



Difficulty level

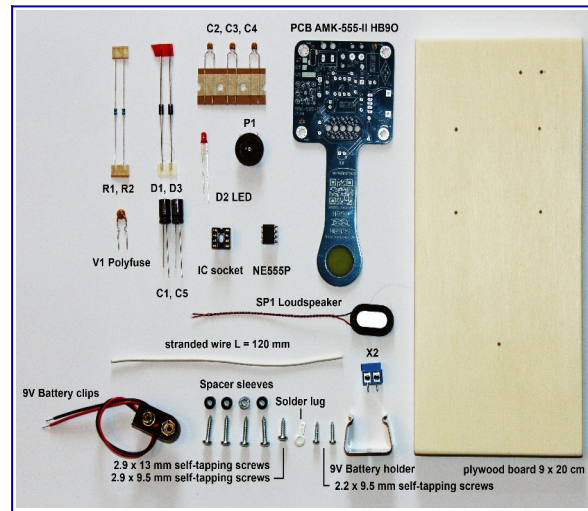
Time required 50 min

Accompanied from 6 years
Independent from 11 years

Accompanis Wolf level
Independent Scout level

Component list in the assembly sequence:

Pcs	Pos	Description
2	R1, 2	820 Ohm resistor 1/4 W
1	P1	10 kOhm potentiometer
2	D1, 3	1N5819
1	IC1	8-pole DIL IC socket
1	IC1	NE555P
1	D2	Light emitting diode
3	C2, 3, 4	100 nF capacitor
1	C1, 5	100 µF electrolytic capacitor
1	X2	2-pole screw terminal
1	V1	Polyfuse
1	SP1	Loudspeaker
1	BAT1	Battery clips
1	BAT1	battery holder
1	KEYIN	Solder lug
1	KEYIN	stranded wire L = 120 mm
2		2.2 x 9.5 mm self-tapping screws
1		2.9 x 9.5 mm self-tapping screws
4		2.9 x 13 mm self-tapping screws
4		3 x 4 mm spacer sleeves
1	PCB	PCB Circuit board AMK-555-II HB90 V1.00
1		plywood board 90 x 200 x 12 mm



Component control

General: Take your time and set yourself up in a quiet place. Read these instructions carefully and thoroughly. Only exact, quiet work guarantees a faultless and functioning Morse key. If you have never assembled an electronics kit before, we recommend that you visit our website at sciencescout.ch. There you will find helpful and further information under "Coaching & Support" in the "FAQ" section. We are constantly expanding this section. You can find our document on the current topic under "FAQ Introduction to electronics soldering":

"FAQ_Einführung_ins_Elektronik_Löten_20230913de.pdf" or newer. It gives you additional information on the subject of soldering.

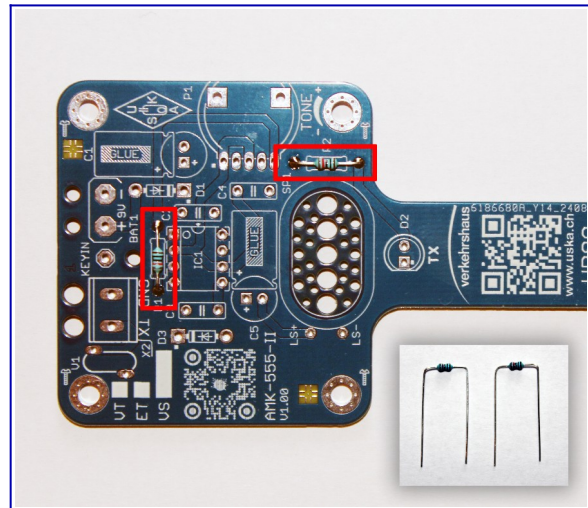
If you set up this kit at an event or in a camp, follow the instructors exactly. If you are not sure, please contact them.

To the build up:

1. If the version of this kit does not come with a prefabricated wooden board, go to the end of this building file and prepare your wooden board for later mounting the Morse key according to the explanations under **Preparing the wooden board**. Then go to point 2, otherwise go directly to point 2.

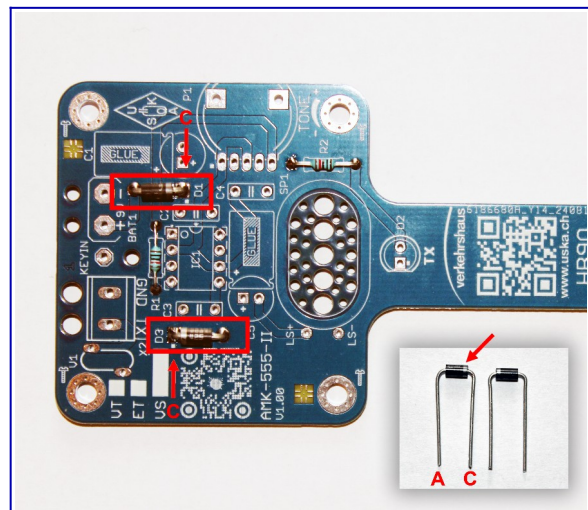
2. The first step is to fit the two resistors. To do this, the connecting wires of the resistors are each bent at 90°, i.e. at right angles to form a U. After soldering on the back, the wires are cut off approx. 1 mm above the circuit board. **Cut the connecting wires in such a way that they do not fly into your eyes, the eyes of others or anywhere else. You can do this by holding the connecting wires to be cut or by placing your hand over them.** This also applies to all subsequent soldering work.

