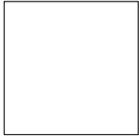


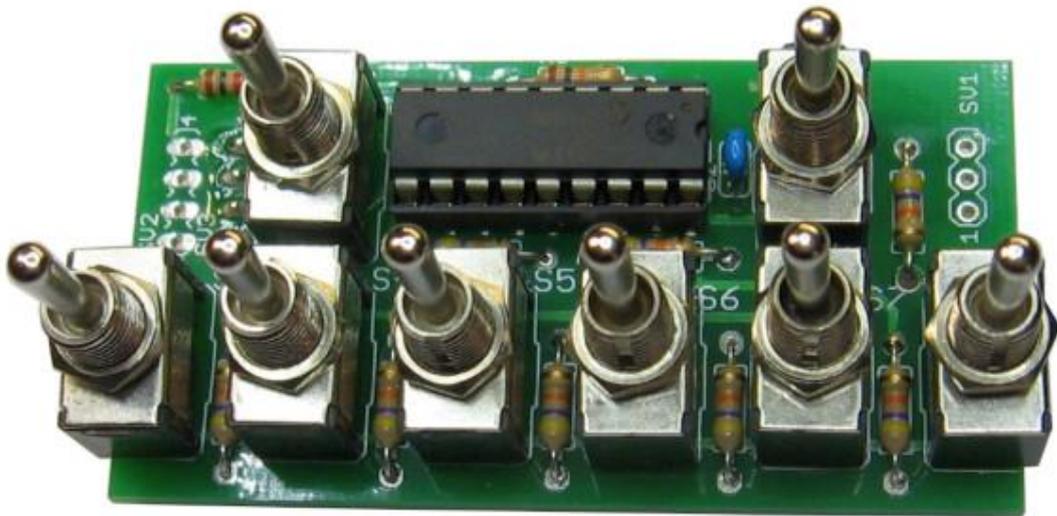


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# 16-channel multiswitch encoder for Graupner transmitter

Assembly and operating instructions



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## Safety instructions

- *Read this manual completely and carefully before installing or operating this module. Keep this manual for future reference.*
- *The module must not be operated on mains voltage (230 V). There is a danger to life!*
- *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, vapors 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 of the remote control or software/hardware errors in the module. Always*

*operate the module and its functional model in such a way that such faulty switching cannot cause any danger to you or third parties.*

## Intended use

The intended use of the module is the control of a 16-channel multiswitch decoder via channel multiplexing. The module is connected to the main board of the transmitter. The transmitter must be designed by the manufacturer for expansion with multiswitch decoders or nautical modules.

## Warnings

- Basic knowledge of electrical engineering is required to connect the encoder in the transmitter.
- Always make sure that the polarity and connection are correct. If the module is incorrectly connected to the transmitter, both the transmitter and the encoder can be damaged.
- Only connect the module to suitable remote control transmitters.
- Do not operate the module if external damage is visible.

## Product description

Switching channel extensions are almost indispensable in RC function model building. If, in addition to the usual functions for the model such as forward/reverse, right/left, a number of special functions are to be switched (e.g. horn, light signals, cranes, winches, ...), a remote control system quickly reaches its limits with the available channels.

A switching channel extension (Multiswitch) makes it possible to perform several independent switching functions via a proportional channel of the remote steering system. The Multiswitch system consists of two modules:

- the encoder with eight toggle switches or toggle buttons, which is installed in the transmitter
- the decoder, which provides 16 outputs for the connection of consumers and is connected to the receiver.

This manual describes the setup and operation of the encoder.

The 16-channel multiswitch encoder has been developed and tested for various Graupner/JR transmitter types:

- MC-15, 6014
- MC-18, MC-20
- MC-19, MC-24, MC-22
- etc.

The encoder only works in PPM mode and is not compatible with some 2.4 GHz modules.

## Structure

Please check the kit for completeness using the parts list before assembly. If a component is missing, please contact cp-elektronik (contact details on the last page of this manual).

## Parts list

Number	Designation	Value	Component
1			Printed circuit board for the 16-channel Multiswitch Encoder (Graupner/JR transmitter)
1	D1	BAT 46	Schottky diode
1	C1	22-47 $\mu$ F	SMD capacitor
1	C2	100 nF	Ceramic capacitor, RM 2.5 mm
1	IC1	PIC 16F628A or 16F627A	programmed microcontroller, 18-pin DIL package
1			Socket for IC1, 18-pin
8	R1, R4-R10	47 k $\Omega$	Carbon film resistor 1/4 W
1	R2	1 k $\Omega$	Carbon film resistor 1/4 W
1	R3	10 k $\Omega$	Carbon film resistor 1/4 W
2	S1, S2		Toggle switch 1-pole (ON)-OFF-ON, one-sided latching/pushbutton action
3	S3, S4, S5		Toggle switch 1-pin, (ON)-OFF-(ON), momentary contact on both sides
3	S6, S7, S8		Toggle switch 1-pole, ON-OFF-ON, latching on both sides
1	SV1	brown/red/orange	3-pin connection cable for function socket on transmitter board
1	SV2	blue	1-pin connection cable (sync. signal)
1	SV3		Male connector 4-pin, RM 2.54 mm Connection for an additional encoder (sync. signal)

## Necessary basic knowledge

For the construction of the circuit, basic knowledge of the correct handling of the components is assumed. You should also have some practice in soldering electronic components.

The microcontrollers and other CMOS ICs are sensitive to electrostatic charge. Before touching these devices, ground yourself by touching a water pipe, heater, or device connected to a protective grounding conductor.

## Notes on the structure

- Work absolutely conscientiously when soldering and wiring.
- Take your time with each solder joint and make sure that there are no cold solder joints.
- Use an adjustable soldering station or a small soldering iron with a power of max. 30 Watt with a small soldering tip for soldering.
- Semiconductors are sensitive to heat. Do not solder too long on one pin (max. approx. 3 seconds). If necessary, let the component cool down again in between.
- The use of leaded solder (Sn60Pb40) makes soldering easier for the beginner. If the requirements of the RoHS directive are to be met, only lead-free solder may be used.
- For some components it is necessary to pay attention to the correct polarity or orientation. In these cases, this is indicated in the text.

## Wired components

The connecting wires of wired components are inserted from the side with the placement imprint through the corresponding holes of the PCB and soldered on the track side. For some components, a certain orientation must be observed, in which case this is explicitly indicated in the text. If the text does not contain any information about the mounting position, the orientation is arbitrary.

Components with axial connection wires, such as resistors or diodes, are bent beforehand to the appropriate pitch. The use of a bending gauge is recommended for this purpose. It allows the exact bending in the grid dimensions 7.5/10/12.5/15/17.5 mm. For resistors, a grid dimension of 10 mm applies unless otherwise specified.

After soldering, the protruding ends of the connecting wires are removed with a side cutter.

## Placement

When assembling the components, refer to the assembly diagram, Fig. 1a. and the assembly print on the PCB.



- R3: 10 k $\Omega$  (color code: brown-black-orange-gold)

## Diode D1

D1 is a Schottky diode with a glass body and is used to protect against reverse polarity. The diode is marked with a ring on one side. Solder the diode as shown in Fig. 1a).

## Capacitor

Now solder in the 100nF capacitor C2. The capacitor bears the inscription 104.

## 18-pin IC socket

When soldering the 18-pin IC socket, pay attention to the correct orientation: the notch on the socket must point in the direction of C2 (100nF). After completing all soldering work, the programmed PIC microcontroller is placed in this socket with the notch on the microcontroller housing also pointing in this direction.

## Switch S1-S8

Now equip the eight toggle switches or toggle pushbuttons. Three of the switches are double-sided latching, three are double-sided momentary and two of the switches are single-sided momentary or latching. The different types of switches can be positioned on the PCB as you see fit. The parts list with the corresponding switch numbers provides a recommendation.

Make sure that the switches are absolutely straight on the board. If necessary, fix the switches with a strip of adhesive tape before soldering. First solder only the middle connection and then check whether the switch is sitting straight. You can correct the switch position by heating the soldering point again. If the switch is seated correctly, solder the other two connections as well.

Allow the switches to cool down after soldering one terminal at a time to avoid overheating the inside of the switch.

