Rock It- Instructor Guide

NOTE: This is an advanced kit with a lot of parts. If you have Cubs and Joeys assembling this kit, it is highly recommended that you at least pre-solder the IC sockets, and maybe also the resistor networks in for them to reduce the time it takes to assemble it.

Design principles

The Get to 9, is designed to be built by young Scouting youth members with limited to no soldering experience. It has many design principles that should ensure lower assembly failure rate, and a longer lasting robust kit

Design features

- Momentary on/off switch - so that it can not be accidentally left on
- Centred On/Off switch and catch switch at the bottom so that it can be operated by a left or right handed person
- PCB Mount battery holder
- Recommend using a small 2mm thick piece of double sided tape to help hold the battery holder on - see assembly section.
- Larger solder pads 2.5-3mm, to make soldering easier for Scouts
- Wider spacing for radial component leads to prevent solder bridges, and components laid down to prevent breakage.
- Longer IC pads to help with Soldering,
- Short Stem switches to help prevent switches breaking
- Hole at the top for connecting to a Lanyard
- Wider tracks so that if through holes are delaminated, then the component lead can be soldered to the track - saves replacing the board and starting again,
- No more than 1 track connected to a through hole to reduce the number of tracks to be reconnected if a pad is delaminated.
- Space for youth members name and group on the back

