Morse Code Practice Oscillator

A device which lets you hear your Morse while you’re learning… before you go ‘on-air’

This project builds into a box into which you plug a Morse Code Key. Using the Morse Key creates realistic sounds so you can judge how well you “Send”. A great tool for beginners to improve Morse sending skills before going ‘on-air’.

This is NOT new; when Morse was mandatory Amateur Radio books gave directions to build something similar – today it’s a fun side aspect of Radio so this project may be new to you.

The NE555 Integrated Circuit is the heart of the project, around which 2 basic circuits are built.

1. A circuit to create the frequencies, which can be changed to the pitch/tone you prefer.
2. A circuit to pass the amplified sound to the speaker which you control with a volume knob.

Components required:

- 555 Timer IC with PCB mount socket [NE555 – 8 Pin]
- Resistors R1 & R2 : 1k Ω and 220 Ω
- Variable Resistor R3 [Potentiometer] Logarithmic 100k Ω
- Variable Resistor R4 [Potentiometer] Linear 1k Ω
- Capacitors C1 & C2 2 x 0.1uF [non electrolytic]
- Capacitor C3 47uF Electrolytic – i.e. polarized... note the “+” & place it correctly
- Speaker 8 Ω 250mW [0.25W] size to suit your jiffy box [27 – 57 mm]
- Socket, panel mount – size to suit your Morse Code Key – 6.5mm used
- Battery clip to suit 9v battery
- Knobs x 2 to fit Frequency & Volume Pot shafts
- Jiffy box – I used 125mm x 65mm x 43mm
- PCB circuit board, I used one Vero board to make 4 units
- Supply of suitable link wire & solder/tools to suit
- Optional – 4Pin header/housing PCB mount blocks to attach components with long wires

See Notes: for additional information on the 555 Timer & a full parts list with Jaycar catalogue numbers
Design your circuit on paper before you begin to solder onto a board.

Plan where each component will go & make sure it meets up with the next component at the correct point on the board. See image 3 – this is the most important [and difficult] step for beginners.

Check that power is flowing in a continuous line around the board. Broken links or components sitting alone on the board mean the ‘circuit’ is not complete and it will not work.

Use pencil and paper – draw the 555 IC near the centre and work out from each pin – noting how many components are connected at junctions – one row can be ‘common’ to 2, 3 or 4 components in this project. Computer design software is free & can help complete a paper plan. Double and triple check your penmanship… follow the line from each Pin of the IC to be sure it matches the Schematic. Your plan may not look like mine, that’s OK, work with whatever board you have, move components where you want… just refer to the points above.

Solder components to the board

Begin with the Wire links first as they lay flat on the board then add each component according to its height. I put links, resistors, IC socket, capacitors, 4Pin mounts and Large Cap in that order.

When the design is marked with an “X” it means to CUT the copper track under the board.

When using an IC it’s quite common to isolate the Left and Right sides of the IC. Use a sharp knife and carve a small ditch in the copper – test to make sure you have isolated both sides of the IC. Quick continuity test with meter will do.

Solder the IC Socket in but do NOT put the 555 IC chip into the board until you’ve finishing adding/heating components with soldering iron.

Pay attention to any components that are ‘Polarized’ – i.e. they need a particular Positive/Negative placement. Our Capacitor C3 must to be placed with the +ve leg joining Pin 3.
Test the circuit

When all components are added, do a final physical check following the line from each Pin of the IC... does each pin have a correct line of power and components as per the schematic?

- Add the NE555 IC to the circuit – it’s time to be brave
- Connect a 9V battery & Morse Key to the circuit
- Press the Morse Key to close the circuit
- Adjust the Frequency and the Volume knob until the Tone suits your ear

IF it isn’t loud enough? Look to your Pots – the variable resistors. The Linear 1k must be connected to the speaker and the Logarithmic 100k must be connected through Pins 2 & 6 to create the Frequency or Pitch. If it doesn’t work – YOU have done something wrong – it’s time to walk away and come back with fresh eyes... and start following the schematic around your circuit.... What’s missing? What’s in the wrong place? Are all your solder joints holding – test under the board with a continuity tester to be sure power runs along each rail.

Success!

The circuit worked so it’s time to drill holes in the Jiffy Box

- Two tiny pinholes for the battery clip pins
- Two for the Pots [frequency & volume knobs]
- Hole for the Morse Key Socket.
- Drill holes in a pattern over where the Speaker will sit [Image 6 shows more holes than necessary because the recycled 57mm speaker I used failed so I substituted a new 27mm Mylar speaker from Jaycar – Great Speakers for that tiny size]
- I used 4Pin Block Mounts to keep my coloured wires under control – each wire could be soldered directly to the board if you prefer
- These oscillators will be used in our club teaching program so using block mounts makes the board modular and easily repaired.
CW Practice Oscillators ready Basic Morse Code Training

Image 8 – 555 IC Pin designation

Notes: NE555 Integrated Circuit

I’m keeping this simple so that beginners can have confidence use them in circuits. See Image 8 for the Pin Designations for a 555 Timer

Without going into too much depth, just know what this IC is performing many small jobs so you don’t have to build lots of small circuits to accomplish the same thing. Each Pin is numbered and has a designated FUNCTION.

Note “U” at the top of the IC that’s ‘the top’ and Pin 1 is always the top left. With 1 to 4 down the left side and 5 to 8 back up the right side. When you look at the real chip it also has a ‘dip’ or ‘U’ at the top – so does the socket. Make sure you know Pin1/Top.

Comparing these Pins to our original circuit. Pin 1 went direct to Negative or Zero volts – check. Pin 3 to output…. Ours went Pin 3, through a capacitor and then to the output – [the speaker and the volume control] – check. Nice to know that whoever designed the original schematic kept to the functions of this IC.

To build this Oscillator you do not need an in depth course in the mysteries of these devices but do some internet research if you want to know more… or else just build and have fun… you can learn more as you go along.

Creating a layout on paper

Just because you can identify the components in the schematic doesn’t mean you know how to place them on a circuit board….. It’s not difficult… ONCE you LEARN.

I found this website http://electronicsclub.info useful for beginners as it take you step by step in building up a simple circuit and understanding how components should be linked to each other.

I also found a beginner level computer design program called verodes – do a search and download it.

It’s simple to use but is dated 2011 and not all features work in Win8x products.

Parts list with Jaycar part numbers & Cost as at Nov2014

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<thead>
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<th>Component</th>
<th>Part Number</th>
<th>Cost</th>
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<tr>
<td>Vero board [share]</td>
<td>HP9542</td>
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<td>Speaker</td>
<td>AS3002</td>
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<td>Knobs x 2</td>
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<td>Battery Holder</td>
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<td>Phone Socket</td>
<td>PS0162</td>
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<tr>
<td>Jiffy Box 130x68x44</td>
<td>HB6013</td>
<td>$3.95</td>
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<tr>
<td>** Built 4 – so shared $8 cost of 1 95x150mm board</td>
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