

SD-1

Schaltdecoder

Motorola-Format

Switching decoder

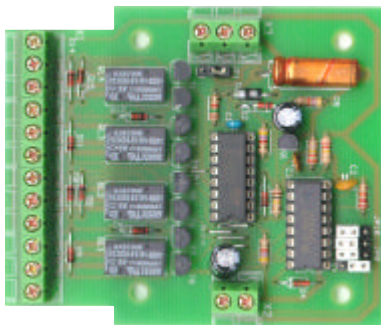
Motorola-Format

Décodeur de commutation

Format-Motorola

Schakeldecoder

Motorola-format



Art.-Nr. 21-01-058

Art.-Nr. 22-01-058

Anleitung

Manual

Mode d'emploi

Handleiding



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How to use this manual

If you have no specialist technical training, this manual gives step-by-step instructions for safe and correct assembly of the kit or fitting of ready-built modules, and operation. Before you start, we advise you to read the whole manual, particularly the chapter on safety instructions and the FAQ chapter. You will then know where to take care and how to prevent mistakes which take a lot of effort to correct.

Keep this manual safely so that you can solve problems in the future. If you pass the kit on to another person, please pass on the manual with it.

Intended use



Caution:

Integrated circuits are very sensitive to static electricity. Do not touch components without first discharging yourself. Touching a radiator or other grounded metal part will discharge you.

The kit or the ready-built module can be assembled or fitted using this manual. The module is designed for use in model railways. It analyses the digital data in motorola format sent by the central unit and switches the accessories connected to the four outputs.

The kit and the ready-built module are not suitable for children under the age of 14.

Reading, understanding and following the instructions in this manual are mandatory for the user.

Any other use of the kit is inappropriate and invalidates any guarantees.

Safety instructions

Mechanical hazards

Cut wires can have sharp ends and can cause serious injuries. Watch out for sharp edges when you pick up the PCB.

Visibly damaged parts can cause unpredictable danger. Do not use damaged parts: recycle and replace them with new ones.

Electrical hazards

- Touching powered, live components,
- touching conducting components which are live due to malfunction,
- short circuits,
- connecting the circuit to a higher voltage than designed,
- impermissibly high humidity,
- condensation of water

can cause serious injury due to electrical shock. Take the following precautions to prevent this danger:

- Never perform wiring on a powered module.
- Only use low power for this module as described in this manual and only use certified transformers.
- Connect transformers and soldering stations only in approved mains sockets installed by an authorised electrician.
- Observe cable diameter requirements.
- After the condensation of water do not start working until after a minimum of 2 hours of acclimatisation.
- Mounting the module should only be done in closed, clean, dry rooms. Beware of humidity.
- Use only original spare parts if you have to repair the module.

Fire risk

Touching flammable material with a hot soldering iron can cause life-threatening fire, burns and toxic smoke. Connect your soldering iron or

soldering station only when actually needed. Use the correct soldering iron or station and never leave a hot soldering iron or station unattended.

Thermal danger

A hot soldering iron or liquid solder accidentally touching your skin can cause skin burns. As a precaution:

- use a heat-resistant mat during soldering,
- always put the hot soldering iron in the soldering iron stand,
- point the soldering iron tip carefully when soldering, and
- remove liquid solder with a thick wet rag or wet sponge.

Dangerous environments

A working area that is too small or cramped is unsuitable and can cause accidents, fires and injury. Prevent this by working in a clean, dry room with enough freedom of movement.

Other dangers

Children can cause any of the accidents mentioned above because they are inattentive and not responsible enough. Children under the age of 14 should not be allowed to work with this kit or the ready-built module.

Little children can swallow small components with sharp edges. Life threatening! Do not allow components to reach small children.

In schools, training centres, clubs and workshops, assembly must be supervised by qualified personnel.

In industrial institutions, health and safety regulations applying to electronic work must be adhered to.

EMC declaration

This product is developed in accordance with the European standards EN 55014 and EN 50082-1, tested corresponding to the EC - directive 89/336/EEG (EMVG of 09/11/1992, electromagnetic tolerance) and meets legal requirements.

