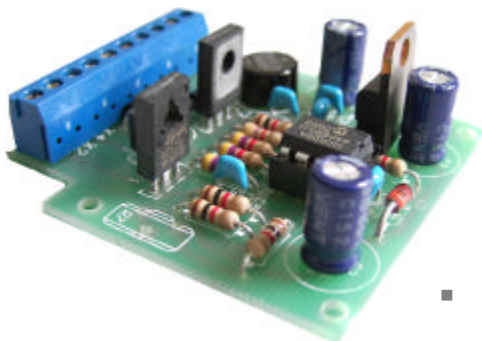


FCS-R



Radarfalle
für Faller* Car-System

Speed trap compatible
to the Faller* Car-System

Flash de radar
de contrôle de vitesse
du Faller* Car-System

Radarcontrole voor
het Faller* Car System

Art.-Nr. 21-01-077 / 22-01-077

Anleitung

Manual

Mode d'emploi

Handleiding

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* **"Faller"** is a registered and protected trade mark of the Gebrueder Faller GmbH, Guetenbach, Germany.

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 and fitting of the ready-built module, 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 or the ready-built module on to another person, please pass on the manual with it.

Intended use

The kit or the ready-built module can be assembled or operated using this manual. The ready-built module is designed for use in sections of the Faller* Car-System.

The kit and the ready-built module should not be assembled or fitted by children under the age of 14.

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

Any other use is inappropriate and invalidates any guarantees.



Caution:

The circuit contains integrated circuits. These 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.

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 another voltage than specified,
- impermissibly high humidity,
- condensation build up

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

- Never perform wiring on a powered module.
- Assembling and mounting the kit should only be done in closed, clean, dry rooms. Beware of humidity.
- Only use low power for this module as described in this manual and only use certified transformers.
- Connect transformers and soldering irons only in approved mains sockets installed by an authorised electrician.
- Observe cable diameter requirements.
- After condensation build up, allow a minimum of 2 hours for dispersion.
- Use only original spare parts if you have to repair the kit or the ready-built module.

Fire risk

Touching flammable material with a hot soldering iron can cause fire, which can result in injury or death through burns or suffocation. Connect your soldering iron or soldering station only when actually needed. Always keep the soldering iron away from inflammable materials. Use a suitable soldering iron stand. 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 from the soldering tip.

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, with fatal results! 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 module responds to vehicles of the car system crossing a reed contact, mounted into the lane. The speed trap's flash is activated by a random switch after the 3rd to 9th vehicle have crossed the reed contact.

As soon as the speed trap's flash has been activated

- points situated in direction of motion are set to „branch“ in order to direct the vehicle caught speeding to a car park,
- a light (electric light bulb or LED) mounted into a policeman's signalling disc flashes, and
- a stop in the car park is activated.

As soon as the vehicle has crossed a reed contact mounted between the points and the stop in the car park

- the points are set back to „straight on“ and
- the flashing light is switched off.

The vehicle halts for approx. 20 seconds at the stop (the time for taking down the driver's particulars) before the stop is released again. During this time no other vehicle can be caught speeding.

To avoid collisions with following vehicles the halting time for the vehicle caught speeding is prolonged for approx. 6 seconds at a time when another vehicle crosses the reed contact mounted into the lane.

As soon as the vehicle caught speeding is running on the lane again the sequence starts anew.

Technical specifications

Supply voltage	16-18 Volt a.c. voltage
Current consumption (without connected loads)	ca. 20 mA
Max. current at the outputs „flashing light“ / „speed trap´s flash“ (3-2 / 4-2)	100 mA each
Max. current at the outputs „points“ / „stop“ (3-1 / 4-1)	500 mA each
Protected to	IP 00
Ambient temperature in use	0 - + 60 °C
Ambient temperature in storage	-10 - + 80 °C
Comparative humidity allowed	max. 85 %
Dimensions	approx. 48 x 52 mm
Weight	approx. 17 g

Checking the package contents

Check the contents of the package for completeness immediately after unpacking:

- one kit, containing the components listed in the parts list (see page I) and one PCB or
- one ready-built module,
- two reed contacts,
- one manual.

Required tools and consumables

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

- an electronic soldering iron (max. 30 Watt) with a fine tip,
- a soldering iron stand,
- a tip-cleaning sponge,
- a heat-resistant mat,
- a small side cutter and wire stripper,
- a pair of tweezers and long nose pliers (not necessary for the ready-built module),
- tin solder (0,5 mm. diameter),
- wire (diameter: $\geq 0,25 \text{ mm}^2$ for all connections),
- four electric light bulbs for testing the module.

