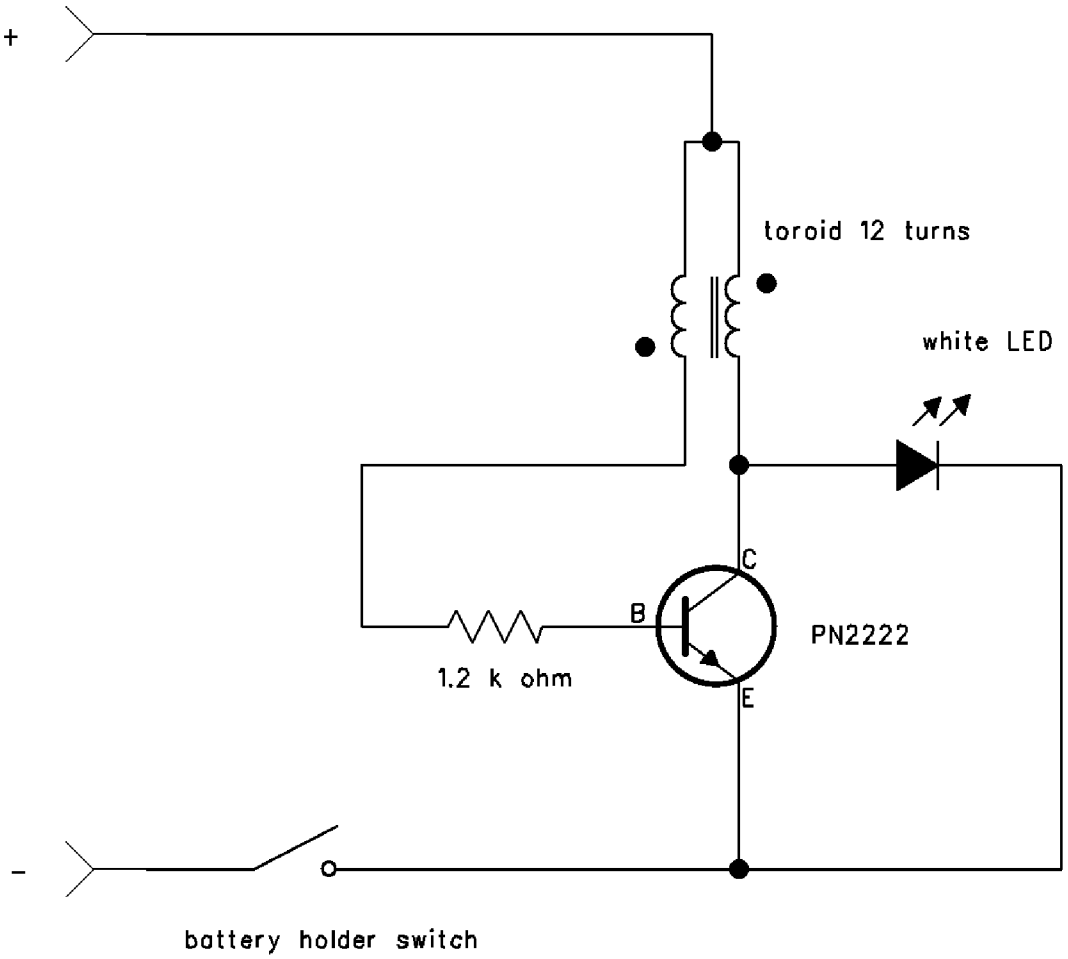
QRPthief - A single AA cell LED light kit - Chuck Olson, WB9KZY, Jackson Harbor Press

The QRPthief is my version of the popular circuit: Joule Thief. Like many, I've got a bunch of alkaline AAcells that are in that are in that zone between completely dead and freshly charged. Stick them in something with a motor and it runs S L O W L Y. Stick them in something with an LCD and the display segments are still visible but "dim". Stick one in a QRPthief and it can light a white LED for hours, "stealing" more power out of the not yet dead cell.

The QRPthief is a simple single transistor circuit which oscillates and multiplies the AA cell's voltage up to the point where a white LED can be driven brightly. The QRPthief packages the circuit into a 2 cell AA battery holder with a built in power switch. The volume normally taken by a second AA cell holds the LED, transistor, resistor and toroid of the joule thief circuit. There is no circuit board, the leaded parts are simply wired together in a "flying lead" style.

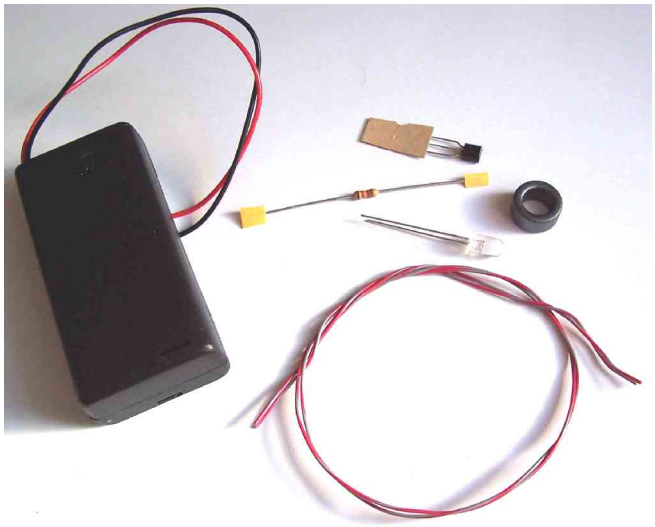
The joule thief circuit is well documented on the internet and there is nothing special about this the QRPthief, implementation. There are probably many changes which could be made to improve this kit. One item to note, the circuit oscillates in the LF band (I can hear the QRPthief prototype with the LF Converter kit at 75 kHz) so be aware of that potential for RFI when using it near an actual QRP (low power) radio (or any other receiver).