To guarantee the electromagnetic tolerance you must take the following precautions:

- Connect the transformer only to an approved mains socket installed by an authorised electrician.
- Make no changes to the original parts and accurately follow the instructions, circuit diagram and PCB layout included with this manual.
- Use only original spare parts if you have to repair the kit or the ready-built module.

Operation overview

The central unit sends digital data in motorola format for one of four solenoid accessories numbered in succession (e.g. 1 to 4, 5 to 8, 9 to 12 etc.) to the address of the switching decoder. The decoder analyses the data and switches the connected accessory or accessories

Jumpers are used to select addresses.

The data flow in the switching decoder is as follows: When the central unit sends data, IC2 on the points decoder checks if the data is assigned to its address. If so, the data is transmitted to IC1, which chooses the right accessory and drives the relevant relay to switch the connected accessory or accessories.

It is possible to connect to each of the four outputs of the switching decoder:

one accessory to switch on or off or

two accessories to switch over.

The switching decoder normally is powered by the connected booster or the central unit. Alternatively it is possible to power the switching decoder with a separate transformer to relieve the digital circuit.

Technical specifications

Supply voltage	Digital voltage of the central unit or 14 – 20 V alternating voltage
Current consumption (without connected accessories)	ca. 20 mA
Max. current loading	1.000 mA
Protected to	IP 00
Ambient temperature in use	0 - + 60° C
Ambient temperature in storage	-10 - + 80° C
Comparative humidity allowed	max. 85 %
Dimensions	ca. 73 x 80 mm
Weight	ca. 51 g

Checking the package contents

Check the contents of the package for completeness:

- 1 kit, containing the components listed in the parts list and 1 PCB or
- 1 ready-built module,
- 1 manual.

Required tools and consumables

Make sure you have the following tools, equipment and materials ready for use:

- a heat-resistant mat
- a soldering iron stand with tip-cleaning sponge
- a small side cutter and wire stripper
- a pair of tweezers and long nose pliers (not necessary for the ready-built module)
- an electronic soldering iron (max. 30 Watt) with a fine tip
- tin solder (0,5 mm. diameter)
- wire (diameter: $\geq 0,14 \text{ mm}^2$ for all connections)

Safe and correct soldering



Caution:

Incorrect soldering can cause fires (through excessive heat). Avoid this danger by reading the chapter **Safety instructions** again and following the directions given.

If you have had training in soldering you can skip this chapter.

- When soldering electronic circuits never use soldering-water or soldering grease. They contain acids that can corrode components and copper tracks.
- Only use tin solder SN 60 Pb (i.e. 60 % tin, 40 % lead) with rosin-based flux.
- Solder fast: long soldering can destroy components and copper tracks, and damages through plated holes.
- Use a small soldering iron with max. 30 Watt. Keep the soldering tip clean so the heat of the soldering iron is applied to the solder point effectively.
- Observe correct polarity orientation of semi-conductors, LEDs electrolytic capacitors and integrated circuits before soldering and ensure that the solder time does not exceed 5 seconds, otherwise components can be damaged.
- Apply the soldering tip to the soldering spot in such a way that the part and the soldering spot are heated at the same time. Simultaneously add solder (not too much). As soon as the solder becomes liquid take it away. Hold the soldering tip at the spot for a few seconds so that the tin solder finds its way, then remove the soldering iron.
- Do not move the component for about 5 seconds after soldering. A glossy and perfect soldering spot should remain.
- To make a good soldering joint you must use a clean and unoxidised soldering tip. Clean the soldering tip with a damp piece of cloth, a damp sponge or a piece of silicon cloth.

- Cut the wires after soldering directly above the PCB solder side with a side cutter.
- After placing the parts, please double check for correct polarity. Check the PCB tracks for solder bridges, short circuits created by accident. This would cause faulty operation or, in the worst case, damage. You can remove excess solder by putting a clean soldering tip on the spot. The solder will become liquid again and flow from the soldering spot to the soldering tip.

Assembling the kit

You can skip this part if you have a ready-built module.

Preparation

Put the sorted components in front of you on your workbench. An explanation of the separate electronic components follows:

Resistors



A resistor will "brake" the current. Mounting orientation is of no importance. Because resistors are very small there is no readable information on them, but their value is given with colour rings.

Key:

Value	Colour ring
1,5 k Ω	brown - green - red (gold)
4,7 k Ω	yellow - violet - red (gold)
22 k Ω	red - red - orange (gold)
47 k Ω	yellow - violet - orange (gold)
100 k Ω	brown - black - yellow (gold)
220 k Ω	red - red - yellow (gold)
330 k Ω	orange - orange - yellow (gold)

The colour ring in brackets indicates the tolerance of the resistor and is of no importance here.

Capacitors



There is a difference between “normal” capacitors and electrolytic capacitors which have to be placed in a certain direction. They have a very bright line at one end marked with the minus (-) sign. That end must always be connected to minus.



Transistors

Transistors are in fact power switches. They have three wires and a flat part on the body. They also have to be placed in a certain direction. The PCB layout will help you to place the transistor. In the layout, the flat part of the transistor is shown.



Diodes

Diodes allow current to flow in one direction only and have to be placed in that direction. The characteristic for a diode is the ring at one end. Place them as drawn in the PCB layout.



ICs:

The notch on the IC shows the mounting orientation. The PCB layout shows this marking.

Relais



Relais are electronic change-over switches. The notch on the relais shows the mounting orientation. The PCB layout shows this marking.

Terminal strips

Terminal strips are solder-in screw-type terminals. They provide a solder-free and safe connection of the cables to the circuit.

Assembling the kit

Start the assembly with the resistors. First solder the components on the solder side of the PCB and then cut the excess wires with the side cutter, as short as possible. Insert the wire bridges Br1 to Br5, using the off-cut wires of the resistors.

**Caution:**

The bridges should not contact each other!

Continue the assembly with the diodes. Then insert and solder in the IC-sockets for the ICs, which must be mounted as marked on the PCB.

**Caution:**

Do not touch the IC without first discharging yourself by touching a radiator or other grounded metal parts. Do not bend the "legs" of the IC.

Next solder the capacitors and the transistors. Continue with the relays.

**Caution:**

Electrolytic capacitors, transistors, ICs, diodes and relays must be placed in the right direction! If you solder them the wrong way the affected parts can be damaged when you connect the power. In the worst case the whole circuit can be damaged. In any case, a wrongly connected part will not function.

Next solder the bridge at JP1. With this bridge you define if the decoder is powered by the central unit or a transformer of its own. Follow the connections diagram fig. 3 and 3a.

Then solder the terminal strips X1 to X3 and the solder pins JP7 to JP10. Before mounting, assemble the terminal strips. Finally, insert the ICs into the soldered IC-sockets.

Performing a visual check

Even if you have a ready-built module you must perform a visual check that screws, plugs and other fasteners are firm and tight to exclude transport damage.

**Caution:**

Do not power up the module yet.

Damaged material and/or incorrect handling of parts can always be a danger. After assembling the kit, perform a visual inspection.

Check all nuts, pins and connections as well as the mechanical connections for correct assembly.

Remove all loose parts, wire ends or drops of solder from the PCB.

Remove all sharp wire ends.

Check solder spots that are too close to each other for short circuits.

Check that all components are polarised correctly. When you have taken all these precautions, go on to the next part.

Connecting the switching decoder



Caution:

If a component gets too hot, disconnect the switching decoder and power supply from the mains **immediately**. Possible short circuit! Check the assembly!



Caution:

Switch off the central unit before connecting the switching decoder!

There are terminal strips soldered to the in- and outputs. Insert the connecting cables into the relevant terminals and fasten the screws.

The Connections diagram (fig. 3) shows the correct assembly.

Start by connecting the accessory or accessories with the relevant outputs from the switching decoder. Continue by connecting the central unit and/or the transformer to the switching decoder decoder, which has interconnected connection points on two sides. This offers the possibility of connecting further decoders. It is irrelevant which side of the decoder you connect to the central unit.



Caution:

Take care to connect the red and the brown wire of the central unit correctly.

Now adjust the required address on the decoder. The table on page IV shows how to assemble the short-circuit terminations. Then turn on the central unit and switch the connected accessories to check that they switch correctly.

FAQ

- Parts are getting too hot and/or start to smoke.



Disconnect the system from the mains immediately!

Possible cause: one or more components are soldered incorrectly.

→ Perform a visual check.

- The switching decoder does not work.

Possible cause: The connection to the central unit or in case to the transformer is interrupted.

→ Check the connection between the module and the central unit resp. the transformer.

Possible cause: The wires from the central unit to the switching decoder are incorrectly connected.

→ Check the wiring against the connections diagram (fig. 3).

Possible cause: The connection of the decoder to the accessory or accessories is interrupted.

→ Check the connection from the module to the accessory or accessories.

Possible cause: The central unit or the transformer is not operating.

→ Check if the central unit resp. the transformer is ready for operation.

Possible cause: The accessory or accessories is /are defective.

→ Check the accessory/-is.

If you cannot find the problem, please return the module for repair (address on the cover page).

Manufacturer's note

According to DIN VDE 0869, the person who builds this kit or brings the circuit into operation is the manufacturer of the product. If he sells the product to another person he is responsible for passing on all the relevant papers. Domestic appliances assembled from a kit are deemed industrial products and must comply with health and safety regulations.

Certification

This product conforms with the EC- directive 89/336/EEG on electromagnetic radiation and is therefore CE certified.

Conditional warranty

This product is guaranteed for two years. The warranty includes free repair if the problem is due to material failure or incorrect assembly of the ready-built module by us. Because we have no control over the assembly of the kit, we can only guarantee the quality of the components and the completeness of the kit.

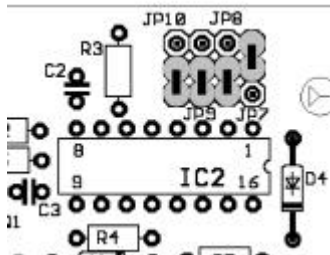
Other claims are excluded. By law, we are not responsible for damages or secondary damages in connection with this product. We retain the right to repair, make improvements, supply spare parts or return the purchase price.

The following invalidate the warranty:

- using an unsuitable soldering iron, solder containing liquid acids or similar,
- if the kit is assembled and soldered poorly, or if damage is caused by not following the instructions in this manual or the circuit diagram,
- if the circuit has been altered and repair attempts have failed,
- if arbitrary changes in the circuit are made,
- if parts are stored incorrectly and if the wires to the switches, the power resistors, etc. are made incorrectly,
- if parts other than the original ones delivered with this kit are used,
- if the copper tracks or soldering points are damaged,
- if parts are placed incorrectly or the circuit is connected incorrectly,
- if damage occurs due to an overload of the circuit,
- if the wrong power or current is connected,
- if damaged by other persons,
- if damaged by the wrong use or abuse of the circuit,
- if parts are damaged due to static because they were touched before a discharge is performed.

Einstellung der Adresse / Adjusting the address

Réglage de l'adresse / Instellen van het adres



Beispiel:

Einstellung der Adresse "1"

Example:

Adjusting the address "1"

Exemple:

Réglage de l'adresse "1"

Voorbeeld:

Instellen van adres "1"

Adresse Address Adresse Adres	Verbraucher Accessory Accessoire Verbruiker	JP7	JP8	JP9	JP10
1	1 – 4	2 – 3	1 – 2	1 – 2	1 – 2
2	5 – 8	--	1 – 2	1 – 2	1 – 2
3	9 – 12	1 – 2	2 – 3	1 – 2	1 – 2
4	13 – 16	2 – 3	2 – 3	1 – 2	1 – 2
5	17 – 20	--	2 – 3	1 – 2	1 – 2
6	21 – 24	1 – 2	--	1 – 2	1 – 2
7	25 – 28	2 – 3	--	1 – 2	1 – 2
8	29 – 32	--	--	1 – 2	1 – 2
9	33 – 36	1 – 2	1 – 2	2 – 3	1 – 2
10	37 – 40	2 – 3	1 – 2	2 – 3	1 – 2
11	41 – 44	--	1 – 2	2 – 3	1 – 2
12	45 – 48	1 – 2	2 – 3	2 – 3	1 – 2
13	49 – 52	2 – 3	2 – 3	2 – 3	1 – 2
14	53 – 56	--	2 – 3	2 – 3	1 – 2
15	57 – 60	1 – 2	--	2 – 3	1 – 2
16	61 – 64	2 – 3	--	2 – 3	1 – 2
17	65 – 68	--	--	2 – 3	1 – 2
18	69 – 72	1 – 2	1 – 2	--	1 – 2

Adresse Address Adresse Adres	Verbraucher Accessory Accessoire Verbruiker	JP7	JP8	JP9	JP10
19	73 – 76	2 – 3	1 – 2	--	1 – 2
20	77 – 80	--	1 – 2	--	1 – 2
21	81 – 84	1 – 2	2 – 3	--	1 – 2
22	85 – 88	2 – 3	2 – 3	--	1 – 2
23	89 – 92	--	2 – 3	--	1 – 2
24	93 – 96	1 – 2	--	--	1 – 2
25	97 – 100	2 – 3	--	--	1 – 2
26	101 – 104	--	--	--	1 – 2
27	105 – 108	1 – 2	1 – 2	1 – 2	2 – 3
28	109 – 112	2 – 3	1 – 2	1 – 2	2 – 3
29	113 – 116	--	1 – 2	1 – 2	2 – 3
30	117 – 120	1 – 2	2 – 3	1 – 2	2 – 3
31	121 – 124	2 – 3	2 – 3	1 – 2	2 – 3
32	125 – 128	--	2 – 3	1 – 2	2 – 3
33	129 – 132	1 – 2	--	1 – 2	2 – 3
34	133 – 136	2 – 3	--	1 – 2	2 – 3
35	137 – 140	--	--	1 – 2	2 – 3
36	141 – 144	1 – 2	1 – 2	2 – 3	2 – 3
37	145 – 148	2 – 3	1 – 2	2 – 3	2 – 3
38	149 – 152	--	1 – 2	2 – 3	2 – 3
39	153 – 156	1 – 2	2 – 3	2 – 3	2 – 3
40	157 – 160	2 – 3	2 – 3	2 – 3	2 – 3
41	161 – 164	--	2 – 3	2 – 3	2 – 3
42	165 – 168	1 – 2	--	2 – 3	2 – 3
43	169 – 172	2 – 3	--	2 – 3	2 – 3
44	173 – 176	--	--	2 – 3	2 – 3
45	177 – 180	1 – 2	1 – 2	--	2 – 3
46	181 – 184	2 – 3	1 – 2	--	2 – 3
47	185 – 188	--	1 – 2	--	2 – 3
48	189 – 192	1 – 2	2 – 3	--	2 – 3
49	193 – 196	2 – 3	2 – 3	--	2 – 3

Adresse Address Adresse Adres	Verbraucher Accessory Accessoire Verbruiker	JP7	JP8	JP9	JP10
50	197 – 200	--	2 – 3	--	2 – 3
51	201 – 204	1 – 2	--	--	2 – 3
52	205 – 208	2 – 3	--	--	2 – 3
53	209 – 212	--	--	--	2 – 3
54	213 – 216	1 – 2	1 – 2	1 – 2	--
55	217 – 220	2 – 3	1 – 2	1 – 2	--
56	221 – 224	--	1 – 2	1 – 2	--
57	225 – 228	1 – 2	2 – 3	1 – 2	--
58	229 – 232	2 – 3	2 – 3	1 – 2	--
59	233 – 236	--	2 – 3	1 – 2	--
60	237 – 240	1 – 2	--	1 – 2	--
61	241 – 244	2 – 3	--	1 – 2	--
62	245 – 248	--	--	1 – 2	--
63	249 – 252	1 – 2	1 – 2	2 – 3	--
64	253 – 256	2 – 3	1 – 2	2 – 3	--
65	257 – 260	--	1 – 2	2 – 3	--
66	261 – 264	1 – 2	2 – 3	2 – 3	--
67	265 – 268	2 – 3	2 – 3	2 – 3	--
68	269 – 272	--	2 – 3	2 – 3	--
69	273 – 276	1 – 2	--	2 – 3	--
70	277 – 280	2 – 3	--	2 – 3	--
71	281 – 284	--	--	2 – 3	--
72	285 – 288	1 – 2	1 – 2	--	--
73	289 – 292	2 – 3	1 – 2	--	--
74	293 – 296	--	1 – 2	--	--
75	297 – 300	1 – 2	2 – 3	--	--
76	301 – 304	2 – 3	2 – 3	--	--
77	305 – 308	--	2 – 3	--	--
78	309 – 312	1 – 2	--	--	--
79	313 – 316	2 – 3	--	--	--
80	317 – 320	1 – 2	1 – 2	1 – 2	1 – 2