Remark: Functionally, this has no influence, but it shows professionalism where it is possible to assemble the components of prototypes and handmade devices such as this kit in such a way that the color rings can be read from left to right or from top to bottom. The same applies to capacitors and other components with printed values. The imprint should also be legible after assembly.



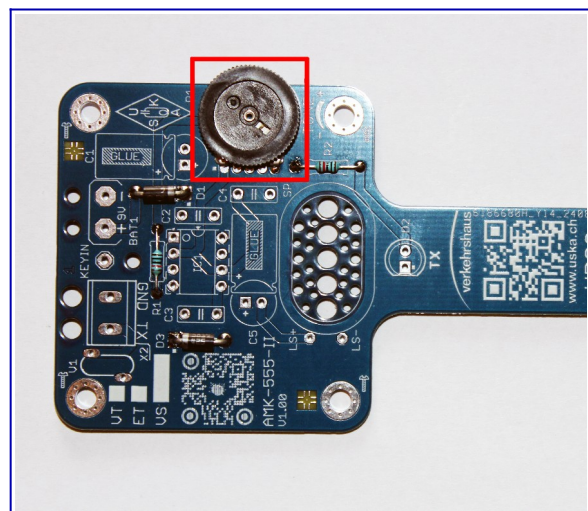
Fitting the resistors R1 & R2

3. Now fitting the diodes D1 and D3. **Make sure that these components have a so-called polarity. One end of the diode housing is marked with a white or silvery stripe. This is the cathode (C) of the diode. On the circuit board, the solder connection is square on the one hand and there is a white square next to it on the other. This position thus marks where the cathode of the diode is to be connected.** See adjacent picture.



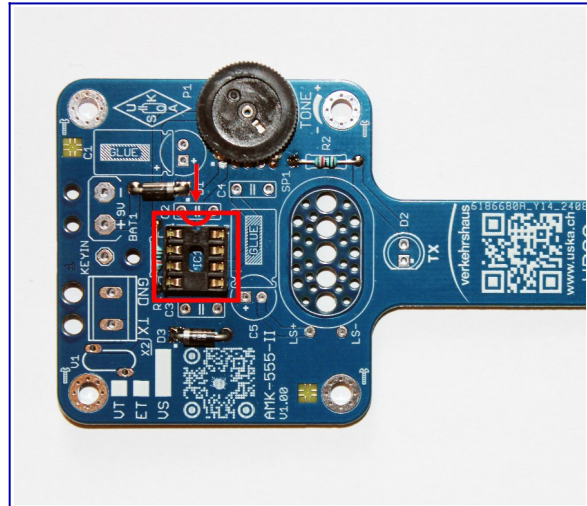
Placement of diodes D1 & D3

4. The next component to be fitted is the potentiometer P1. Make sure that it is clean and flush on the circuit board.



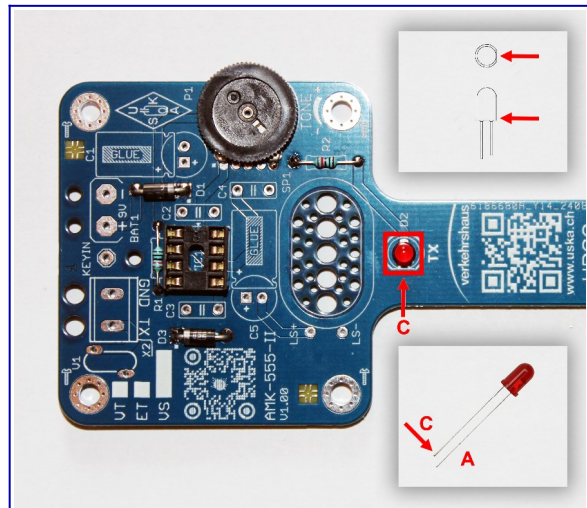
Fitting the potentiometer P1

5. Now it's the turn of the IC socket. (Attention! The notch on the socket must match the marking on the circuit board)



Equipping the IC socket IC1

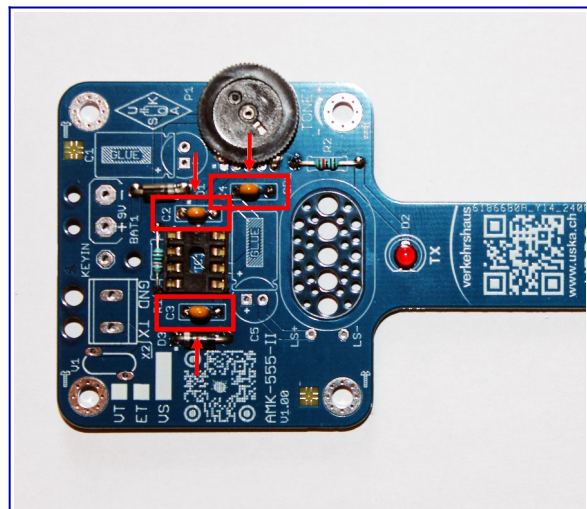
6. The LED D2 must now be installed and soldered. Note: The LED has a shorter and a longer connecting wire. The longer connecting wire is the anode (+) side, while the shorter one marks the cathode (-) side. The light-emitting diode also has a small collar at the bottom edge, which has a flattened area at the cathode (-) connection. This flattened area must correspond to the component label.



