



# microTutor Build-A-Thon edition

The microTutor is a no nonsense back to basics old school Morse Tutor. It uses a modern micro controller chip that gives features that you would expect in much more expensive units.

Let's look at its features:-

## 6 Modes:

- 1:- Random Letters (In 5 fig groups)
- 2:- Random Numbers (In 5 fig groups)
- 3:- Random Prosigns
- 4:- Random Mix of Letters, Numbers, & Prosigns (5 figure groups)
- 5:- International Callsigns, In this mode the pitch and the speed change by approx. +/- 15% to add to the realism and to make things less tiring for longer sessions.
- 6:- Contest Mode, Speed and pitch changes as above but sends a simple contest over, callsign then 5NN and either a three or four digit serial number, the serial number may sometimes use 'Cut' numbers so you may hear 6092 or 6TN2 for example.

## Controls:

- Adjustable Volume
- Adjustable Speed (approx. 8 to 30 WPM)
- Adjustable Gap (approx. up to 4 seconds)
- Adjustable Pitch via user setup options (can be changed whenever you wish)
- Visual on-Board LED CW Indicator

## External Connections:

- Straight Key Input for use as a practice oscillator (3.5mm Mono plug on key needed)
  - Headphones out socket (3.5mm mono or stereo)
- The instructions are longer and more detailed than you may expect for such a simple kit but that's to help first time builders.





## Using the microTutor

This is refreshingly simple to use, no menus!

Turn on the tutor and your away, adjust the gap and speed control to your preference and start improving your code speed. To change modes press and **hold** the mode push button for a second or so and you will hear a higher pitch Morse letter. **L** for Letters mode, **N** for numbers mode, **P** for Prosigns, **M** for Mixed, **C** for Callsign mode, and **CT** for Contest mode.

The tutor has a on board CW Indicator LED too.

The on-board battery pack is just 2 standard AAA cells that will last a very long time.

## To use the tutor as a practice oscillator

To increase the tutors value it can also act as Practice Oscillator.

To use this feature plug your key into the rear connector (3.5mm mono plug needed) , **hold the key down and turn on the tutor**. The microcontroller looks at the key input at power on and will detect the key now. It will automatically switch to oscillator mode. When you have finished using the oscillator just turn the tutor off and on again to restore tutor mode.

The headphone socket needs a standard 3.5mm plug so that normal Walkman type headphones or earphones can be inserted. (Stereo or mono phones can be used)

## Tips for improving your code speed.

It's very easy to fall into a common trap that can cause you problems with listening to real life Morse. Do not try to count Dits and Dah's to work out the letters. Start to learn the 'sound' of the letters from day one. Set the speed control to a realistic speed (I find setting the SPD control at the 12 O'clock position is about right to start with, about 12 – 14 WPM), adjust the GAP control to give you more thinking time. As you improve reduce the gap time bit by bit. This way you will learn the characters at the right sound and although it may seem hard at first it will be easier when you listen on air (which is the point of learning the code isn't it)

Spend about 10 minutes a session listening to code, much more than this isn't helpful. Take a break between sessions and you will come back fresh and ready to learn.

Above all, enjoy it and enjoy using the microTutor. Good luck with learning Morse.

73 Paul M0BMN (Kanga-Products)



## Building the microTutor

The microTutor is an easy to build project designed for both the beginner and the more experienced builder.

Check you all the parts needed are with your kit:-

1	x	microTutor PCB
1	x	AAA battery Holder
1	x	8 Pin Dip Socket Holder
1	x	Mode PCB Push Switch
1	x	PCB Mounting Sounder
1	x	CW LED
1	x	Audio Amplifier Transistor (2N2222)
1	x	microTutor Control Chip
1	x	C1 = 0.1uf Capacitor (marked 104)
3	x	Control potentiometer
1	x	On/Off switch
2	x	3.5mm PCB Jack Sockets
3	x	R1, R2, R4 = 3K9 ¼ watt Resistor (1 <sup>st</sup> two bands Orange, White)
3	x	R3, R5, R6 = 1K ¼ watt Resistor (1 <sup>st</sup> two bands Black, Brown)
3	x	Control Knobs
4	x	Stick on rubber feet



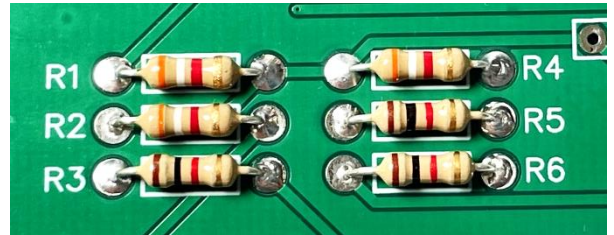
## Step one

Fit the resistors

The kit uses 6 small resistors, R1, R2 and R4 are all of the value 3K9 and have colour bands of Orange, White, Red, Gold.

R3, R5, & R6 are 1K value and have coloured bands of Brown, Black, Red, Gold.

Resistors can be fitted either way round just be sure you select the right value for each part as you fit them. Once fitted trim the leads flush with the back of the PCB, do this with all the other parts you fit too.



## Step 2

Fitting the capacitor C1



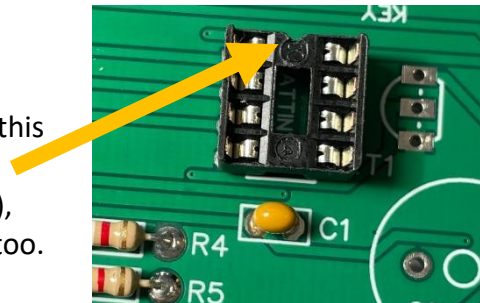
This is marked 104, its value is 0.1uF (Sometimes written as 100nF). This can be fitted either way round.



## Step 3

Fit the 8 way IC socket.

You will note a small notch on one side of the socket, this socket should be fitted so the notch is nearest to the position marked Key (the socket we haven't fitted yet), also the outline on the PCB shows the notch position too.



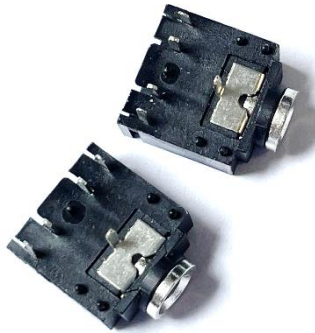
## Step 4



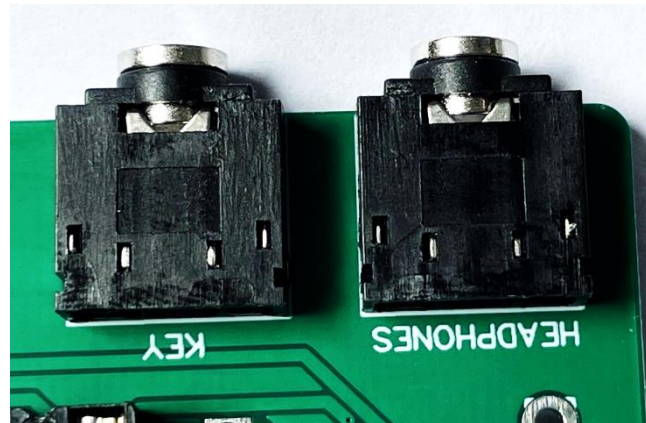
We are using a single stage audio amplifier in our tutor and a very simple arrangement with just one transistor. This transistor must be fitted the correct way round, look at the shape of the transistor and you will see the position for T1 shows the same shape, fit the transistor to match the outline for T1 on the board, it should sit around 4-5mm above the board when fitted, don't try and push it right down as you would break its legs.



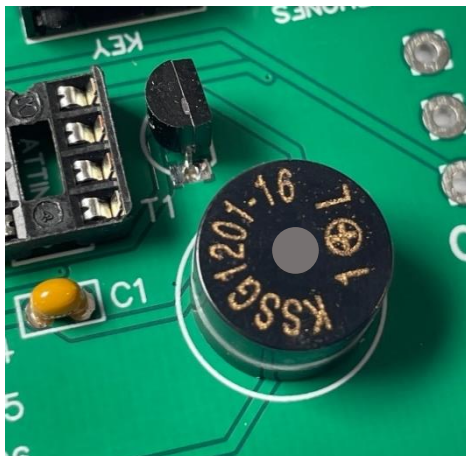
### Step 5



Fit the two 3.5mm PCB sockets, they can only be fitted one way round and are both the same type.



### Step 6



Fit the two-pin sounder, you will notice that the sounder has a small circle with a '+', this side must be nearest to the right hand edge of the board and on the PCB you will also notice a '+' printed on the board near one of the sounders near one of the mounting hole. You will also see that the centre hole has a small black sticker over it, please leave this on the sounder, the sticker causes back pressure on the sounder's element, this back pressure reduces the peak output frequency and for our use and increases the volume considerably at normal CW pitches.

### Step 7

Now fit the power On/Off switch, this switch can be fitted either way round.

Push the switch right down on the board before soldering and trimming the leads flush.