Safe and correct soldering



Caution:

Incorrect soldering can cause dangers through fires and heat. Avoid these dangers by reading and following the directions given in the chapter **Safety instructions**. If you have had training in soldering you can skip this chapter.

- 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.
- Only use electronic tin solder with flux.
- When soldering electronic circuits never use soldering-water or soldering grease. They contain acids that can corrode components and copper tracks.
- Solder quickly: holding the iron on the joints longer than necessary can destroy components and can damage copper tracks or soldering eyes.

- 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 eye 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 solder flows into the joint, then remove the soldering iron.
- Do not move the component for about 5 seconds after soldering.
- 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 and 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.

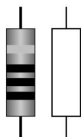
Assembling the kit

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

Preparation

Put the sorted components in front of you on your workbench. The separate electronic components have the following special features you should take into account to prevent mistakes in assembling:

Resistors



Resistors reduce current. Their mounting orientation is of no importance. The value of resistors for smaller power ratings (under 5 W) is indicated through colour rings. Every colour stands for another figure. The colour ring in brackets indicates the tolerance of the resistor which here is of no importance.

Value	Colour rings
1 k Ω	brown - black - red (gold)
4,7 k Ω	yellow - violet - red (gold)

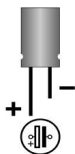
Capacitors



Among other things capacitors are used for filtering interference voltages or as frequency determining parts. Ceramic capacitors are not polarized, for that reason their mounting orientation is of no importance. Normally they are marked with a three-digit number which indicates the value coded.

Value	Number
100 nF	104

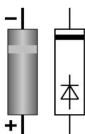
Electrolytic capacitors



Electrolytic capacitors are often used to store energy. In contrast to ceramic capacitors they are polarized. One of the two leads is marked with a minus sign which indicates the mounting orientation. The value is given on the casing.

Electrolytic capacitors are available with different voltage sustaining capabilities. Using an electrolytic capacitor with a voltage sustaining capability higher than required is always possible.

Diodes



Diodes allow the current to pass through in one direction only (forward direction), simultaneously the voltage is reduced by 0,3 to 0,8 V. Exceeding of the limit voltage always will destroy the diode, and allow current to flow in the reverse direction.

The diode type is printed on the body.

Diodes must be mounted in a given direction. The negative end is marked with a ring. This is shown in the PCB layout.

Zener diodes

Zener diodes are used for limiting voltages. In contrast to „normal“ diodes they are not destroyed when the limit voltage is exceeded.

Rectifiers



Rectifiers convert alternating into direct voltage, they have hardly no influence on the level of the voltage. They have four pins: two for the input voltage (a.c. voltage) and two for the output voltage (d.c. voltage). The pins for the output voltage are polarized. The pin connections are printed on the housing. As usual with wired components the longer connecting pin is the positive pole.

Transistors



Transistors are current amplifiers which convert low signals into stronger ones. They have three contacts. As they are polarized, they have to be mounted in a certain direction.



BC-Types have a housing in form of a half cylinder (SOT-housing). The cross section is shown in the PCB Layout which determines the mounting orientation.



The BD types have a flat housing (TO-housing) with the type designation printed on the front side. The metallic rear is unlabelled, on the PCB layout the rear is marked by a thick line.

Integrated circuits (ICs)



Depending on the type, ICs fulfil various tasks. They are polarized and therefore have to be mounted in a certain direction. The most common housing form is the so-called "DIL"-housing, from which 4, 6, 8, 14, 16, 18 or more "legs" (pins) are arranged along the long sides. The mounting orientation is shown by a semicircular or circular marking at the end of the housing, which is also shown on the PCB layout.

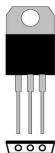
ICs are sensitive to damage during soldering (heat, electrostatic charging). For that reason in the place of the ICs IC sockets are soldered in, in which the ICs are inserted later. The mounting orientation of the sockets is preset as well. The

markings on the PCB, the socket and the IC must lie on top of each other after mounting.

Micro-Controller

Micro-controller are ICs, which are individually programmed for the particular application. When leaving the manufacturer's works their memory is empty. The programmed controller normally are only available from the manufacturer of the circuit belonging to it.

Voltage regulators



Voltage regulators are ICs, which convert a variable, non regulated input voltage in a constant output voltage. They are produced in transistor housings with three connecting pins for input, output and earth.

With voltage regulators in a flat TO-housing the unlabelled metallic rear is marked by a thick line on the PCB layout.

