

Phoenix Code Practice Oscillator

We offer a number of Code Practice Oscillator (CPO) kits, some with built in Morse Tutors and that can work with straight and paddle keys.

Some people just want a simple, reliable CPO that works with a straight key. Well who am I to argue.

We have offered this CPO as just a module kit for a few years now and it has been very popular but often we have been asked about a suitable case/hardware to finish off the kit.



Many of the low cost CPO on the market seem to be built around the 555 timer chip, these work well enough but we find that the tone of these can be a little harsh, often not because of the square wave output but managing the 555'd duty cycle to a constant 50/50 split is very difficult to do over a range of frequencies. We have used a different chip in our oscillator, the CMOS 4047. This gives nice 50/50 duty cycle and despite still being a square wave output we find that the tone is pleasant and steady at all volume settings, also since the speaker is built into the enclosure the audio sounds much fully and smoother than you would expect from such a low cost oscillator.

Our CPO is supplied in a strong case and fitted with both a 6.35 key input socket (1/4 inch) and the more modern 3.5mm (1/8 inch) too!.

The circuit of the oscillator



The pitch is adjustable over a wide range from a few hundred hertz to a number Kilohertzs and is adjustable by a small on board trimmer. The audio output power is in the order a few 100mW's which will be plenty for personal or classroom use.



Parts List

Desk top case	
СРО РСВ	
Socket PCB	
Front panel	
4 x Stick on feet	
case screws	
T1	2N2222
IC1	CD4047
R1, R2	10K ¼ Watt
Socket	14 pin DIP
R3	1M Trimmer
Volume control	10K + Knob
C1	1nF
4 x Terminal block	2 way 5.08mm
1/4 inch (6.35mm) Key socket	
3.5mm Key Socket	
1 x 9V Battery Holder	
Connection wire + heat shrink	
50mm 8 Ohm Speaker	
1 x foam pad	
1 Set Speaker mounting hardware	

Check you have all these parts and let me know if you have any missing parts. Paul@phoenixkitsonline.co.uk

PCB Layout





Front

Back

It is important that care is taken to make sure you fit the parts as indicated in these instructions, some parts are fitted on opposite sides of the board



Building the CPO

This is an easy project that with care could be tackled by a beginner.

 First Fit the 14 pin DIP socket, there is a little notch on one side, this little notch should be positioned so it's near the letters CPO on the board.





and are fitted in R1 and R2 positions. (Keep the off cuts , you will want them later)

iii) Next let's fit the capacitor C1, and then the small blue trimmer (R3)

which is the Pitch control. Fit the capacitor either way round but fit the trimmer as the silk screen picture so the small brass screw is towards the top of the PCB.





iv) Now fit the audio transistor T1, this part MUST be fitted the correct way, look carefully at the layout silkscreen printing on the PCB it shows the how the transistor must be fitted.

v) Now fit the two way terminal blocks, make sure the cable entry points are facing the edge of the board. Blocks are fitted on both sides of the board. A tip here, unscrew the terminals now rather than when the board is fitted in the case, it makes it an easier job to get the wires in later.





vi) Next we will fix the volume control, **IT IS IMPORTANT TO TAKE CARE NOW!** This MUST be fitted to the back of the PCB not the same side as all the other parts. On the back of the volume control are two terminals, these are for the power switch. Use cut offs from the resistors to connect the two terminals to the SWT pads on the PCB (S1 and S2), use the small length of heat shrink to insulate one of the wires (no need to shrink it)





That's the main board built so now we need build the small socket board.



That's an easy one. Fit the two sockets and terminal block to this little board as shown here.



Find the front plate, speaker and its mounting screws/washers & nuts. Take care not to damage the front panel while doing this. See the picture here that shows how to position the speaker. Just nip up the screws, that's all they need.





Now to start putting things together. The oscillator board will fit onto the front plate and is secured by the single nut on the volume control. Once fitted we can start connecting the parts together with the wire provided, strip the insulation off the multicore cable so you have a number of individual wires, you can use any colour wire for any of the connections.

Now wire all the other wires, two wires to the key socket board. Two for the speaker and also the two wires from the battery holder. You may as well also fit the Tone Chip into the socket now too, the chip has a small dot near pin one, this dot should be nearest to the top of the PCB.



Next look at the back of the battery holder, you



will see some double sided tape, remove the backing sheet and CAREFULLY position the holder as can be seen in the picture to the left, press down to fix it in place. You have also a small foam pad, attach this to the back of the speaker.

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Now fit the CPO into the box, the small socket board should be fitted into the back box first, secure it with the large plastic nut from the larger socket. Fit the battery and then lower the top panel onto the box, make sure not to trap any wires. Attach the front panel with the 4 self-tapping black screws provide, make sure the volume/PWR control is off and fit the knob. On the back of the CPO attach the 4 small stick on feet.



That's it all done.

Although the CPO has a volume control with a power switch the CPO draws zero current while the key is up, the power switch does not need to be turned off when not in use, if you are leaving the volume set low and the key plugged in then turning off the CPO makes sure if something is left on top of the key the oscillator doesn't draw power and preserves the battery life.

The Tone or pitch of the oscillator can be changed to your liking at any time, the small blue trimer will allow you to set the pitch, one tip the quality of the tone will sound much nicer when the front panel is fitted to the back box so don't worry about that, just set the tone to the frequency you like and fasten the lid to the case.

I hope you enjoyed building the CPO and that it provides many years of good service.

Any problems please get in touch.

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