Fitting the light emitting diode D2

7. Next up are the capacitors C2, C3 & C4.

Remark: As these capacitors are not polarized, the following has no functional influence, but as already mentioned, it shows professionalism where it is possible to assemble the components in prototypes and handmade devices, such as this kit, in such a way that the printed values can be read even after assembly. See the red arrows in the picture on the right. They point to the labeling of the components.



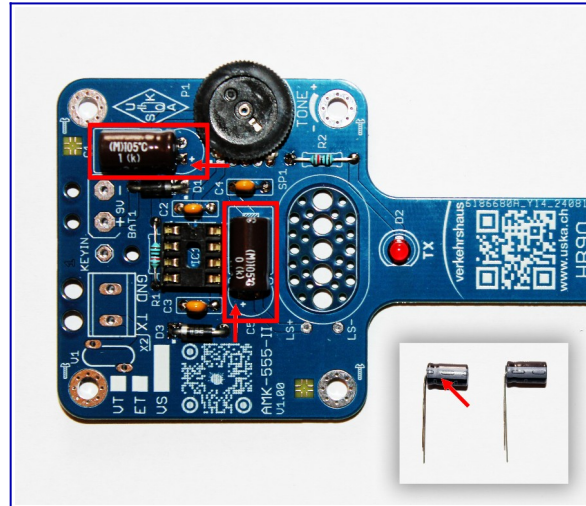
Placement of capacitors C2, C3, C4

8. Before the capacitors C1 & C5 can be fitted, they must be prepared.

Note the small picture in the image. If the capacitors are in front of you so that the negative pole is at the top and the connections are to the left of the capacitor, they must now be bent 90° downwards.

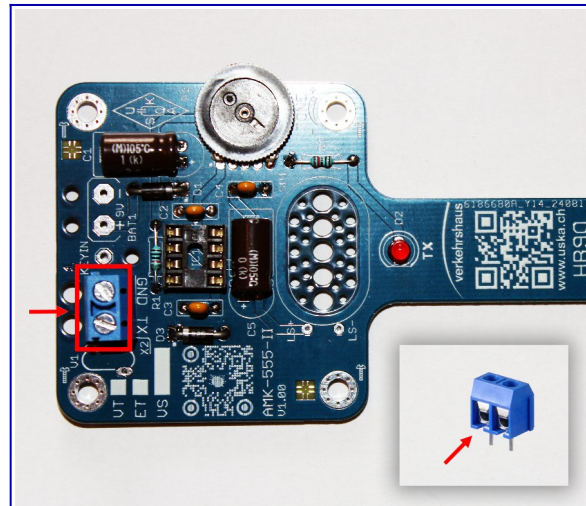
Make sure that the capacitors are firmly seated on the circuit board before soldering them.

Remark: The capacitors can optionally be glued to the circuit board with hot glue before soldering.



Placement of capacitors C1 & C5

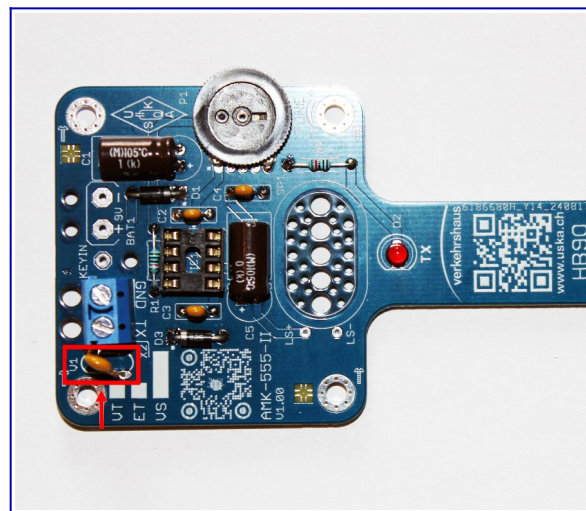
9. Now it's time for the 2-pole screw terminal. Once again, it is important to ensure that the screw terminal is well and firmly positioned on the PCB before it is soldered. The openings for inserting the stranded wire to be connected must point towards the edge of the PCB, as indicated by the arrows in the picture.



Fitting the screw terminal X2

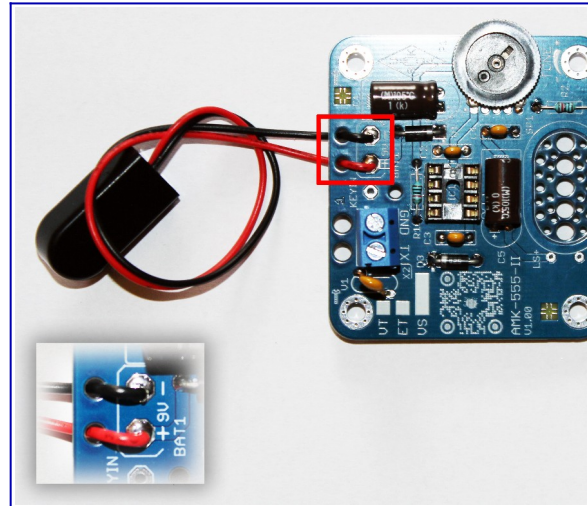
10. The Polyfuse V1 is the next component. This has S-shaped bent legs and only goes as far as the bend in the holes. This is intentional because the component can become very hot in the event of a fault that it is supposed to protect.