QRPThief Schematic:



Building the QRP Thief

kit contents:



2 x AA cell battery holder w/switch
1.2k ohm resistor
PN2222 NPN TO-92 transistor
White LED
generic ferrite toroid
twisted pair solid wire with contrasting/complementary colors

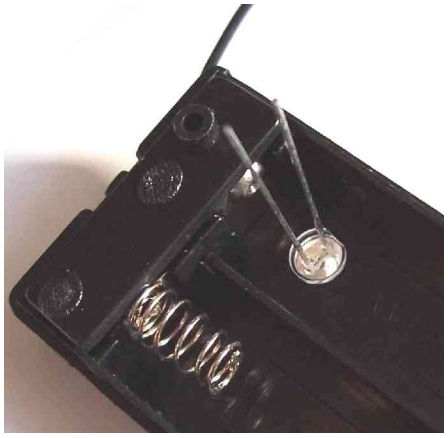
QRP Thief assembly:
1) cut the red wire off flush with the top of the battery holder.
2) use an awl to start a hole about 25/32” from the top of the battery holder on the right side (near the wires):

3) drill the 1/16” hole:

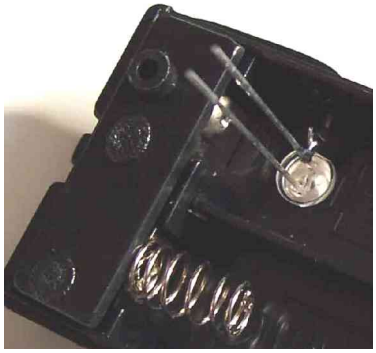
4) drill a 3/16” hole about 25/32 from the top of the battery holder, use the + symbol within the circle:

5) wind 12 turns of twisted pair wire on the toroid core:

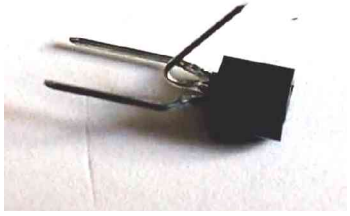
6) cut the black wire to a length of 1 3/8” long, strip the insulation from the last 5/16”
7) press the LED into the 3/16” hole (enlarge slightly if needed but keep a snug fit) with the flat side of the LED towards the 1/16” hole. The flat side of the LED (with the shorter lead) is the cathode.



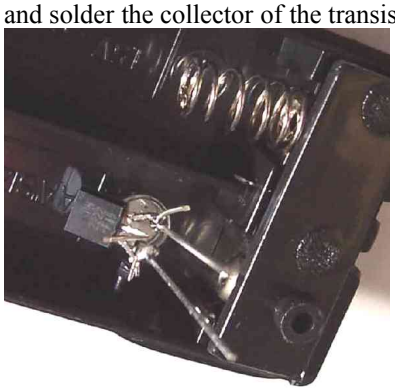
8) thread the black wire through the 1/16” hole and solder it to the short lead of the LED:



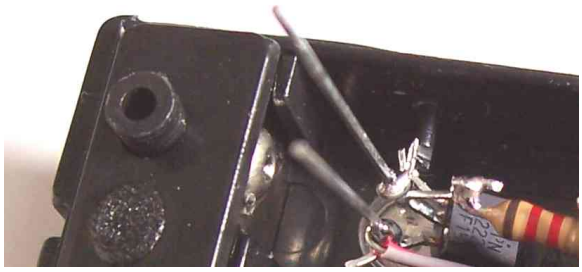
9) bend the base (center lead) of the transistor as shown:



10) solder the emitter of the transistor (left terminal) to the shorter LED wire (cathode)
and solder the collector of the transistor (right terminal) :to the longer LED wire (anode):

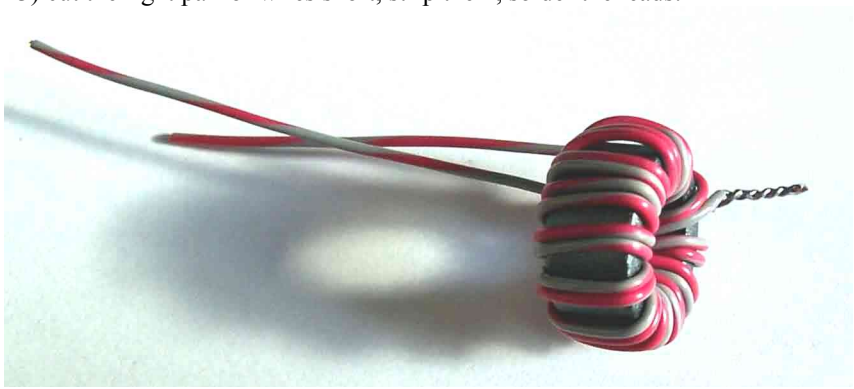


11) solder one lead of the 1.2 kohm resistor to the pre-bent center lead (base) of the transistor.



12) bend the wires of the toroid as shown:

13) cut the right pair of wires short, strip them, solder the leads:



14) solder the toroid to the spring (positive battery lead):

15) solder the shorter toroid wire to the 1.2 kohm resistor:

16) solder the longer toroid wire to the collector of the transistor:

17) clip the leads, check the connections and insert the battery:

18) put on the battery cover and turn on the switch: