching.

## Intended use

The intended use of the module is the switching of resistive loads in the field of RC functional modelling with a max. current consumption of 2 A at a max. voltage of 24 V.

The module is connected to a remote control receiver.

### Warnings

- Inductive loads must be operated with a protective diode. Otherwise there is a risk of electric shock and damage to the module.
- Basic knowledge of electrical engineering is required to connect loads.
- Never operate the module outside the power limits, not even for a short time. The voltage to be switched must not exceed 24 V and the current to be switched per channel must not exceed 2 A. The maximum total load capacity when several loads are switched on simultaneously is 5 A.
- Always ensure that the polarity is correct. If loads are connected with reversed polarity, both the load and the module may be damaged (risk of short circuit risk of fire or electric shock).

- Only connect the module to the remote control receiver. Observe the polarity here too!
- Do not operate the module if external damage is visible.

## Product description

The 16-channel multiswitch decoder is connected to the remote control receiver and switches 16 different consumers (light bulbs, LEDs, sirens, small electric motors, ...) on or off independently of each other via a switching or proportional channel of the remote control. A suitable 16-channel multiswitch encoder in the remote control transmitter is required for operation:

- cp-elektronik Encoder
- Futaba 8084 Encoder
- Graupner 4108 Encoder
- Graupner transmitter with activated multi-channel.

There is an optical switching control via LED for all switching functions.

The connection or attachment of the module in the model is at your own discretion. The following components are recommended:

Quantity	Designation	Article no. (shop.cp-elektronik.de)
1	3-pin servo patch cable with 2.54 mm socket on both ends, suitable for the receiver	CAB-002 (Futaba plug-in system) or CAB-003 (Graupner/JR plug-in system)
16	Connection cable for consumers with 2-pin socket 2.54 mm; cable cross-section 0.14 mm <sup>2</sup>	CAB-004
4	Cylinder head bolts M3x16 incl. M3 nuts	FIT-001
4	Spacer sleeves 5 mm	

## Connection

Beachten Sie bei allen Anschlüssen die richtige Polung!

#### Connection to the receiver

The module is connected to the receiver like a servo using a 3-pin patch cable (with a 3-pin plug on both sides with a 2.54 mm pitch). Suitable patch cables are available as accessories from cp-elektronik.de. Observe the correct polarity when plugging the 3-pin connector into the module. The colouring may vary depending on the connection cable used:

	Pulse line	Positive pole	Negative pole
Graupner system	orange	red	brown
Futaba system	white	red	black

#### Connection of consumers and external supply

The loads are connected via pin headers with a 2.54 mm pitch. Suitable 2-pin connection cables are available from cp-elektronik.de.



Fig. 1: Connection of consumers and external supply

The loads are connected through to minus and all have a common positive pole. They are supplied from one or two external 6 V to 24 V voltage sources, which are connected to the circuit board via a screw terminal.

Fig. 2 shows an example of the connection of an incandescent lamp to an output channel.

When connecting LEDs, please observe the polarity (red: positive pole, black: negative pole) and do not forget a suitable series resistor.



6 V ... 24 V Versorgungsspannung

Fig. 2: Connecting a consumer to the decoder

If only one external voltage source is used, the wire jumper can be fitted (status on delivery). All 16 loads are then supplied from this source, which can be connected to V1 or V2.

However, it is also possible to connect two different voltage sources (e.g. with different voltages) to V1 and V2. The wire jumper must then be cut. The two negative poles of the voltage sources are connected to each other via the circuit board. Consumers connected to SV3 are supplied from V1, consumers connected to SV2 from V2.

The maximum current per switching function is 2 A. The total load of the module when several loads are switched on must not exceed 5 A. The module will be damaged if these values are exceeded!

If higher currents are to be switched, the use of a relay module is recommended. Currents of up to 16 A can be switched with the relay module art. no. KIT-012 or MOD-012.

When connecting inductive loads (e.g. electric motors), ensure sufficient interference suppression. To protect the output stage, inductive loads (electric motors, relays) must be operated via a free-wheeling diode (see Fig. 3 and Fig. 4). The maximum current consumption must not exceed 2 A.



Fig. 3: Connection of a motor with interference suppression capacitors and freewheeling diode.



Versorgungsspannung

Fig. 4: Use of a freewheeling diode when connecting a relay. Commercially available relay modules usually already have an integrated freewheeling diode, so it is essential to observe the polarity!

The circuit board can be attached to a module carrier in the model using four M3 screws and two 5 mm spacer sleeves. The module must be installed protected from splash water and contact.

