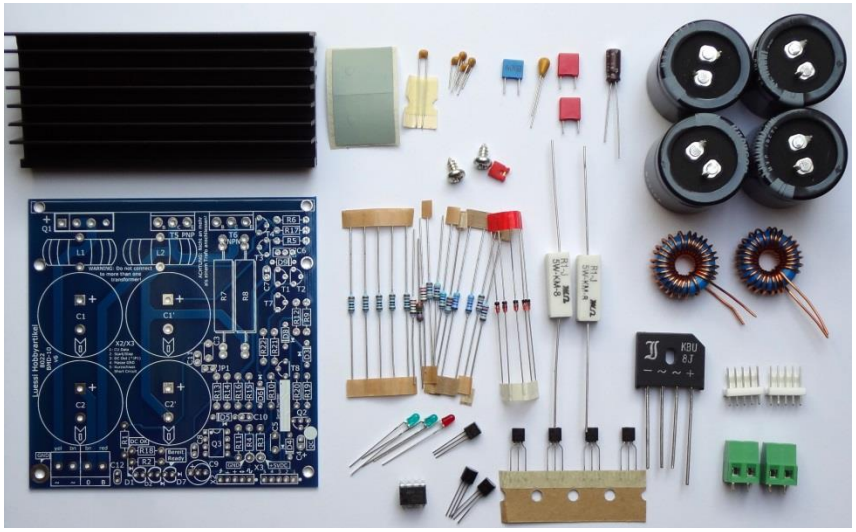
Assembling the booster kit (v6 and above)

You'll need the following tools and parts:

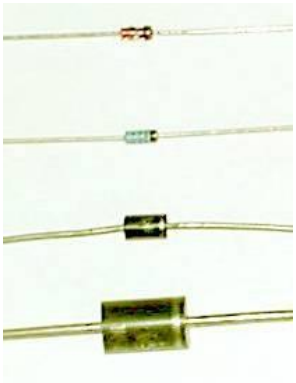
- PCB 8022
- All components
- The assembly plan
- An electronic temperature-controlled soldering iron with at least 50 watt
- Electronic grade solder wire
- A Pozidrive size 2 screw driver
- An electronics wire cutter

Please make yourself familiar with all parts and the assemble plan before starting the assembly.



Check all parts:
According to the assembly plan you should identify all delivered parts before starting the assembly.

We'll start with the lowest parts. In our case these are the diodes 1N 4148. Remember to check the correct polarity of the diodes. The ring marked on the diodes shows the cathode side:



In this picture the ring is on the right side of all diodes and corresponds to the symbol on the left, i.e. the current flows through from left to right, the diode blocks in the opposite direction.

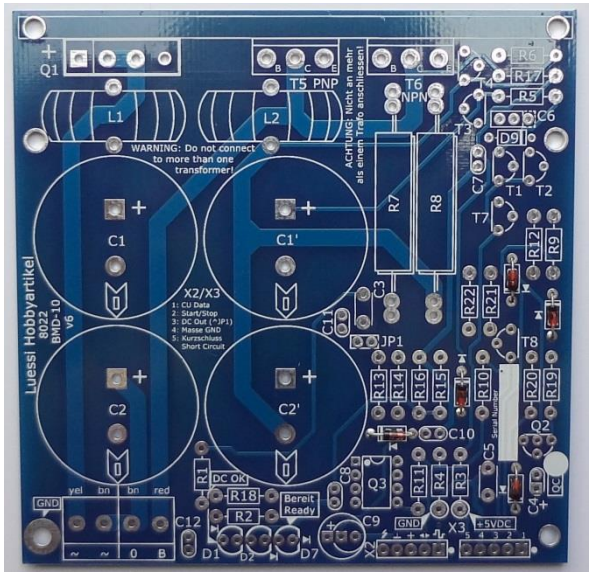
It is recommended to align all resistors in the same way, i.e. to insert them with the colour rings readable from left to right and from bottom to top so that they are legible. This facilitates possible later troubleshooting and repairs.

Were necessary the wires of the components are cleaned with a sharp knife before bending, i.e. the partially black layer is scraped away. This makes soldering much easier and prevents cold solder joints and the like. With a bending tool, the wires can be bent to fit exactly, as the tool is designed for the tenths of an inch grid that is common with printed circuit boards. If necessary, an electronic round nose pliers will also do.