Remark: The Polyfuse is not polarized. So the following has no functional influence here either, but with prototypes and handmade devices such as this kit it is nicer to fit them in such a way that the printed values can be read even after fitting. See the red arrow in the picture on the right. It points to the labeling of the component.



Fitting the Polyfuse V1

11. When fitting the BAT1 battery clip, make sure that the red wire is connected to the solder connection marked with a plus sign, while the black wire must be connected to the one marked with a minus sign. The wires are pulled through the holes closer to the edge of the PCB from below. They are then bent through 180° and inserted into the corresponding solder connections. After soldering, the strands are carefully pulled back. This method provides simple strain relief.

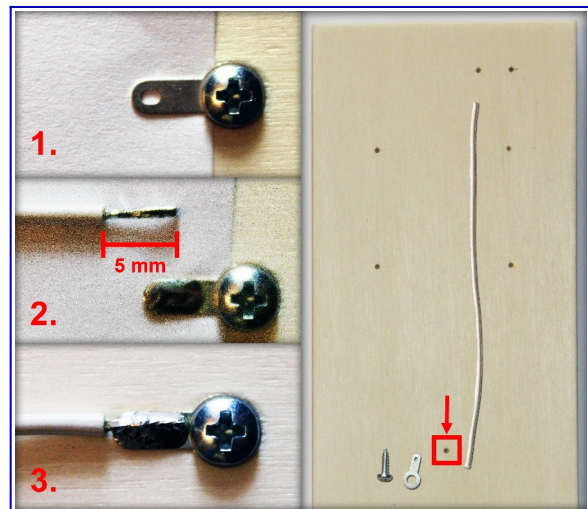


Fitting the 9V battery clip BAT1

12. Now it gets a little more technical. If you place the base plywood board in front of you as shown in the picture on the right, the soldering lug is screwed in place with the tab facing backwards using the 2.9 x 9.5 mm self-tapping screw as shown in position 1 in the picture.

Now place a piece of paper between the soldering lug and the wooden board as shown. As in position 2, strip 4 - 5 mm of insulation from both ends of the solder wire and tin it. The soldering flag on the soldering lug is also pre-tinned.

Now solder the stranded wire as flat and straight as possible onto the soldering lug. You can then remove the paper. It was only used to prevent the wooden board from changing color and getting dirty from flux from the solder.



Mounting the button contact for KEYIN

If you have done everything cleanly, it should look like position 3.

Attention: Tighten the screws with feeling and do not overtighten. Otherwise they will tear out and no longer hold.

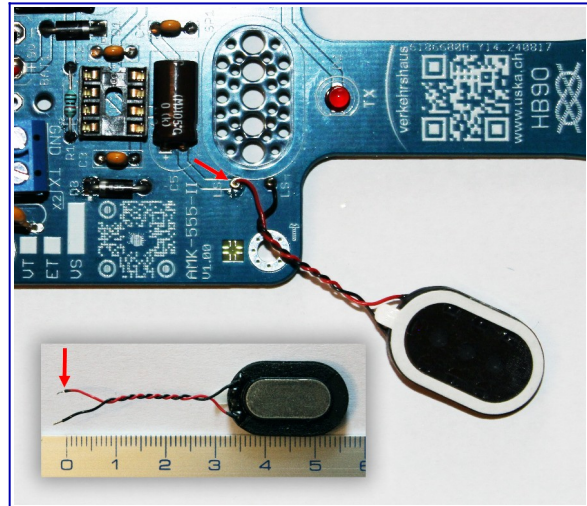
Remark: If you align all the screws nicely, your kit will also look more elegant.

13. To be able to solder in the SP1 loudspeaker, the connecting wires must be shortened to 30 mm. As shown in the picture, the ends must be stripped by 2 mm.

Attention: The connecting wires are very thin and correspondingly sensitive.

The red wire goes into the SP+ solder connection, the black wire into the SP-.

Attention: The speaker is not glued on before the function test. Otherwise it will be very difficult to remove if it does not work and can after not be reused.



Soldering the loudspeaker SP1 without gluing.

14. After the visual check, the IC is inserted into the IC socket. Care must be taken here to ensure that the connecting legs of the IC do not bend and are actually inserted into the socket. The dot or notch on the IC marks the side that must match the notch in the socket. See the red arrow in the picture.