## Operation

#### Selecting the encoder

Before switching on the module, use DIP switches 3 and 4 to set the decoder to the encoder used in your transmitter:

DIP switch 3	DIP switch 4	Encoder type	
OFF	OFF	<ul> <li>cp-elektronik Encoder:</li> <li>Transmitter F-14 (7- and 8-channel version)</li> <li>Transmitter of the FC series, 35/40 MHz</li> <li>all Graupner transmitters 35/40 MHz with retrofit option for Nautic Module 4108</li> </ul>	
OFF	ON	Graupner Nautic Module 4108	

		<ul> <li>all 35/40 MHz Graupner transmitters with Nautic Module 4108</li> <li>Graupner transmitter with multi-channel option (also iFS, HoTT)</li> </ul>	
ON	OFF	<ul> <li>Futaba® Encoder 8084:</li> <li>Transmitter F-14 (7- and 8-channel version), 35/40 MHz</li> <li>Transmitter of the FC series, 35/40 MHz</li> </ul>	
ON	ON	<ul> <li>Transmitter of the FC series, 35/40 MHz</li> <li>Futaba® Encoder 8084:</li> <li>F-14 transmitter with PCM coding 35/40 MHz,</li> <li>F-14/FC series (8-channel version) with 2.4 GHz module TM-24 FHSS Air</li> </ul>	

Please note that the position of the switches is analysed immediately after the module is switched on; changes to the switch positions during operation have no effect on the function.

#### Commissioning

Connect the decoder to the receiver and switch on the power supply to the receiver. The transmitter initially remains switched off. The red and yellow LEDs should now light up and indicate that no valid signal is being received.

Now switch on the transmitter. The red and yellow LEDs should go out and you should be able to switch all channels using the switches on the encoder.

In general, you should always switch on the transmitter first, then the receiver.

If the yellow LED lights up permanently or flickers when the transmitter is switched on, or if not all channels can be switched, please carry out the pulse length setup described below. This allows the decoder to be programmed to the pulse lengths used by the transmitter within certain limits.

**Note when using the multi-channel with Graupner transmitters:** with the transmitter types MC-16/20 Hott or MC-24 Hott, various switching channels on the transmitter are combined into one multi-channel by software. To operate the decoder with these transmitter types, it is necessary to set the servo centre to a value of +5% in the transmitter settings.

**Note when using a Futaba encoder with Futaba transmitters:** with FC transmitter types, the channel used must be set to MULTI and Servo Reverse (REV) in the transmitter menu. Please also refer to the instructions for operation with a multiswitch module in the manual for your transmitter

#### Pulse length setup

Das Setup der Impulslängen sollte nur durchgeführt werden, wenn sich die Kanäle nicht fehlerfrei schalten lassen. In praktisch allen diesen Fällen liegt die Fehlerursache aber auf Seiten des Encoders im Sender! Bitte überprüfen Sie zunächst den Encoder im Sender auf richtigen Anschluss und fehlerfreie Funktion, bevor Sie dieses Setup durchführen!

The pulse lengths that encode the switch on or synchronisation functions may differ slightly for different transmitter types. During the pulse length setup, the maximum and minimum pulse length is measured by the decoder and saved in the EEPROM. Data that is saved in the EEPROM of the microcontroller is retained even after the supply voltage is switched off and is therefore permanently saved. By repeating the setup procedure, new values can be saved and the old data will be overwritten.

## To ensure that the setup is carried out correctly, it is very important to perform all the steps listed below in the exact order and exactly as described.

Step no.	Action		
1	Switch off the transmitter and receiver		
2	This step depends on the encoder used (switching module in the transmitter).		
	<ul> <li>cp-elektronik encoder in one</li> <li>Futaba transmitter or</li> <li>Graupner/JR transmitter</li> </ul>	Switch at least one of the eight switches on the encoder up or down and leave it switched there (it is best to select a switch with a latching function, if available).	
	<ul> <li>Original Graupner Encoder 4108 or</li> <li>Graupner multi- channel option</li> </ul>	On the transmitter, set at least one of the switches to the lower position and at least one switch to the upper position. The switches must remain in this position during setup.	

	<ul> <li>Original Futaba encoder 8084</li> </ul>	all switches on the encoder are is in the neutral position (centre position).	
3	Set the DIP switches on the Multiswitch decoder as follows: DIP switch no. 1: OFF DIP switch no. 2: ON DIP switch no. 5: OFF Set switches no. 3 and no. 4 according to the encoder type used, see page 8.		
4	Switch on transmitter		
5	Switch on receiver/multiswitch decoder		
6	Measurement is started automatically. In the following approx. 5 seconds, the minimum and maximum pulse length are measured and permanently stored in the EEPROM of the controller.		
	The red LED must not light up, otherwise no valid pulses will be detected. In this case, check the wiring of the encoder in the transmitter and the connection of the multiswitch decoder on the receiver.		
7	Measurement ends automatically after approx. 5 seconds. The yellow and red LEDs start to flash alternately.		
8	Switch off the receiver while the yellow and red LEDs flash alternately.		
9	Wait 30 seconds and leave the receiver/multiswitch decoder switched off during this time. The capacitors must discharge completely.		
10	Move DIP switch no. 2 on the decoder back to the OFF position.		
11	Switch on the receiver/multiswitch decoder again. The newly measured pulse lengths are now active and all switching functions should be operable with the switches on the transmitter.		