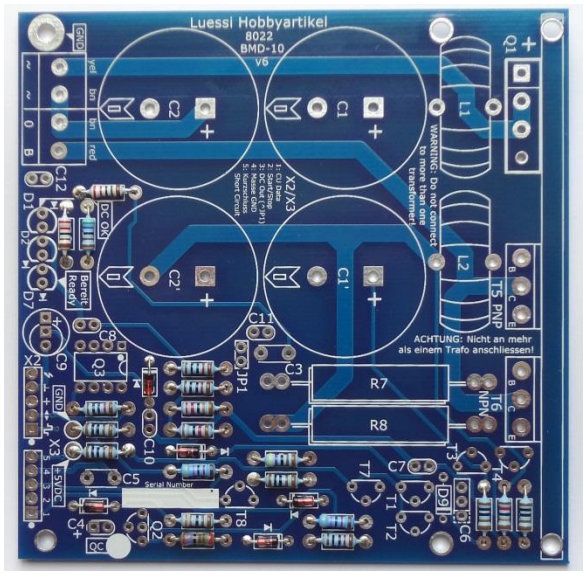
A simple tool like this makes it easier to assemble the PCBs and also ensures that the wires fit accurately. It is available in most well-stocked electronics stores for little money.

After soldering, for which only the finest quality electronic solder wire with a rosin core is used, the wires are pinched off just above the soldering point with sharp electronic side cutters. Larger side cutters, such as those used by electricians, are unsuitable.

Step-by-step building instructions



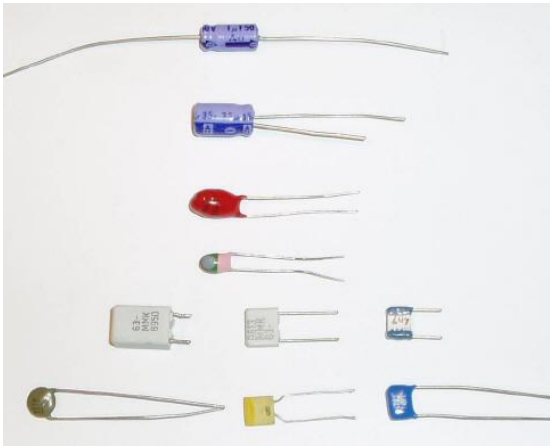
We start with the lowest components. In our case these are the diodes 1N4148.



The small resistors are then soldered in place.

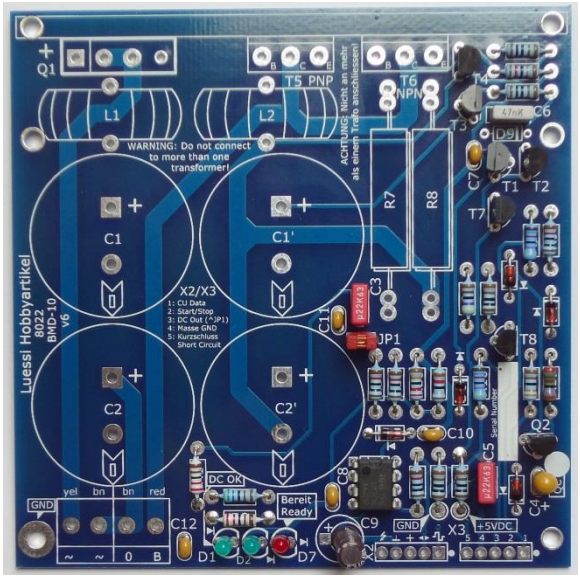
The next step is to process the next larger components, such as small capacitors, small-signal transistors, ICs and the like. Pay attention to the correct polarity of tantalum and electrolytic capacitors. With tantalum capacitors, the positive pole is usually marked with (+ +) as well as a slightly longer wire. Electrolytic

capacitors also have a corresponding marking that identifies one of the two terminals, for example a row of minus signs and an arrow (- - >).