## Connection cable

The encoder is connected with a single-core and a 3-core connection cable to the Transmitter board connected.

The encoder is supplied with power via the 3-wire connection cable SV1. In addition, the output signal of the encoder is present here (encoder, yellow cable). A suitable 3-pin connection cable with a 5-pin plug is required for the connection, which is plugged into one of the function sockets on the transmitter board. Solder the 3-wire connection cable to SV1 as shown in Fig. 2.

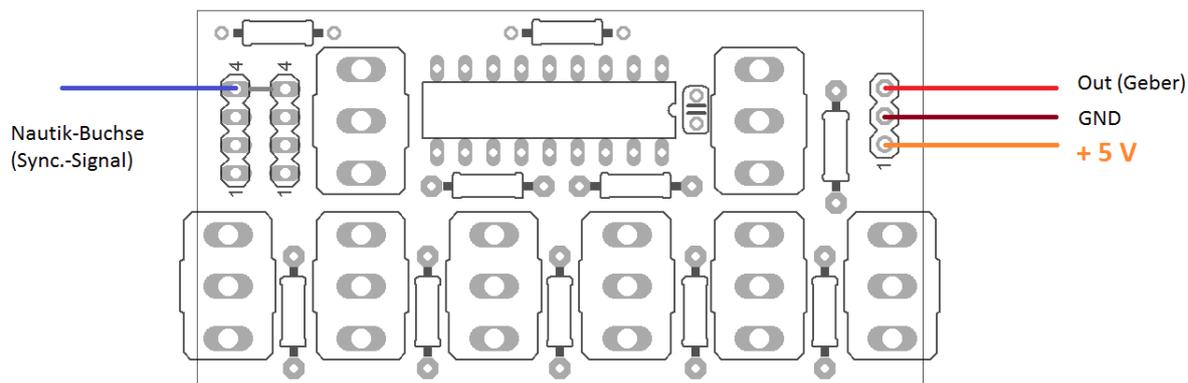


Fig. 2: Connecting the cables to the encoder

A single-core connection cable is soldered to SV2 of the encoder, via which the encoder is supplied with the synchronization signal. Which connector this cable has at the other end and where in the transmitter it is plugged in depends on the type of transmitter and is described in the next section.

In addition, if required, a 4-pin header can be fitted to SV3 on the solder side of the board (solder on the component side). Here the sync. signal can be taken off when using further option modules.

### Inserting the microcontroller

Carefully push the programmed microcontroller into the 18-pin socket. Pay attention to the notch, which must point in the direction of the notch of the socket. If the connector legs of the PIC stick out a little and do not point exactly downwards, take the PIC between the thumb and forefinger of both hands and carefully bend the legs of one side together into a vertical position on a flat surface (table). Repeat for the second side. It should now be easy to insert the PIC into the socket.

## Connection in the transmitter

The mechanical installation of the encoder in the transmitter housing as well as the connection corresponds to the procedure described in the operating instructions for the transmitter for the installation of the Multiswitch encoder or Nautic Expert modules.

The spacing of the switches is such that the encoder board fits into the corresponding holes of the transmitter. The switches are attached to the transmitter housing with the nuts provided.

The three-core cable (orange/red/brown) is connected to one of the function sockets (channel 5, 6 or 7) with the 5-pin plug. On the 5-pin function sockets, only the two outer pins and the middle pin are assigned.

orange cable: positive pole

red cable: encoder voltage

brown cable: negative pole

**The plugs supplied are not protected against polarity reversal! Please be sure to check the polarity at the transmitter function socket with a voltmeter before connecting! If the polarity is reversed, both the transmitter and the encoder can be damaged!**

The connection of the single-core blue Sync. signal connection cable depends on the transmitter type. Types MC-15, 6014 and similar have a 4-pin Nautical socket, to which the 4-pin plug of the Sync. cable is connected. With other transmitter types the 4-pin plug can be connected to the nautical adapter, which is available from Graupner. The nautical adapter cable is in turn connected to an interface distributor on the transmitter board.