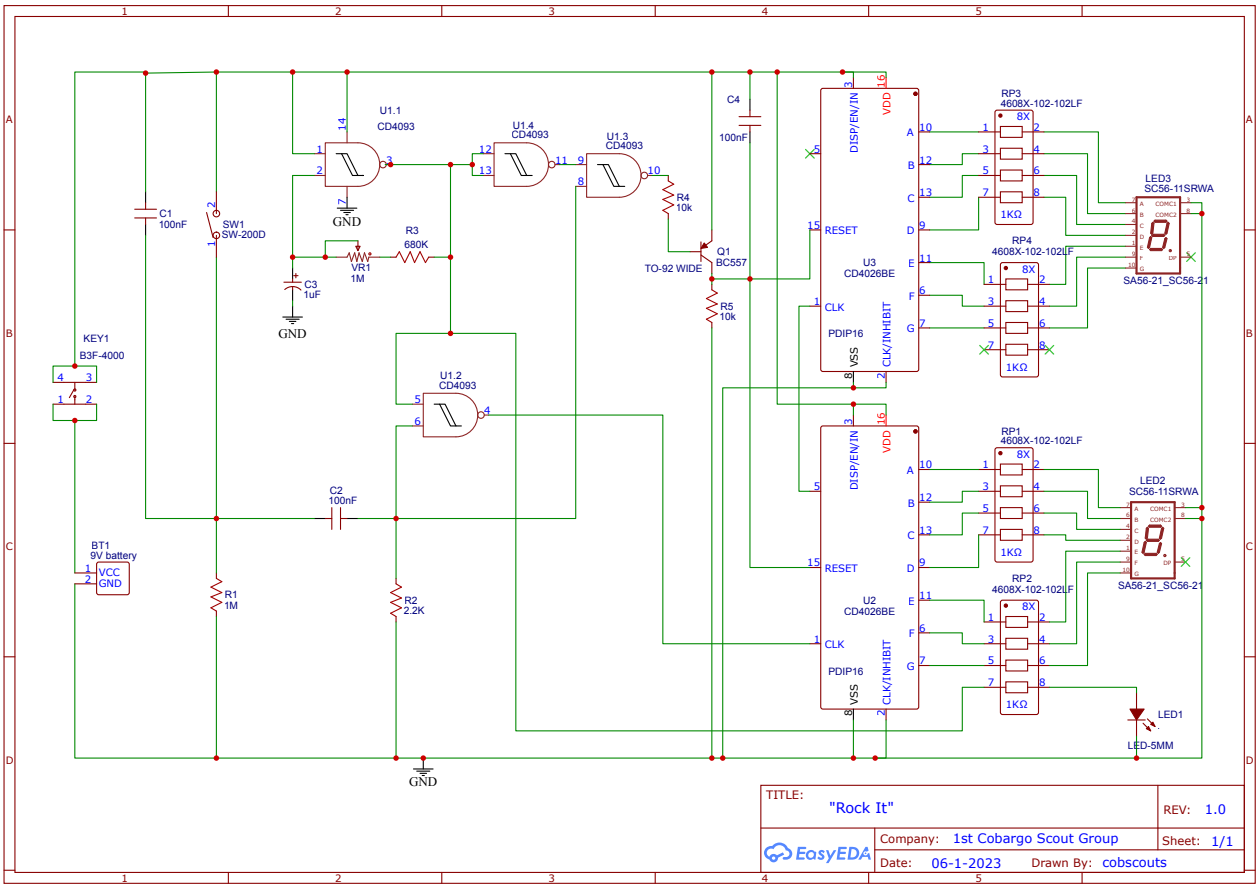
Circuit details

The circuit is based on a CD4093 and CD4026 IC.

KEY 1 is a momentary switch - this needs to be held down to power the circuit.

U1-1 is configured as an astable multivibrator, the frequency of the oscillator is changed by rotating VR1, this in turn changes the speed that the LED Flashes.

The idea is to “Rock” the board to the right and left, which connect and disconnects the tilt switch SW-200D, when the LED is on, and therefore increment the 2 - 7 Segment display by 1.



Count up
R1,R2, C1,and C2 act as a “one shot”, that is only re-triggered by turning the Tilt switch off and on by rocking the board
U1-2 takes the output from the One shot and U1-1, and if they are both Low (Key 2 pressed when the LED is on), this then increments the Clock input on the CD4026, increasing the display by 1.

Reset display to Zero
If the tilt switch is not on at the same time as the LED is on, then the combination of U1-4,U1-3 and the BC557 will reset the CD4026 to display a Zero on the 7 segment display.

Zero displayed on startup
C4 is used to reset the CD4026 to display a Zero output on startup.

Battery Holder options.

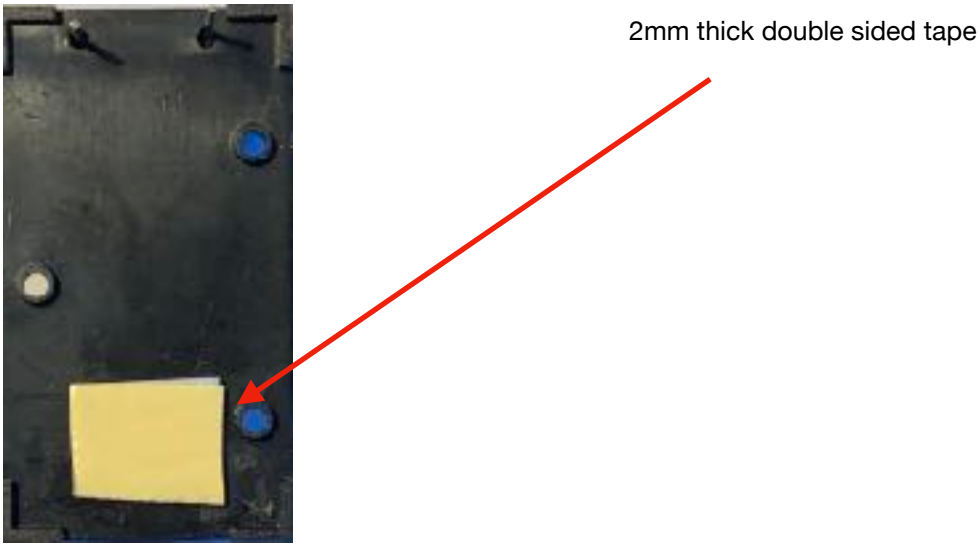
The Board can accommodate different PCB mount 9v battery holder types

The main preference is a PCB Mount battery holder, there are many different brands available, in qty of 10 or more they are about $1 or less each. See the shopping list for suggestions. The recommended one in the shopping list is available from Altronics, but I have also seen it at, Jaycar and Radio parts for a similar price.