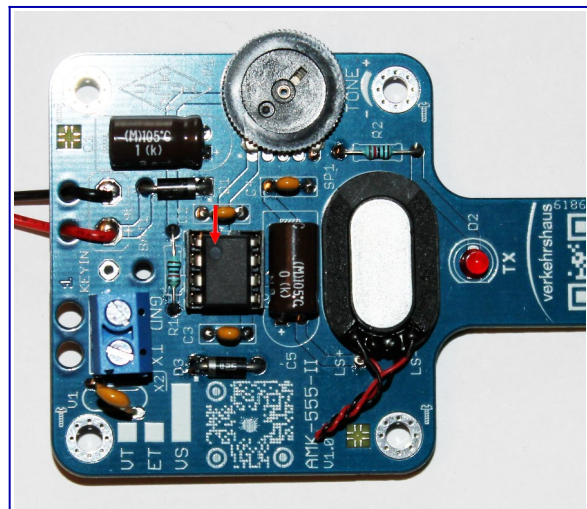
Now connect the 9V battery for the first time. Now connect "BAT1 +" with "X2 TX" using tweezers or a piece of wire.

Does a clear tone sound and can the pitch be adjusted with potentiometer P1?

If yes, remove the battery and peel off the white foil from the speaker. Do not touch the adhesive surface on the speaker! Carefully stick the speaker into the marking.

If no remove the battery and check the assembly according to these instructions. Also check the solder joints. If necessary, present to an instructor.

Attention: Do not place the circuit board on a conductive surface during the test. (short circuits)



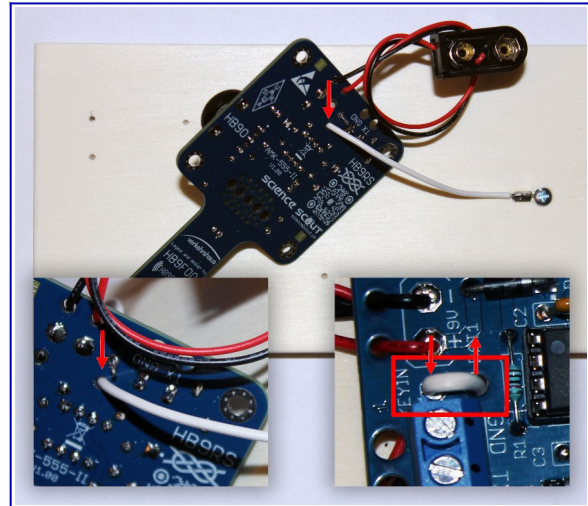
Inserting IC 1 and gluing on the loudspeaker SP1

15. Now it's time to connect the push-button contact, which you have already pre-assembled on the wooden board, to the circuit board.

To do this, feed the switching wire through the hole in front of the "KEYIN" solder connection from below, as shown in the picture.

Just as with the battery clip, bend the switching wire 180° at the top and then insert it into the "KEYIN" solder connection, where it is soldered from below.

Now carefully pull the switching wire back from below so that it rests firmly on the top of the circuit board.



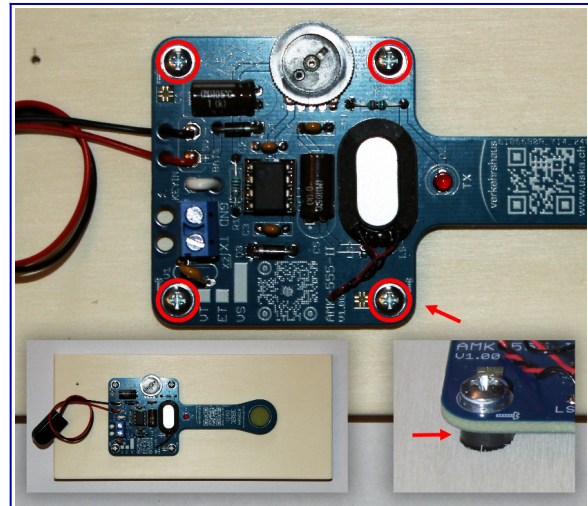
Connecting the pre-assembled push-button contact.

16. Almost finished. The PCB now needs to be screwed onto the wooden board.

The four spacer sleeves are placed between the wooden board and the circuit board as shown in the picture below right.

With the four 2.9 x 13 mm self-tapping screws, the circuit board can now be carefully fastened.

The stranded wire should now lie tightly under the circuit board without touching it. Ensure that the solder lug is adjusted so that only the screw head of the mating contact touches the PCB at the end of the button when it is pressed down.

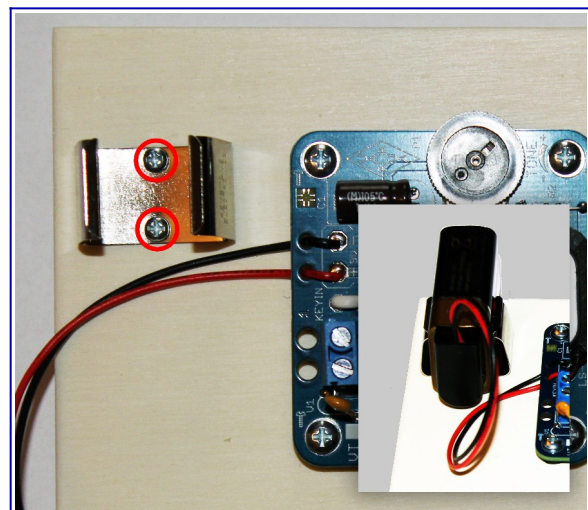


Mount the circuit board on the plywood board.