If no nautical adapter cable is available, the sync. signal connector of the encoder can also be connected directly to the 10- or 14-pin interface distributor. Corresponding connection cables with suitable sockets are available from cp-elektronik (<https://cp-elektronik.de>) as accessories:

Transmitter type	Interface distributor	cp-elektronik Article no.
MC-18, MC-20 etc.	10-pin	CAB-010
MC-19, MC-22, MC-24 etc.	14-pin	CAB-011

Fig. 3 shows the position and assignment of the sockets on the transmitter board to a MC-15 transmitter is shown. Fig. 4 shows the connection in a 6014 transmitter.

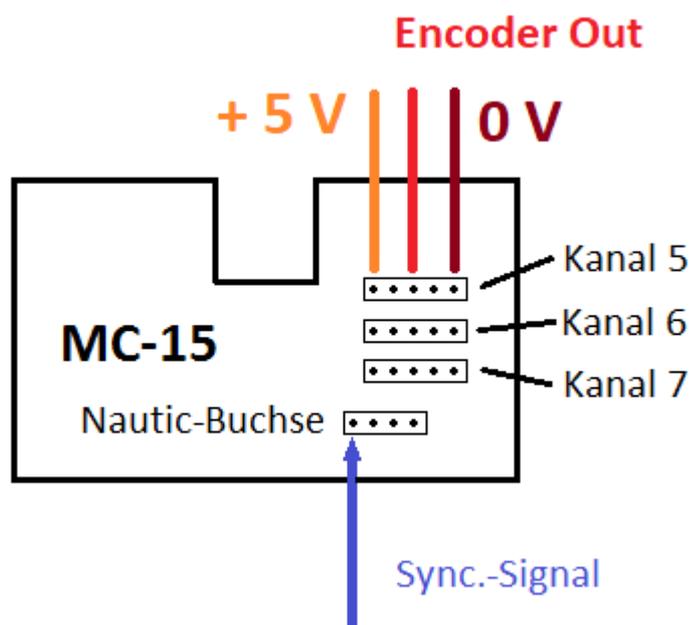


Fig. 3: Position and assignment of the connection sockets MC-15

Anschluss im Sender 6014

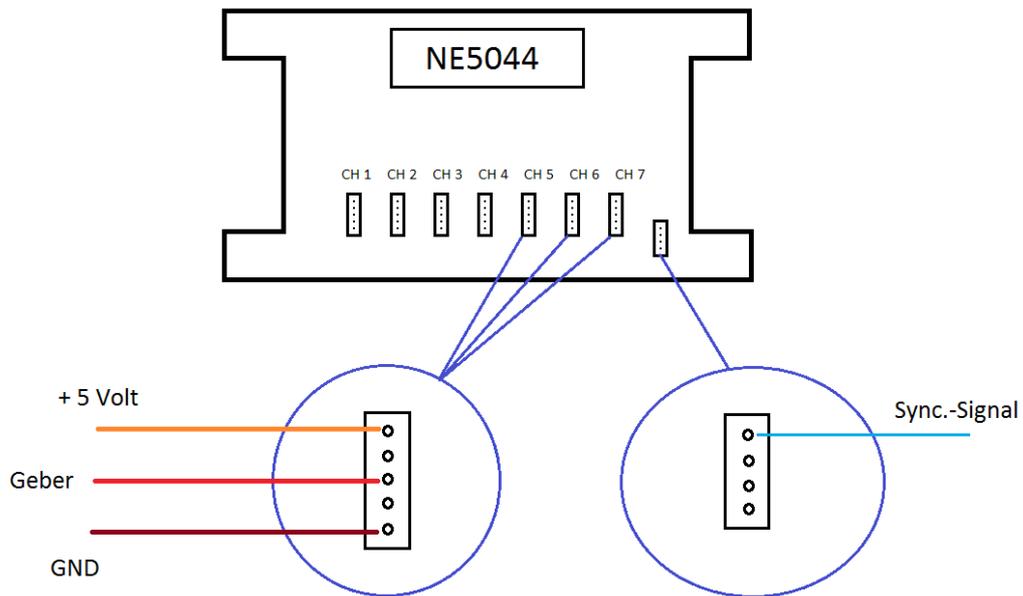


Fig. 4: Position and assignment of the connection sockets 6014 etc.