Stückliste - Parts list - Nomenclature - Stuklijst

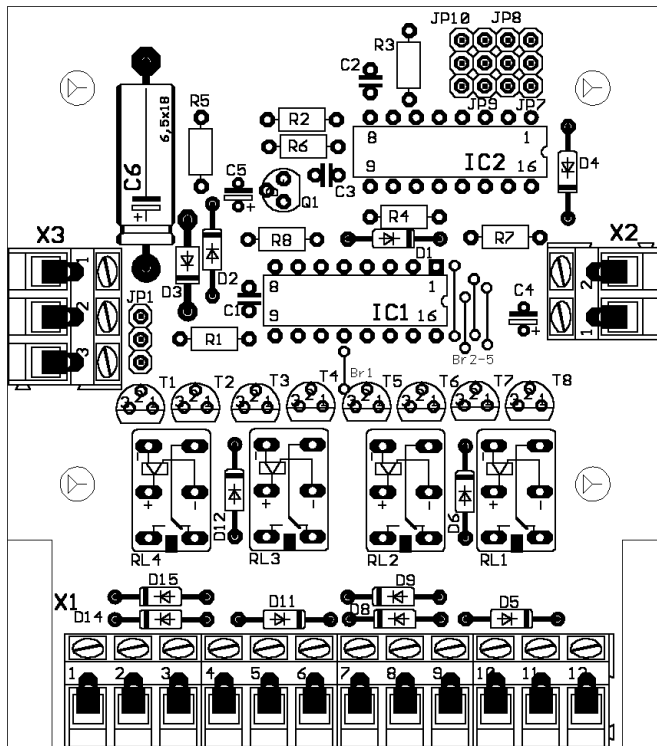
Kondensatoren - Condensers Condensateurs - Condensatoren	C1	100 nF
	C2	1,8 nF
	C3	3,9 nF
	C4	100 µF
	C5	10 µF
	C6	220 µF/25 V
Dioden - Diodes Diodes - Diodes	D1, D2, D5, D6, D8, D9, D11, D12, D14, D15	1N4148 *
	D3	1N4004 *
Zener-Dioden - Zener diodes Diodes Zener - Zenerdiodes	D4	ZD 5,1 V *
IC's - ICs - CI's - ICs	IC1	4051
	IC2	145027
IC-Sockel - IC-socket Soquet IC - IC-voetje	IC1	16-pol.
	IC2	16-pol.
Relais	RL-1, RL-2, RL-3, RL-4	V23026
Stiftleisten – Solder pins Fiches – Pinstrips	JP7 – JP10	4x3-pol. / 3x4-pol.
Transistoren – Transistors	Q1	BC547B *
	T1 – T8	BC557
Widerstände Resistors Résistances Weerstanden	R1	1,5 kΩ
	R2	220 kΩ
	R3	22 kΩ
	R4	100 kΩ
	R5	47 kΩ
	R6	330 kΩ
	R7, R8	4,7 kΩ
Anreihklemme - Terminal strips Borniers - Printkroonsteen	X1	12-pol.
	X2	2-pol.
	X3	3-pol.