Different manufacturers have different pin spacing, the board has slotted holes for the battery holder that can accommodate pin spacing from approx 12.5 to 14 mm.

Double sided tape for the battery holder

It is advisable to use a piece of 2mm thick double sided tape (automotive tape is nice and strong) at the end of the battery holder near the on /off switch end. This will ensure that the battery holder is firmly secured to the board at both ends, and prevent it from being broken off.



Assembly guide suggestion

Install the components in the following order (the board will stay relatively flat on the bench this way, and will not require you to splay the wires much to keep the component from falling out.

1. Resistors - 5 (use the lead bending tool - 10mm)
2. Transistor - its is recommended that you pre-bend the leads for this.
3. Electrolytic Capacitor (must go in the right way round)
4. SW-200D Tilt Switch.
5. Ceramic Capacitors - not polarised so can go either way round.
6. IC Socket -2. (There are 1-16 pin and 1-14 pin socket)
7. Switches - 1
8. Resistor Networks - 4
9. 7 Segment display - 2
10. LED
11. Potentiometer

Test the Board before soldering in any more components.

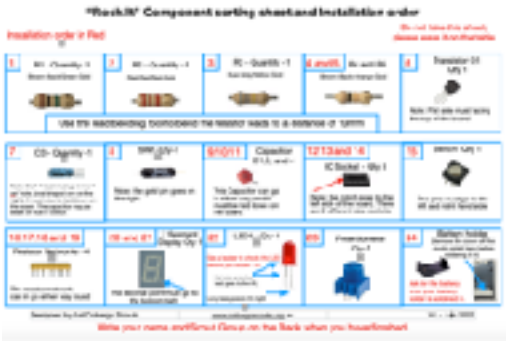
It is important to test the board before letting them solder in the battery holder, as it is hard to unstick and desolder if one of the components underneath is not in correctly.

- Check the soldering before going any further, and ensure that they have put in all the components the right way round, and that the soldering is ok.
- Put in the 3 IC, the 2*4026 go in the sockets in the middle of the board, and the 4093 at the top.
- To test it, put a battery in the holder put it into the board and twist it slightly so that it contacts the holes in the board. Then press the On/Off button and ensure that the LED flashes, and that you can “Increase the counter” when you rock the board button. And that it resets when you press the button when the LED is off.Also test that the LED flash rate changes when you turn the potentiometer.
- If all is ok, then remove the battery, get the person assembling it, to remove the cover on the double sided tape and solder it in.

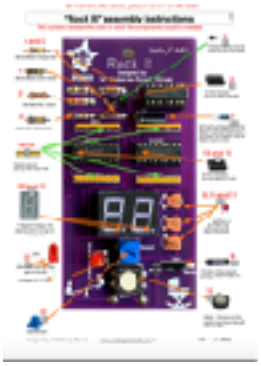
12. Get them to write their name and Scout Group on the back in the space provided.
13. It is recommended that you put a piece of 40mm wide Kapton tape on the back of the board over the components above the battery holder. This circuit is sensitive to resistance from fingers on the pins. The tape will also help protect fingers from sharp solder joints.

To Do list before the Day

1) Order Boards
2) Order Components
3) Source and buy the Double sided tape for the battery holder.
4) **Solder requirements** - 60cm solder (approx 2.3g) (Can do it with about 50cm, if you are a good at soldering)
5) Print one copy of the Component Sorter per Soldering station, and laminate them. Stick these to the table so that the Scouts do not take them with them. These are used by the Scouts to sort the components, do not let them start soldering until you have checked that they have sorted them correctly



6) Print two copies of the Assembly guide (double sided) per table (4 - 6 scouts) - they can just share them. Laminate this as well.



7) Cut the double sided tape and stick it on the lower bottom edge of the battery holder,

8) Package the kits in the Mylar bags. Only put in the 5-resistors, 3-ceramic capacitors, 1-electrolytic capacitor 1-switches, 3-IC sockets 1-transistor, 1-Led and 1-Potentiometer, 2-7 Segment display, and 4 resistor networks. As per the component sorter do not give out the battery holder , 4093, 4026 IC and battery until the soldering has been checked, and board tested.