The Graupner Nautical Adapter is required for MC-18 and MC-20 transmitters. If this is not available, the sync signal is tapped from the 10-pin connector strip (interface distributor), the sync signal is applied to the 2nd pin (from the left), see Fig. 5.

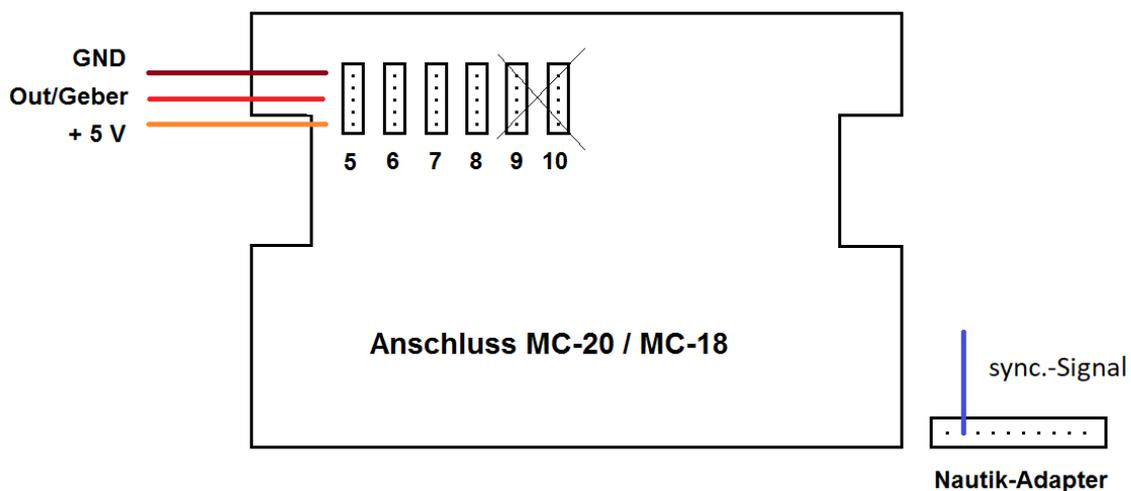


Fig. 5: Position and assignment for MC-18, MC-20, etc.

For transmitters MC-19, MC-22, MC-24 etc. with a 14-pin interface distributor, either the Graupner Nautical Adapter can be used, or the sync. signal is branched off from the 14-pin interface distributor, as shown in Fig. 6. or 7.