* oder ähnlich - or similar - ou équivalent - of gelijkwaardig

Bestückungsplan - PCB layout

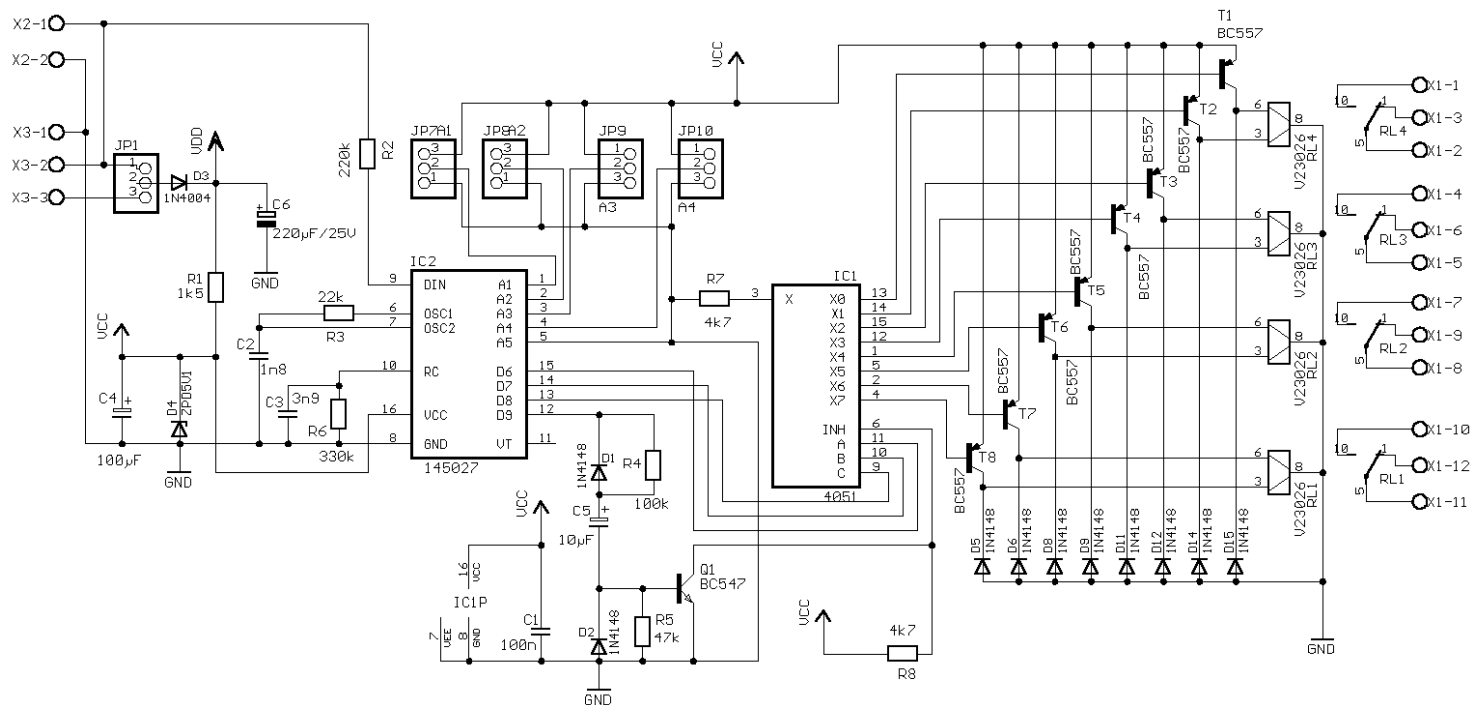
Plan d'implantation - Printplan

■ Fig. 1



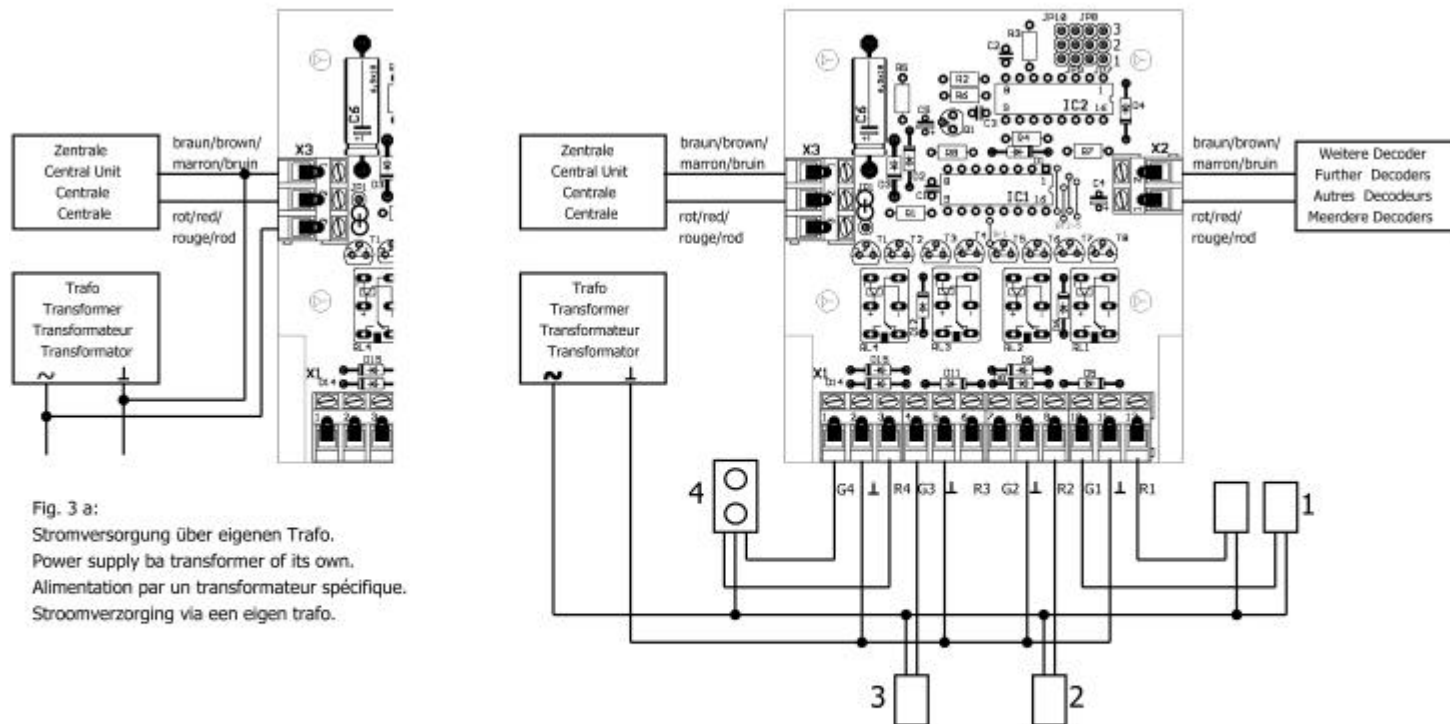
Schaltplan – Circuit diagram - Schéma de principe - Schakelschema

■ Fig. 2



Anschlußplan – Connections - Plan de raccordement - Aansluit plan

■ Fig. 3



- | | | | | | | | |
|---|---|---|---|---|---|---|------------------------------------|
| 1 | Verbraucher, zwischen denen umgeschaltet wird.
Accessories to switch over.
Accessoires entre lesquels on bascule.
Verbruikers waartussen omgeschakeld wordt. | 2 | Verbraucher, der über "R" eingeschaltet wird.
Accessory to switch on via "R".
Accessoire commuté par "R".
Verbruiker die via "R" geschakeld wordt. | 3 | Verbraucher, der über "G" eingeschaltet wird.
Accessory to switch on via "R".
Accessoire commuté par "G".
Verbruiker die via "G" geschakeld wordt. | 4 | Signal
Signal
Signal
Sein |
|---|---|---|---|---|---|---|------------------------------------|

Aktuelle Informationen und Tipps:

Information and tips:

Informations et conseils:

Actuele informatie en tips:

<http://www.tams-online.de>

Garantie und Service:

Warranty and service:

Garantie et service:

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