Various capacitors (examples)
From top to bottom:
- Electrolytic capacitor (electrolytic capacitor) with axial connections, here 1µF, 50V. An arrow indicates the negative connection.
- Elko with radial connections. A (-) indicates the negative terminal, the positive terminal has a longer wire.
- Drip tantalum. On the red type, the positive terminal is marked with two + +. The lower type lacks any labelling. Which connection is plus here? In the picture it is the upper one. The value can be derived from the colours: brown = 1, green = 5, grey dot = times 0.01µF. So 0.15µF. Pink stands for a dielectric strength of 35V.
- Three foil capacitors: Here the value is printed. Here .47K stands for 0.47µF, so 470nF; 47nK stands for 47nF; 4n7 stands for 4.7nF. (For the first two, the value is not visibly printed on the upper side in the picture).
- To underline three ceramic capacitors. The designations are:
151K = 15 and a zero = 150pF.
4n7 = 4.7nF
472J = 47 and two zeros = 4700pF = 4.7nF

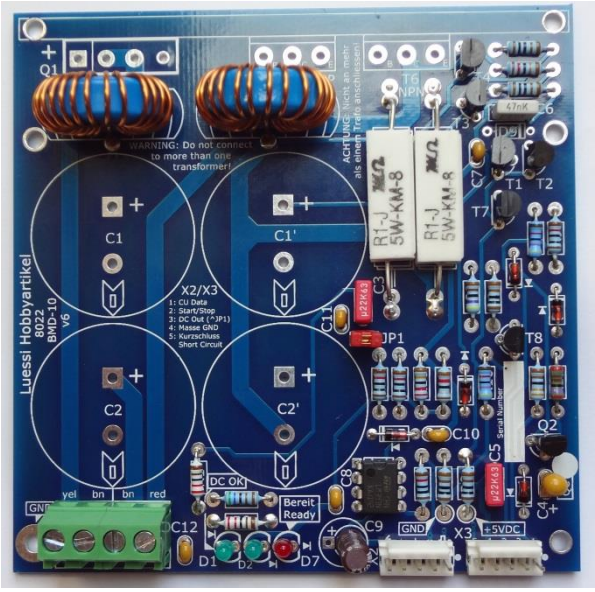
The integrated circuits (IC) must also be inserted correctly. A notch or a small dot indicates pin 1.



The small semiconductors and capacitors are now also installed and soldered.

Now it's the turn of the big parts. Power resistors are always spaced slightly away from the circuit board to ensure good heat dissipation. A small piece of wood like a matchstick a few millimetres thick or a slice of cork as a base until the resistor is soldered is a good solution.

The screw terminals must lie snugly on the PCB and should therefore be pressed against the PCB during soldering.



The larger components are soldered. The heat sink with the power semiconductors and the large electrolytic capacitors are still missing.

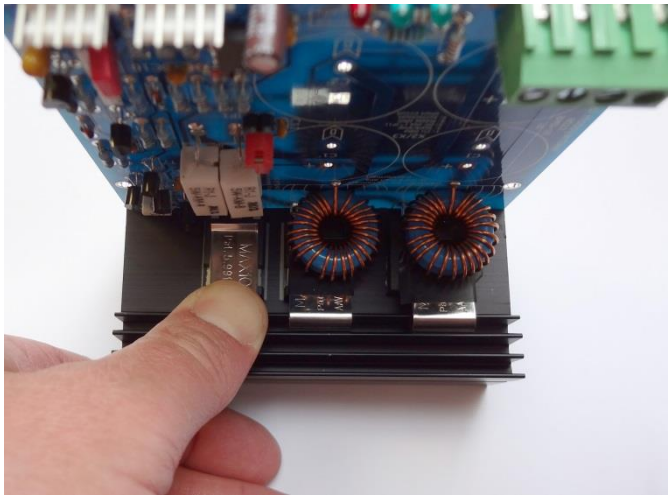
Note on soldering the chokes
The wire of the chokes is coated with a solderable insulating lacquer. For soldering, the soldering iron must have a temperature of at least 400° C and be soldered for at least 7 seconds with the addition of solder. Alternatively, the lacquer can be scraped off with a sharp knife before inserting the chokes.

Mounting the heat sink
Version 6 of the booster is supplied with clips for attaching the components to the heat sink. This facilitates any repair work.

- First solder the two transistors and the bridge rectifier to only one middle terminal each.

The two power transistors and the bridge rectifier are first soldered to one leg only.