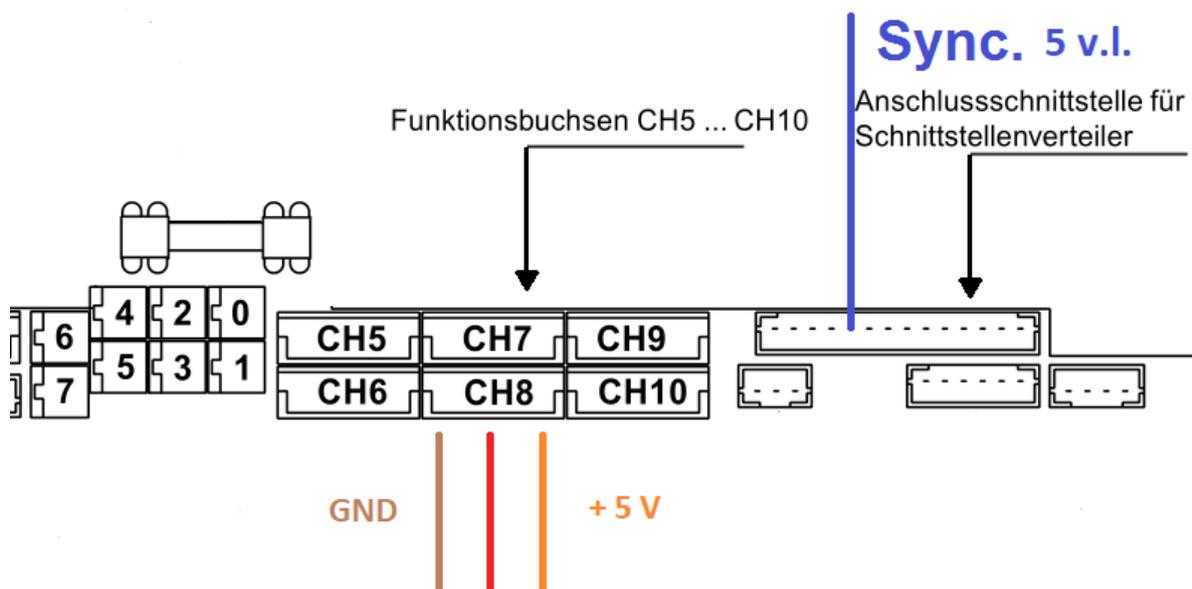


Fig. 6: 14-pin interface distributor MC-19

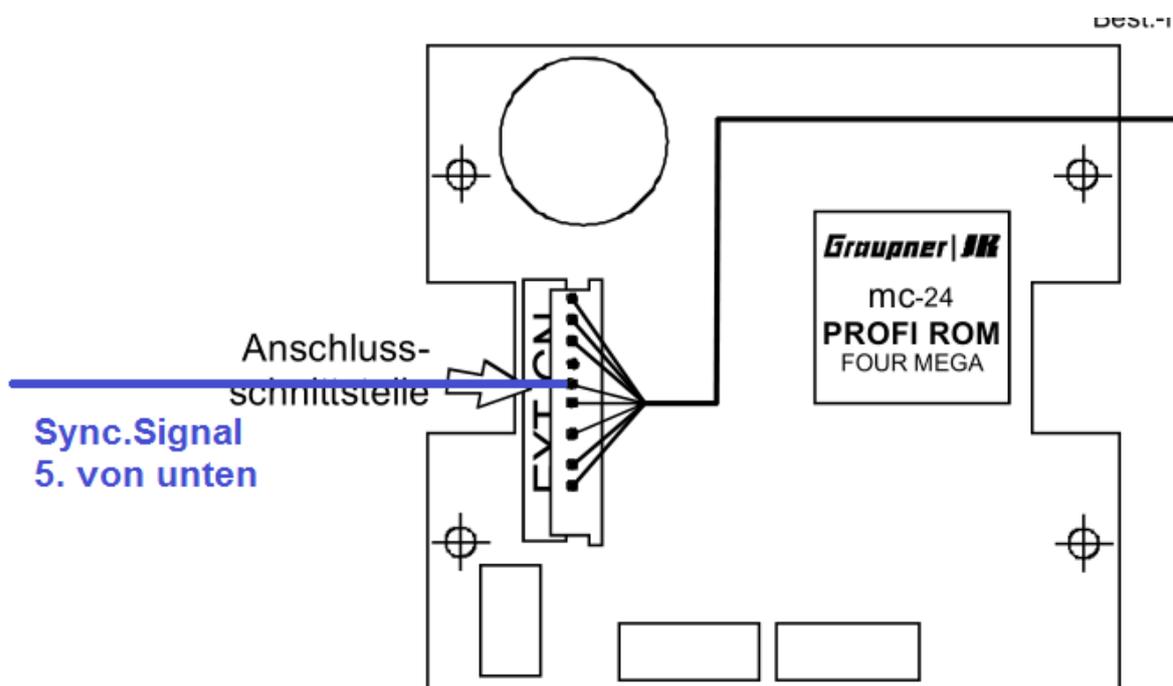


Fig. 7: 14-pin interface distributor MC-24 etc.

## Transmitter settings

Please refer to the operating instructions for your transmitter to find out under which conditions the function inputs can be assigned for the connection of a multiswitch encoder, and which settings are required for this (e.g. PPM mode, mixer, model memory, servo travel, servo direction of rotation).

## Notes on the MC-19 transmitter

### Software encoder: Nautic channel

This transmitter, like transmitters of similar design, has a built-in Software Nautic channel, which can be assigned to a desired control output in the "Basic settings model" menu. A 16-channel Multiswitch decoder can be connected to the corresponding channel on the receiver. An encoder switch module, as is the subject of these instructions, is not necessary in this case. Instead of the eight switches of the encoder, available external switches, encoders, sticks and trim switches can be assigned to the switching functions of the Multiswitch module. Please refer to the instructions for your transmitter for details.