17. Finally, screw the battery holder onto the board in the position provided.

The two 2.2 x 9.5 mm self-tapping screws are used, again with care, to secure the battery holder to the wooden board as shown in the picture.

Now everything is complete and the battery can be connected and inserted as shown in the picture below right.



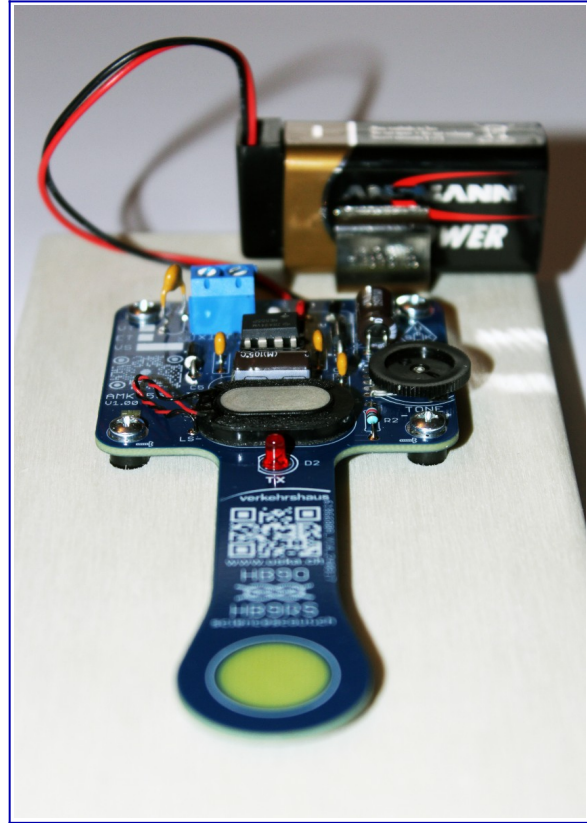
Fitting the battery holder.

18. The Morse key is now ready for operation.

The international Morse code is as follows:

A ···	N ···	1 ·····	. ·····	= ·····
B ·····	O ·····	2 ·····	, ·····	+ ·····
C ·····	P ·····	3 ·····	? ·····	- ·····
D ···	Q ·····	4 ·····	! ·····	\$ ·····
E ·	R ···	5 ·····	' ·····	@ ·····
F ·····	S ···	6 ·····	" ·····	
G ···	T ·	7 ·····	(·····	
H ·····	U ···	8 ·····) ·····	
I ··	V ·····	9 ·····	& ·····	
J ·····	W ·····	0 ·····	: ·····	
K ···	X ·····		; ·····	
L ···	Y ·····		/ ·····	
M ·-	Z ·····		_ ·····	

SOS ·······	Break ·····
New Line ·····	Closing ·····
New Page ·····	Shift to Wabun code ·····
New Paragraph ·····	End of contact ···
Attention ·····	Understood ·····
Error ·······	Invitation for named station to transmit ·····
Wait ·····	Invitation for any station to transmit ···



The Morse key is now ready for operation.

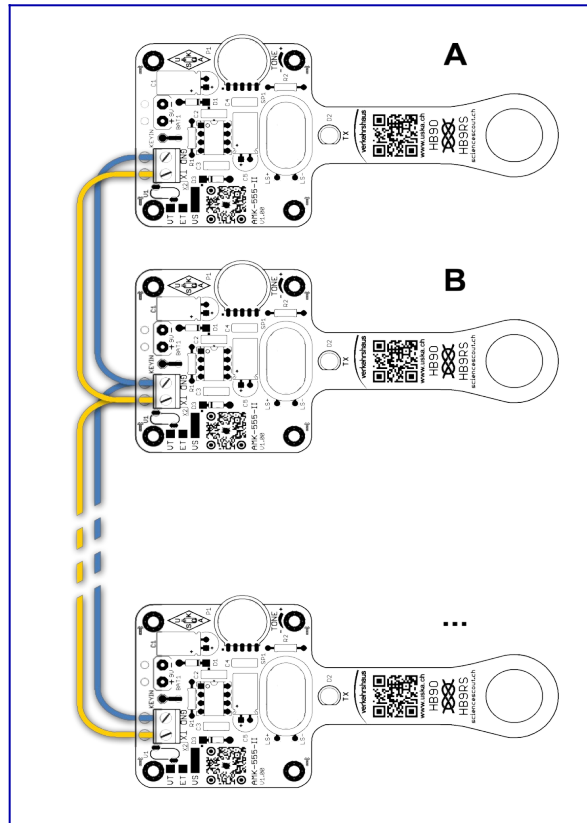
19. The Morse key is only really fun when you can communicate with someone. The adjacent picture shows how the respective participants are connected to each other.

It should be noted that the number of participants is limited by the maximum available current of the transmitting station.

If there are too many, nothing will break, but the Morse keys will simply not get enough power and will not work, but this will be immediately reversed if there is enough power by removing participants.