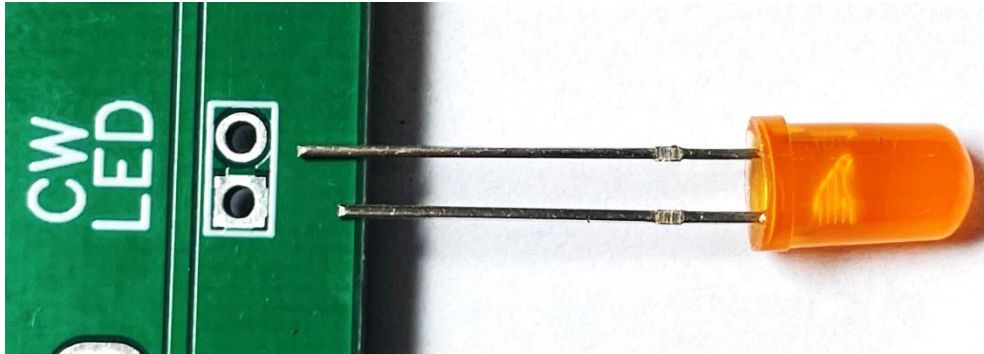






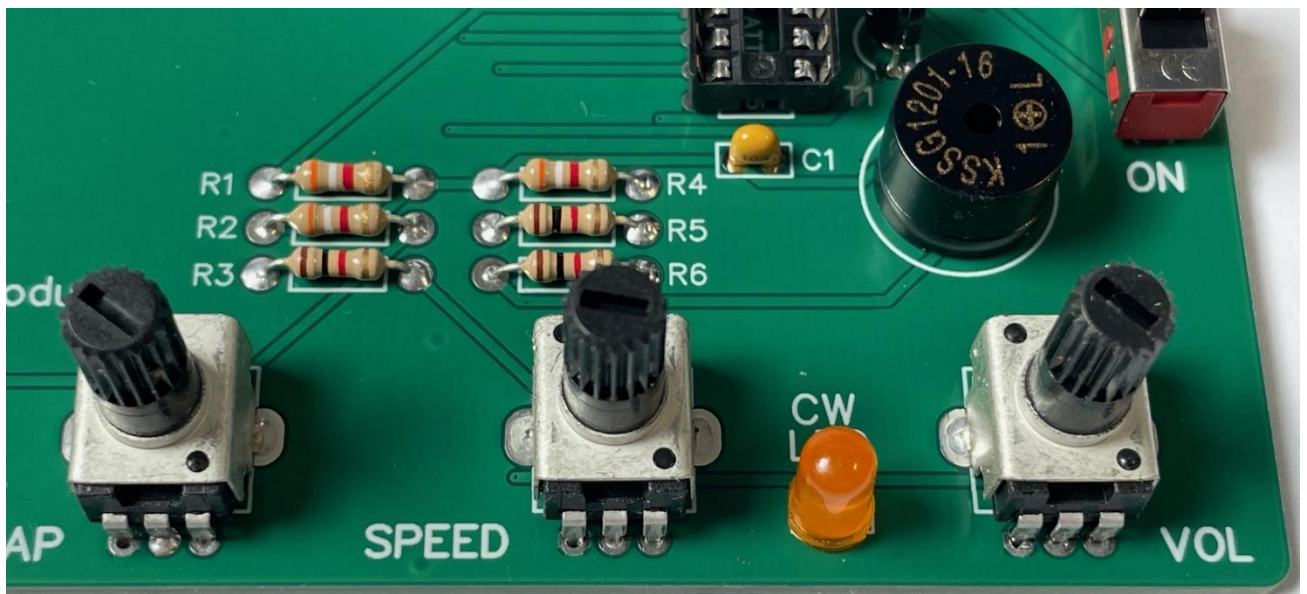
### Step 8

CW Led, you will have a 5mm Orange LED with the kit, if you look at the legs of the LED you will see one is longer than the other, now this is very important. The long leg **MUST** go into the round pad hole for the LED **NOT** the square pad!



### Step 9

Fit the three control potentiometers. These are all the same value 10K. They will fit vertically on the PCB, make sure they sit right down onto the board before soldering, I suggest just solder on pin of the potentiometer and check they are flush before soldering the rest of the pins and the two support lugs.





### Step 10

Now fit the Mode button. This has four small legs, the switch will fit into its position on the main board with easy, note that the switch will only fit correctly one way so you may have to turn it round to fit it . The switch will be provided with a coloured cap, this may already be fitted, if not it's just a push on fit.



### Step 11

Fit the battery holder.

The battery holder is for two AAA cells, it will only fit one way.