For the operation of the 16K Multiswitch Encoder, this Nautic channel must not be activated for the same control output assigned to the function socket (CH5- CH10) to which the encoder is plugged. If the software Nautic channel is not used because one or two hardware encoders are used in the transmitter, the Nautic channel should remain deactivated.

### Settings

For the model type must be selected *ship* or *car*.

In addition, the inputs or function sockets must be assigned to an encoder (here: encoder) in the "Encoder settings" menu. The inputs are selected by turning the 3D rotary knob while it is pressed. The encoder assignment between input and encoder is done after selecting the input usually by moving the corresponding control element. Since a connected encoder sends continuously variable signals, it is immediately recognized during the assignment.

With two encoders connected, however, the assignment cannot be carried out reliably because it depends on chance which of the two encoders is recognized. Therefore, it is better to first connect only one encoder and perform the assignment. Afterwards the second encoder is connected additionally. Since the 1st assignment already exists, the 2nd assignment is now correctly recognized.

Assigning or changing other inputs with other encoders should also be done with the encoder module unplugged, otherwise one of the encoders will immediately be assigned as the encoder.

The servo travel setting can be left symmetrically at +/- 100%.

It is recommended to connect the 16K encoders to the function sockets CH8 and CH9. In the encoder settings, input 8 must then be connected to encoder 8 and input 9 to encoder 9. The decoders are connected to channel 8 and channel 9 on the receiver.

### Operation with Jeti Duplex 2.4 GHz

You need the JETIBOX to make the necessary settings. The JETIBOX can be connected either directly to the receiver or by means of a wireless connection via the transmitter. For details, please refer to the documentation of your Jeti module.

Set the following parameters:

Menu	Parameter	Value
MeasureOrSetting -> MainSetting	Output Period	ByTransmitter

Select the receiver output channel N to which the multiswitch decoder is connected on the receiver by pressing the *right arrow* key several times. The receiver output channel is designated Y in the JETIBOX.

Pressing the *down arrow* key several times takes you to the *SetInChannel Y<N>* item. Please make sure that the assigned transmitter channel matches the channel on whose function socket the encoder is plugged in.

Now set the following parameters for the selected channel:

Menu	Parameter	Value
MeasureOrSetting -> Out Pin Set	Reverse A Y<N>	off
MeasureOrSetting -> Out Pin Set	Reverse B Y<N>	off
MeasureOrSetting -> Out Pin Set	ATV HighLimit Y<N>	2.20 ms
MeasureOrSetting -> Out Pin Set	ATV LowLimit Y<N>	0.80 ms

The settings ATV HighLimit and ATV LowLimit are not critical, the cp-elektronik Multiswitch Decoder can be set to other values by a pulse width setup.

## Test

With a standard servo you can roughly test if the encoder is connected correctly in the transmitter and works. To do this, connect a servo to the receiver output provided for the decoder as a test. The synchronization signal is particularly long and therefore the servo should twitch rhythmically. If you have an oscilloscope, you can of course spare the servo this ordeal and view the multiplexed receiver signal on the screen.

## Care and maintenance

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

## Malfunction and repair

A repair of the module may only be carried out by a specialist. If you need help with a repair, please contact cp-elektronik.de (address on the last page of this manual).

## Technical data

Dimensions	65.6 mm x 34.4 mm
Weight	45 g
Operating voltage	5 V
appropriate types of transmitters	Graupner/JR MC-15, 6014, MC-18, MC-19, MC-20, MC-22, MC-24 etc.
compatible multiswitch decoders	<ul style="list-style-type: none"><li>• cp-elektronik Multiswitch Decoder</li><li>• Sound module Fa. Beier Elektronik (select <i>Mergen/cp protocol</i> in Sound-Teacher).</li></ul>

## Contact

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This product complies with national and European specifications.

## Disposal



Electrical and electronic equipment that falls under the ElektroG may not be disposed of with the residual waste, but can be handed in free of charge at the municipal collection points (e.g. recycling centres).

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