Further interesting information on this topic:

<https://de.wikipedia.org/wiki/Morsecode>

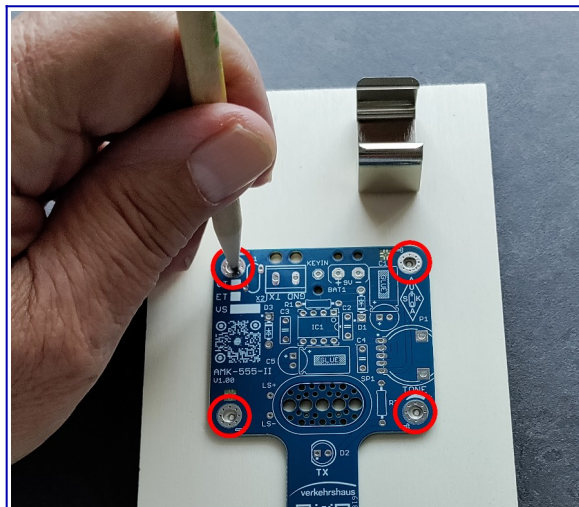


The Morse key in combination with remote stations.

Preparatory work for wooden board

General information: This section shows you how you can prepare your wooden board for the Morse key without much effort. Proceed without tools such as a scale and mechanical drawing.

A. Place the circuit board and the battery holder on the board as shown in the picture and mark the holes with a pencil.



Make the markings for the fixing screws of the circuit board.

B. Circle the green dot on the edge of the PCB. Make a horizontal mark at the level of the center of the green dot. Also make a vertical mark in the middle of the PCB width. When you now remove the PCB from the wooden board, mark the intersection of the horizontal and vertical markings.



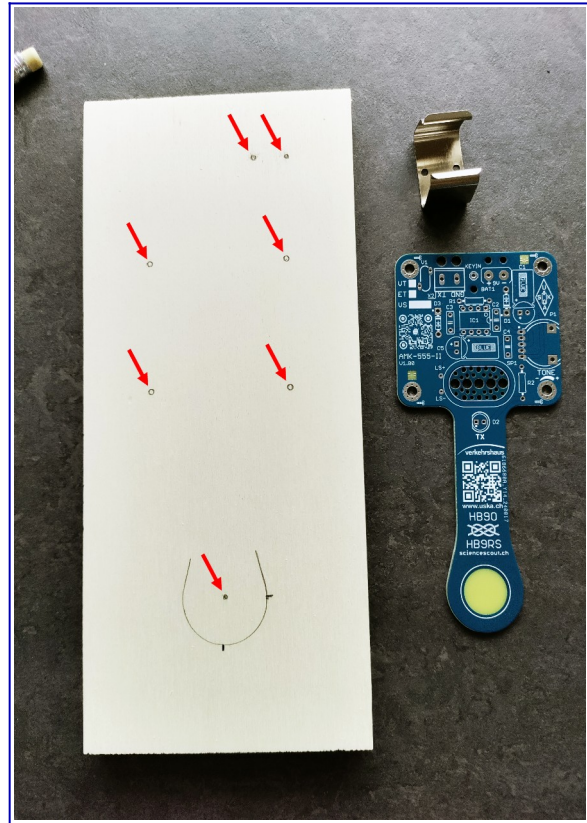
The mark for the screw position of the mating contact.

C. Carefully pre-punch the marked points on the wooden board with an awl to accommodate the screws. A depth of approx. 3 mm is sufficient.

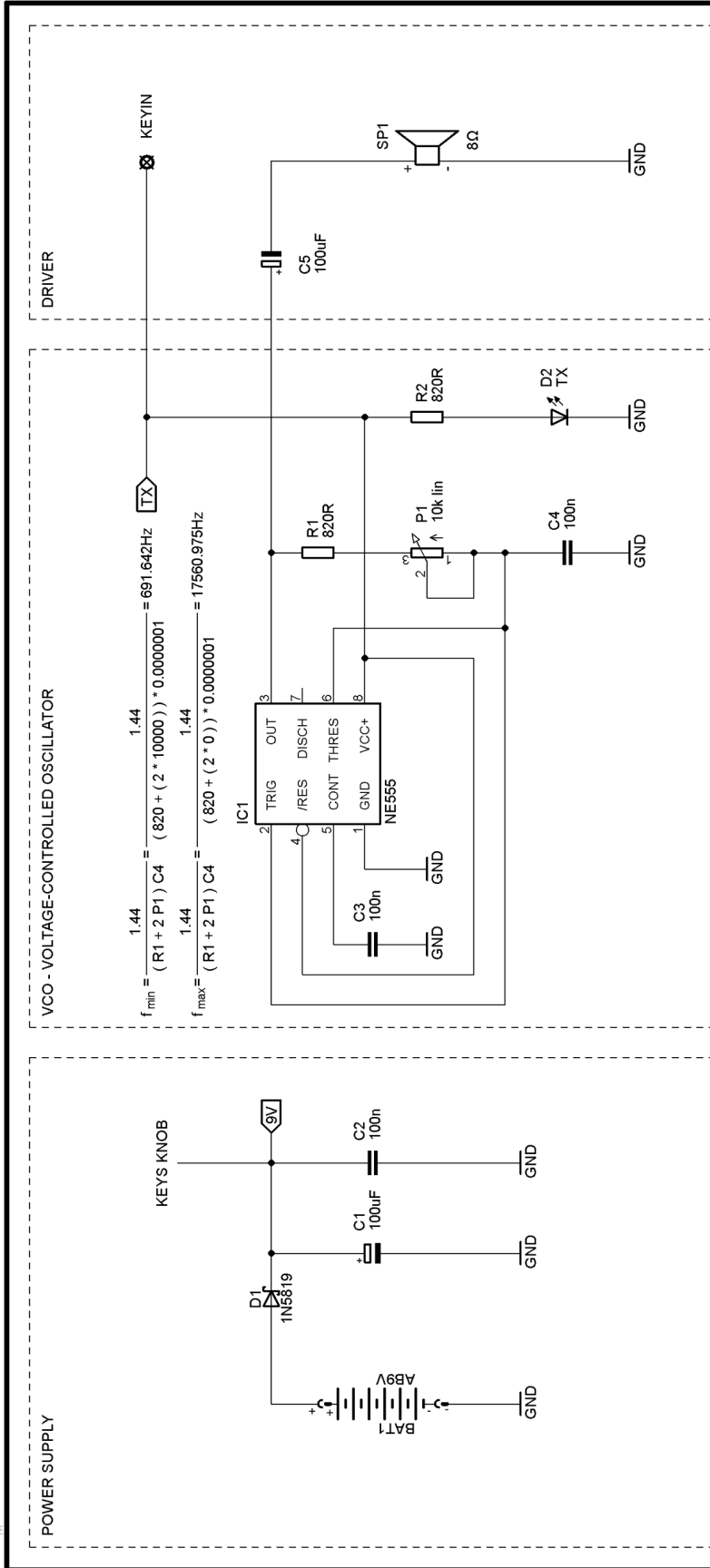
Erase the pencil marks with an eraser or sand the surface with a sanding block and fine sandpaper.