The settings of the pulse length setup remain saved until a new setup is performed.

#### Setting up the memory function

When the memory function is activated, a switching channel switches on the first time it is operated, but only switches off again the second time it is operated. This means that two functions can be switched on at the same time if they are operated with a switch on the transmitter. The memory setup mode allows you to specify which channels should have a memory function and which should not. If DIP switch no. 1 on the decoder is switched on, the microcontroller is in memory setup mode.

It is very important to carry out all the steps listed below in exactly the same order and exactly as described in order to carry out the setup correctly.

Step no.	Action	
1	Switch off the transmitter and receiver	
2	Set the DIP switches on the multiswitch decoder as follows: DIP switch no. 1: ON DIP switch no. 2: OFF DIP switch no. 5: OFF Set switches no. 3 and no. 4 according to the encoder type used, see page 8.	
3	Switch on transmitter	
4	Switch on receiver/multiswitch decoder	
5	You now have 30 seconds to make the memory settings. All channels that are to have a memory function are switched on at the transmitter/encoder. The corresponding switching control LEDs on the decoder light up. So that both channels of a switch can be switched on at the same time, all channels have a memory function for the duration of the setup. To switch a channel off again, the switch is switched on again from the neutral position. If you do not want a memory function on any of the channels, leave all channels switched off in setup mode. The entire process must be completed after 30 seconds at the latest.	
6	Setting mode is cancelled automatically after approx. 30 seconds. The yellow and red LEDs start to flash alternately. All channels that were switched on at this point now have a memory function.	

7	Switch off the receiver while the yellow and red LEDs flash alternately.
8	Wait 30 seconds and leave the receiver/multiswitch decoder switched off during this time. The capacitors must discharge completely.
9	Move DIP switch no. 1 on the decoder back to the OFF position.
10	Switch on the receiver/multiswitch decoder again. The new settings are now active and all switching functions should be operable with the switches on the transmitter.

The settings remain saved until a new setup is performed. The memory setup can be repeated if required.

#### Setup of the indicator or speed camera function

A flashing function can be configured for the eight switching channels of port A of the microcontroller (40 ms on, 460 ms off, frequency 2 Hz) and a flashing function with a frequency of approx. 1 Hz for the eight outputs of port B (500 ms on, 500 ms off). The indicators/flashers operate at the same frequency on all ports, but with a different phase depending on when they are switched on, so that several configured flashing functions generally do not flash with the same phase.

The procedure for configuring the indicator function is exactly as described for the memory setup. However, both DIP switches no. 1 and no. 2 must be switched on before switching on the power supply. Channels that are to have a flashing function are switched on at the transmitter.

It is very important to carry out all the steps listed below in exactly the same order and exactly as described in order to carry out the setup correctly.

Step no.	Action
1	Switch off the transmitter and receiver
2	Set the DIP switches on the multiswitch decoder as follows: DIP switch no. 1: ON DIP switch no. 2: ON DIP switch no. 5: OFF Set switches no. 3 and no. 4 according to the encoder type used, see page 8.
3	Switch on transmitter

4	Switch on receiver/multiswitch decoder		
5	You now have 30 seconds to make the indicator settings.		
	All channels that are to have a flashing/flashing function are switched on at the transmitter/encoder. The corresponding switching control LEDs on the decoder flash. So that both channels of a switch can be switched on at the same time, all channels have a memory function for the duration of the setup. To switch a channel off again, the switch is switched on again from the neutral position.		
	If you do not want a flashing function on any of the channels, leave all channels switched off in setup mode.		
	The entire process must be completed after 30 seconds at the latest.		
6	The setting module is automatically cancelled after approx. 30 seconds. The yellow and red LEDs start to flash alternately. All channels that were switched on at this point now have a flashing or red LED. Flash function.		
7	Switch off the receiver while the yellow and red LEDs flash alternately.		
8	Wait 30 seconds and leave the receiver/multiswitch decoder switched off during this time. The capacitors must discharge completely.		
9	Move DIP switch no. 1 and no. 2 on the decoder back to the OFF position.		
10	Switch on the receiver/multiswitch decoder again. The new settings are now active and all switching functions should be operable with the switches on the transmitter.		

The memory function and the blink/flash function are independent of each other and can be set individually for each channel. If required, the setup can be repeated at any time and the blink/flash functions can be reassigned.