Reed contacts



Depending on their version reed contacts fulfill the task of a closer or a change-over switch. They respond to a magnetic field, thus making possible contactless switching operations. They consist of a glass bulb filled with a protective gas. Sealed in the glass bulb are two or three reeds made of a magnetic material. When bending the legs the glass bulb they can be easily damaged through mechanical strain.

Terminal strips

Terminal strips are solder-in screw-type terminals. They provide a solder-free and safe connection of the cables to the circuit, which can still be separated any time. When several terminal strips have to be mounted side by side, they have to be put together before mounting.

Assembling the kit

Start the assembly with the resistors and the diodes. First solder the components on the solder side of the PCB and then cut the excess wires with the side cutters, as short as possible.

Then insert and solder in the IC-socket and the rectifier. The socket must be mounted according to the marking on the PCB.

Continue the assembly with the capacitors, the transistors, the voltage regulator and the electrolytic capacitors.



Caution:

Diodes, ICs, rectifiers, transistors, voltage regulators and electrolytic capacitors must be placed in the right direction! If you solder them the wrong way around the affected parts can be damaged when you connect the power. In the worst case the whole circuit can be damaged. At the best, a wrongly connected part will not function.

Continue the assembly by soldering the terminal strips. Join them together before soldering. Finally, insert the IC into the soldered IC-socket.



Caution:

Do not touch the ICs without first discharging yourself by touching a radiator or other grounded metal parts. Do not bend the "legs" of the ICs when inserting them into the sockets. Check that the markings on the PCB, the socket and the IC point to the same direction.

Finally solder the terminal strips. Join them together before soldering.

Performing a visual check

Due to material defects and/or improper assembly there may be risks of injury. Transport damage to ready-built modules is also possible. So you must perform a visual check after the assembly or after unpacking the module.



Caution:

Do not power up the module yet.

The following points are inapplicable if you have purchased a ready-built module.

- Remove all loose parts, wire ends or drops of solder from the PCB. Remove all sharp wire ends.
- Check that solder contacts which are close to each other are not unintentionally connected to each other. Risk of short circuit!
- Check that all components are polarised correctly.

When you have remedied all faults, go on to the next part.

Performing a functional check and connecting the module

Follow the connection diagram (fig. 3) and the following table.

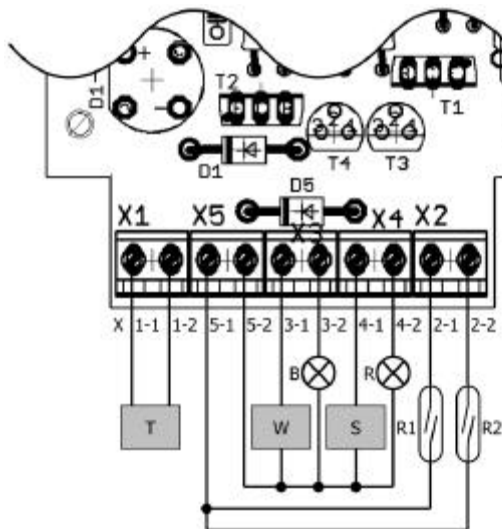


Fig. 3:
Connection
diagram

Functional test

It is recommended to test the module with four light bulbs first, so that faults in the module can be detected and eliminated more easily than when connected to the car system lane. Even if you have purchased a ready-built module performing a functional test is recommended as transport damage never can be excluded.

In order to perform the functional test, connect according to the connection diagram and the table „Connections“.

Connections

Input / Output		Functional test	Car system lane
1-1	T	Transformer	Transformer
1-2	T	Transformer	Transformer
2-1	R1	Reed contact 1	Reed contact „lane“
2-2	R2	Reed contact 2	Reed contact „car park“
3-1	W	Electric light bulb 1	Points
3-2	B	Electric light bulb 2	Flashing light
4-1	S	Electric light bulb 3	Stop
4-2	R	Electric light bulb 4	Speed trap flash
5-1		Return conductor for reed contacts	Return conductor for reed contacts
5-2		Return conductor for electric light bulbs	Return conductor for connected loads



Caution:

Do not connect the module to the power supply before having made all connections!

First switch the reed contact 1 at X2-1 („lane“) with a magnet several times. After releasing the reed contact three to nine times

- the light 4 connected to X4-2 should flash shortly,
- the light 2 connected to X3-2 should flash alternately,
- the lights 1 and 3 connected to X3-1 and X4-1 should light.