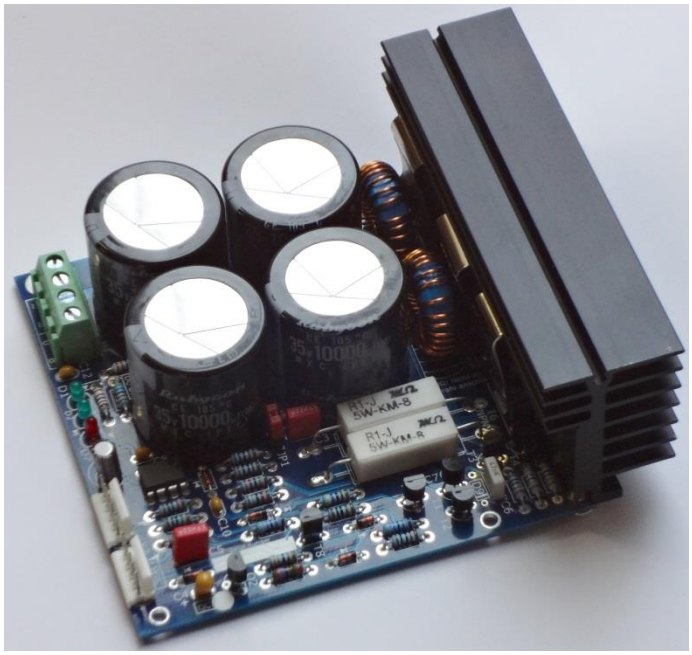
- Hold the heat sink in the correct position and mark the mounting holes of the two transistors with a pencil.
- Stick the supplied heat conducting foils to the heat sink and screw it to the PCB. To do this, use the self-tapping screws supplied and the plastic washer (for R6).
- Press the three MAX10 clips into the heat sink with your thumb to firmly connect the components to the heat sink.



The clips supplied are inserted with firm thumb pressure. For the two chokes, the clips should be insulated with a piece of insulating tape to avoid contact with the choke windings.

- Now solder all connections of the 3 components (also re-solder the previously soldered "legs"). This removes the mechanical pressure on the soldering point.

Finally, the two or four large electrolytic capacitors are soldered in place. The capacitors have so-called snap-in connections. Simply press them into the holes provided on the PCB and they hold by themselves during soldering.



The heat sink with the two power transistors and the bridge rectifier, which are attached with the metal springs, can be seen clearly here.
Finished. All parts are neatly soldered and the connecting wires shortened. A final check before commissioning can prevent unpleasant surprises.

The module is now ready. But before we apply voltage, all components are checked again for correct values and polarity. A final visual check of the solder joints can't hurt either.

Everything OK? Then you're ready to go.

The test site is neatly prepared. Of course, no cut pieces of wire and the like should be lying around.
The module is first connected to the transformer only: yellow connection to L (light), brown connection 0 (ground). This is the 18V AC supply. For checking purposes, the two green light-emitting diodes (LED) now light up, indicating the correct function of the rectifier part for the positive and negative voltage.

A simple test setup with a few tracks is sufficient to test the new circuit. A clean workplace is important. (In the picture you can see an older version of the booster.)

Only now do we connect the control unit, e.g. a Control Unit (Märklin 6021) or Intellibox (Uhlenbrock) via the 5-pole booster interface with the cable supplied. If the control unit is switched to "Ready", the red LED must also light up on the booster.

So far everything is fine?
Then now is the time to test the function with a locomotive. The connections B (traction current) and 0 (ground) on the booster are connected to the corresponding connections on a test track. The locomotive is being laid on rails and the control unit is set to the locomotive's address and to “Ready”. The reward for our work is now visible.
You also might want to check the correct functioning of the short circuit protection by shorting the output of the booster (e.g. with a screwdriver on the track conductors). The control unit should switch to “not ready”. After removing the short circuit you can set the control unit back to “Ready”.

Installation

The module can be mounted in any position, e.g. suspended under the unit. However, it is recommended to protect the PCB from accidental contact with metal objects. Furthermore, sufficient heat dissipation of the heat sink must be ensured, especially if the unit is to be operated at the power limit for a longer period of time. Installation in small niches and the like should therefore be avoided.