On the back of the holder there is a length of double-sided foam tape, remove the backing paper and careful align the holder on the PCB, the two pins have

been pre-cut for you, make sure you solder the pins after fitting the holder!



### Step 12

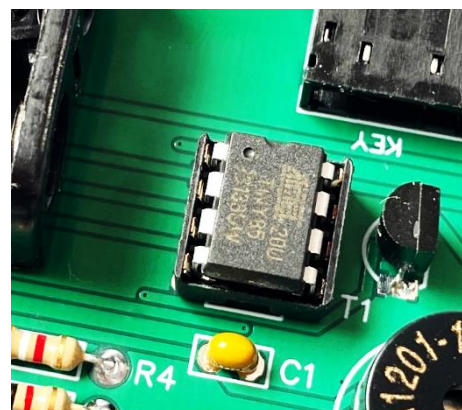
Finishing Off the tutor.

Right now the tutor is complete, just few little jobs to finish up!

First lets fit the mini controller chip. This chip will have a small dot near one pin, this indicates Pin 1, with the board in front of you and the control knobs closest to you the chip should be fitted so the dot is top left .

Now fit the control knobs to the potentiometers, make sure the potentiometers are all turned fully anti-clockwise before you fit the knobs, only put the knobs on lightly to start with to make sure your

happy with the position of the white indicator line, then they all look right you can push them down firmly, be warned they are very hard to remove later if you get this stage wrong. On the back of the board you will see four small white circles, these are suggested locations for the stick on feet.



## Using the tutor

That's it built! Pop two AAA batteries into the holder and turn on. If all good the CW LED will start to flash Morse and if you turn the volume up you will hear CW. Adjust the speed control and check the speed changes, adjust the GAP control and the gap between characters should increase too. If all that works set the gap to minimum and press and **hold** the mode button, you should hear a higher pitch morse character announcing the mode and the tutor will change mode.

## Test the practice oscillator

To test the practice oscillator you will need a straight key, plug one into the Key jack on the rear of the tutor and turn off the power. Now hold the key down and turn the power back on while holding the key down. The tutor will first look at the key socket when it's turned on and if it finds the key down it will start up as a practice oscillator rather than in tutor mode, the LED will also work with your sending, adjust the volume to suit.

When finished as a practice oscillator turn off the power and then turn it back on, this time do not hold the key down.

## Setup the Tutors Pitch

The Tutor (and oscillator) use the same pitch. You can change the pitch to your own liking if you wish, it's very easy to do so.

To change the pitch, turn off the tutor. Press and hold the mode button and **continue to hold it down** while you turn it on. Now you will hear the pitch the tutor will use. Adjust the GAP control and the pitch will change, set this to the pitch you want to use, the small sounder has a noticeable peak response and you will notice certain tones sound louder than others, adjust the pitch to your requirements. When your happy release the mode button and the pitch will be saved in the chips memory ready for next time you use the tutor.

It's a sign of the times but it's very easy for someone to just copy the code used in products like the microTutor and claim it's their own. So to identify this code as mine if you quickly press and hold the Mode button again just as you exit setup the tutor will send my call sign in Morse (MOBMN), if you hear that don't worry it's just to identify the owner of the code.

## Headphones

The tutor also has a headphone output, this output is volume limited to protect your ears, the volume on this output can be increased if you intend to use the tutor with a speaker. To make the tutor more suitable for use with a speaker replace R6, which is a 1K Ohm resistor with a 39 Ohm resistor. If you do this and then use headphones be careful the audio will be very loud.





## Morse Code

A	● —	N	— ●
B	— ● ● ●	O	— — —
C	— ● — ●	P	● — — ●
D	— ● ●	Q	— — ● —
E	●	R	● — ●
F	● ● — ●	S	● ● ●
G	— — ●	T	—
H	● ● ● ●	U	● ● —
I	● ●	V	● ● ● —
J	● — — —	W	● — —
K	— ● —	X	— ● ● —
L	● — ● ●	Y	— ● — —
M	— —	Z	— — ● ●

### Numbers

1	● — — — —
2	● ● — — —
3	● ● ● — —
4	● ● ● ● —
5	● ● ● ● ●
6	— ● ● ● ●
7	— — ● ● ●
8	— — — ● ●
9	— — — — ●
0	— — — — —

### Prosigns

(.)	● — ● — ● —
(.)	— — ● ● — —
(?)	● ● — — ● ●
(/)	— ● ● — ●
(=)	— ● ● ● —
(AR)	● — ● — ●
(BK)	— ● ● ● — —
(CT)	— ● — ● —
(VA)	● ● ● — ● ●
(KN)	— ● — — ●