Next switch the reed contact 2 at X2-2 („car park“) with a magnet once. Now the lights 1 and 2 connected to X3-1 and X3-2 should go out. The light 3 lights for approx. another 20 seconds before it goes out.

**Caution:**

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

After a successful function test, disconnect the module from the power supply and the temporary wiring, and connect it to your car system lane. You can connect either light bulbs or LED to the outputs X3-2 and X4-2.

**Caution:**

If you use light-emitting diodes (LEDs) you must always operate them via a series resistor.

**Caution:**

If you connect polarized loads to the outputs 3-1, 3-2, 4-1 or 4-2 (e.g. LEDs) you should connect the return conductor (+ pole) to the connecting point 5-2 (return conductor for connected loads).

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 speed trap's flash is not activated although more than nine vehicles have crossed the reed contact in the lane.

Possible cause:

The reed contact in the lane has been placed wrongly or too deep, and therefore does not react to the magnets in the vehicles.

→ Check the position of the reed contact and change it if necessary.

- After a vehicle caught speeding has accessed the car park the points are not reset and the flashing light does not go out.

Possible cause:

The reed contact in the car park has been placed wrongly or too deep and therefore does not react to the magnets in the vehicles.

→ Check the position of the reed contact and change it if necessary.

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.

Conditions of warranty

This product is guaranteed for two years. The warranty includes the correction of faults which can be proved to be due to material failure or factory flaw. As we have no control over the correct and proper assembly and mounting we can only guarantee the quality of the components and the completeness of kits. We guarantee the function of the parts according to the parameters in not mounted state as well as the adherence to the technical specifications of the circuit when assembled and connected according to the manual.

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,
- if the ready-built module has been altered and repair attempts have failed,
- if arbitrary changes in the circuit are made,
- if the circuitry is changed in any way, through adding or omitting wiring or components, or through modifying the circuit board,
- if parts other than the original ones delivered with this kit are used,
- if the copper tracks or soldering eyes are damaged,
- when components are mounted incorrectly, or if the components or the circuit are poled incorrectly, also subsequent damage resulting from these faults,
- if damage occurs due to an overload of the module,
- if connected to a incorrect voltage or current,
- if damaged by other persons,
- if damaged by faulty operation or if damaged by careless use or abuse,
- if damaged by touching components before electrostatic discharging of the hands.

Stückliste - Parts list - Nomenclature - Stuklijst

Widerstände - Resistors	R1, R2, R9	1 k Ω
Résistances - Weerstanden	R3, R4, R5, R6	4,7 k Ω
Kondensatoren – Condensers Condensateurs - Condensatoren	C4, C5, C6, C7, C8	100 nF
Elkos - Electrolytic capacitors Condensateurs électrolytiques - Elco's	C1, C2	100 μ F/25 V
Dioden - Diodes	D1, D5	1N4004*
Zener-Dioden - Zener diodes Diodes Zener -Zenerdiodes	D2	5V1
Gleichrichter – Rectifiers Redresseurs - Gelijkrichters	D1-4	B80C800
Transistoren - Transistors	T1,T2	BD679
	T3, T4	BC547
Micro-Controller - Micro-contrôleurs	IC1	PIC12F508P
IC--Sockel		
Spannungsregler - Voltage regulators Régulat. de tension - Spanningsregelaars	IC2	7812
Anreihklemmen - Terminal strips Borniers - Printkroonstenen	X1, X2, X3, X4, X5	2-pol.

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

Bitte beachten Sie: Die Bauteile R7, R8, R10 und C3 werden für den Baustein FCS-R nicht benötigt und werden daher nicht bestückt.

Please notice: The components R7, R8, R10 and C3 are not required for the module FCS-R and for that reason are not inserted.

Attention : Les pièces R7, R8, R10 et C3 ne sont pas utilisées sur le module FCS-R et ne sont donc pas fournies.

Let op: de componenten R7, R8, R10 en C3 worden voor de FCS-R schakeling niet gebruikt en hoeven daarom niet te worden ingebouwd.