In general, it is up to you and your imagination how you want to refine the wooden board. For example, you can attach self-adhesive rubber feet to the underside yourself. Or glue on a felt covering the entire surface. This will protect the surface of the surface on which the Morse key is operated.

Now you can continue with point 2 of these instructions.



The positions where an approx. 3 mm deep hole is to be made with the awl.



verkehrshaus **HB90** **science scout** sciencescout.ch

HB90 **AMK 555-II HB90**

H	Date	Name
G		DB
F	Created	to device
E	Checked	to machine
D		
C		
B		
A	1.00	DB

Rev Amendment no. Date Name

25.09.2024 12:25:14 DB

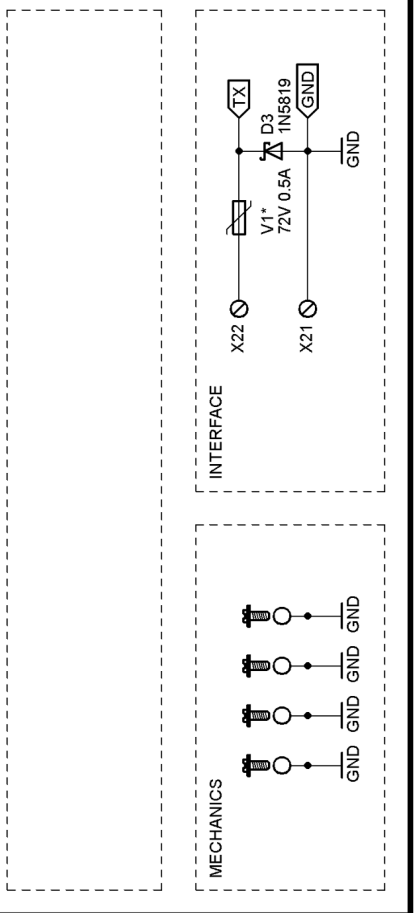
Analog_Morselaste_V100_Easy_9V_HB90_B

Sheet 1/1

Drawing no. 20240807.0010.0001.0001

Naming AMK 555-II HB90

Logo: **HB90EUB**



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Authors:

Otto Sykora / HB9FOO
Daniel Bossy v/o Rodeo / HB9EUB

Co-authors, editors & proofreaders:

Alfons Fässler / HB9DAL

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Every care has been taken in the compilation of texts and illustrations.

Nevertheless, errors cannot be completely ruled out.

The authors cannot accept any liability for incorrect information and its consequences.

The authors would be grateful if you would notify them of any errors.

Safety instructions:

These high-quality kits are suitable for training purposes.

They are regarded as toys and must never be used for emergencies, safety-related installations and medical operations!

The operator assumes responsibility for all damage, whether personal injury or material damage, resulting from improper use.

They are not suitable for children under 6 years of age, as individual small parts can be swallowed!
Small electronic parts do not belong in the hands of children without adult supervision!

This kit is intended exclusively for operation with 9V block batteries.

Connection to the 230 VAC domestic power supply is not permitted, in this case, the module will be destroyed and there is a danger to life!

The kit is only intended for use in dry rooms, any use other than that specified is not permitted.
The connecting cables for interconnected operation must never be connected to other systems of any kind.
In the event of a thunderstorm, the connection must be disconnected if there is a risk of thunderstorms and, if possible, to catch up. At the very least, however, it must be removed from the tent or shelter.

Lead-free solder for electronics must be used for soldering whenever possible.
Soldering grease should never be used on this circuit board as it will destroy the circuit board.

Please note that we accept no liability for damage resulting from incorrect assembly, handling or connection errors of the module, as these are beyond our control.

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