#### Reset to factory settings

The settings for the pulse lengths, the memory function and the indicator/flasher function can be reset to the factory settings at any time:

- 1. Disconnect the module from the power supply
- 2. Set ALL switches of the DIP switch to the ON position
- 3. Switch on the power supply

- 4. If the yellow and red LEDs flash alternately, the module has been reset to the factory setting.
- 5. Disconnect the module from the power supply and set all switches of the DIP switch to OFF.
- 6. Now select the appropriate encoder again on the DIP switch.

#### Setup configuration with the DIP switch

The following table summarises the function of the setup switches once again:

DIP switch 1	DIP switch 2	DIP switch 5	Setup type
OFF	OFF	OFF	Normal operating mode
ON	OFF	OFF	Memory setup
OFF	ON	OFF	Pulse length setup
ON	ON	OFF	Speed camera/indicator setup
ON	ON	ON	Reset to factory settings

## Care and maintenance

Protect the module from splash water, heat and contact. The module is maintenance-free.

## Fault and repair

A permanent or intermittent illumination of the red LED indicates faulty receiver pulses and indicates reception interference or a switched-off transmitter. If necessary, check the correct connection on the receiver and the correct connection of the servo cable.

If the yellow LED lights up continuously or intermittently, this indicates a fault with the encoder in the transmitter or an unknown multiswitch protocol. Ensure that the encoder is compatible or that the correct encoder is selected with the DIP switch and carry out a pulse length setup if necessary.

The module may only be repaired by a specialist. If you need help with a repair, please contact cp-elektronik.de (address on the last page of these instructions).

## Technical data

Dimensions	62.1 mm x 47.2 mm
Weight without connection cable	24 g
Voltage (ext. supply)	6 V 24 V
max. current per output	2 A
Max. total current (sum of all outputs switched on simultaneously)	5 A
Max. current consumption from receiver	100 mA
Operating voltage (receiver)	4,8 V 8,4 V

## Contact us

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# Mandatory information according to §18 para. 4 ElektroG

The Electrical and Electronic Equipment Act (ElektroG) contains a large number of requirements for the handling of electrical and electronic equipment. The most important ones are summarised here.

#### 1. Separate collection of old appliances

Electrical and electronic appliances that have become waste are referred to as old appliances. Owners of old appliances must dispose of them separately from unsorted municipal waste. In particular, old appliances do not belong in household waste, but in special collection and return systems.

#### 2. Batteries, rechargeable batteries and lamps

As a rule, owners of waste appliances must separate waste batteries and accumulators that are not enclosed in the waste appliance, as well as lamps that can be removed from the waste appliance without destroying them, from the waste appliance before handing them in at a collection point.

This does not apply if old appliances are prepared for reuse with the involvement of a public waste management organisation.

#### 3. Options for returning old appliances

Owners of old appliances from private households can hand them in free of charge at the collection points of the public waste disposal authorities or at the take-back centres set up by manufacturers or distributors within the meaning of the ElektroG.

Shops with a sales area of at least 400 m<sup>2</sup> for electrical and electronic equipment and food shops with a total sales area of at least 800 m<sup>2</sup> that offer electrical and electronic equipment several times a year or permanently and make it available on the market are subject to the take-back obligation. This also applies to sales using means of distance communication if the storage and dispatch areas for electrical and electronic equipment are at least 400 m<sup>2</sup>

or the total storage and dispatch area is at least 800 m<sup>2</sup>. Distributors must always guarantee the take-back by means of suitable return options at a reasonable distance from the respective end user.

The possibility of returning an old appliance free of charge exists for distributors subject to the take-back obligation if, among other things, a new similar appliance that essentially fulfils the same functions is supplied to an end user.

If a new appliance is delivered to a private household, the old appliance of the same type can also be handed over there for collection free of charge; this applies to appliances of categories 1, 2 or 4 in accordance with Section 2 (1) ElektroG, namely "heat exchangers", "display screen equipment" or "display screen equipment" in the case of distribution using means of distance communication.

"Large appliances" (the latter with at least one external dimension over 50 centimetres). End users are asked about their intention to return such appliances when concluding a purchase contract. In addition, it is possible to return old appliances that do not exceed 25 centimetres in any external dimension free of charge to the distributors' collection points, regardless of whether a new appliance is purchased, and this is limited to three old appliances per appliance type.

#### 4. Data protection notice

Old devices often contain sensitive personal data. This applies in particular to information and telecommunications technology devices such as computers and smartphones. In your own interest, please note that each end user is responsible for deleting the data on the old devices to be disposed of.

#### 5. Meaning of the "crossed-out wheelie bin" symbol



The crossed-out wheeled bin symbol regularly shown on electrical and electronic appliances indicates that the appliance in question must be collected separately from unsorted municipal waste at the end of its service life.