Fig. 1:

Bestückungsplan - PCB layout - Plan d'implantation - Printplan

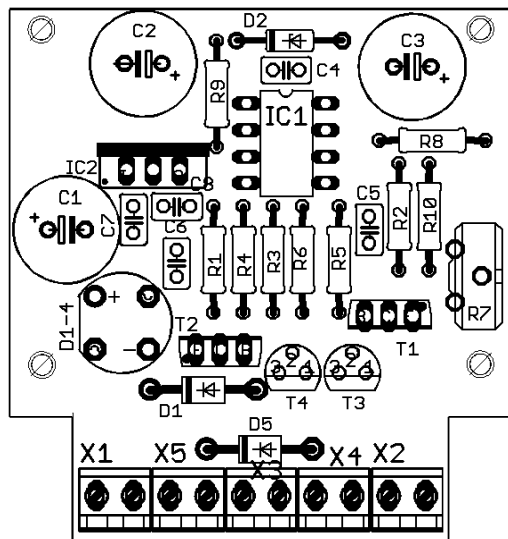
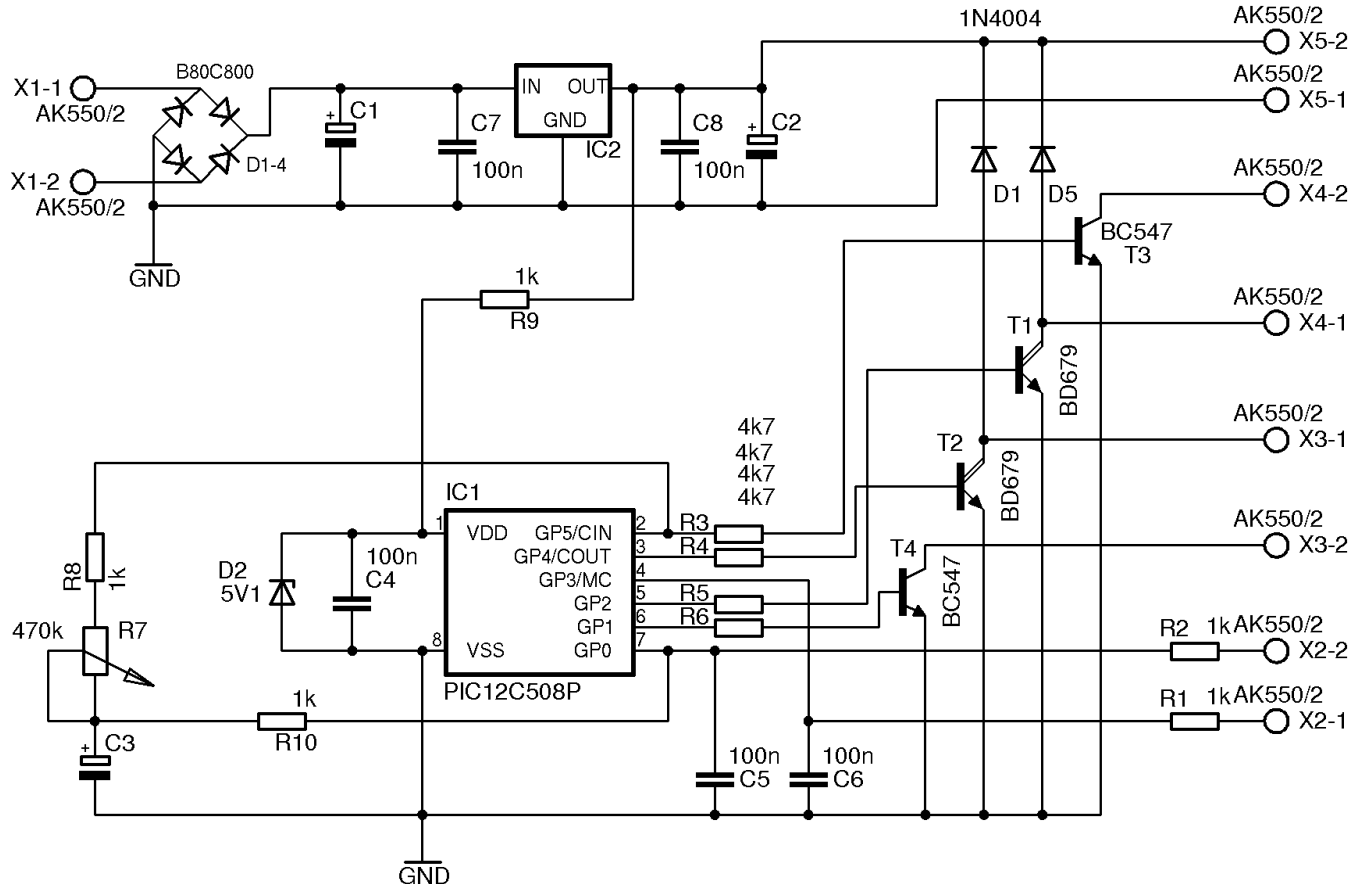


Fig. 2:

Schaltplan - Circuit diagram - Schéma de principe - Schakelschema



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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