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BUILD A USB CABLE CONTINUITY TEST JIG

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If you are like me, you likely have a drawer or shoebox stuffed with assorted USB cables that are used to either charge or program a USB device. The problem often is that some cables may only be useful for charging and which have only the +Vcc and ground wires intact, with one or both data wires either broken or not connected in the first place.

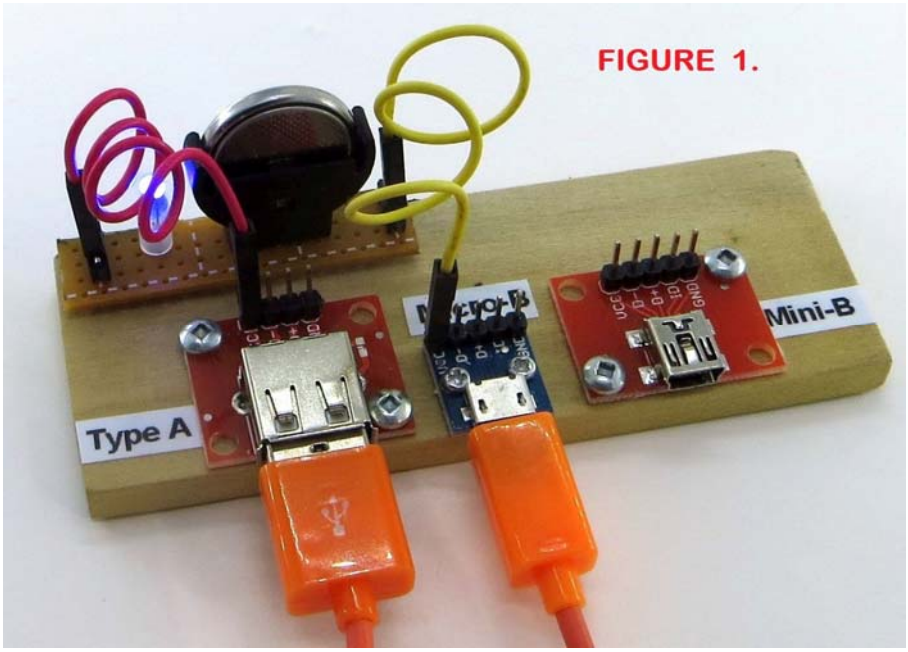


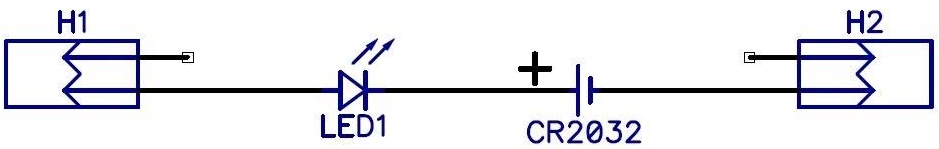
FIGURE 1.

But how to tell??

Figure 1 shows a really simple test jig that will make it easier for you to quickly check the continuity of a 4 conductor USB cable.
The only parts needed are 2 or more "breakout" boards with female USB receptacles to match the ends of the USB cable you want to test, and something to mount them on.
(I used the USB type A, USB Micro-B and USB Mini-B and fastened them to a small piece of wood)
Simply plug in your questionable cable to the appropriate mating female connectors on the test jig as shown and use your ohmmeter to check continuity by probing matching pin numbers on each breakout board. You can also verify the interconnection of pins 4 & 5 on an OTG cable. (see sidebar)

As an after-thought, I added the simple LED continuity checker shown at the top of Figure 1. It consists of just a Lithium-ion coin cell like CR2032, a blue Led from my junk box and some jumper wires. It is much easier to use than a multimeter.
The schematic, as simple as it is, is shown in Figure 2.

FIGURE 2.



The circuit can be built up on a small piece of perfboard. A strip board lay out is shown in Figure 3.

Note re coin-cell holder. I used a vertical holder because I had one. However, horizontal mounted holders may be more common, although they take up more space.

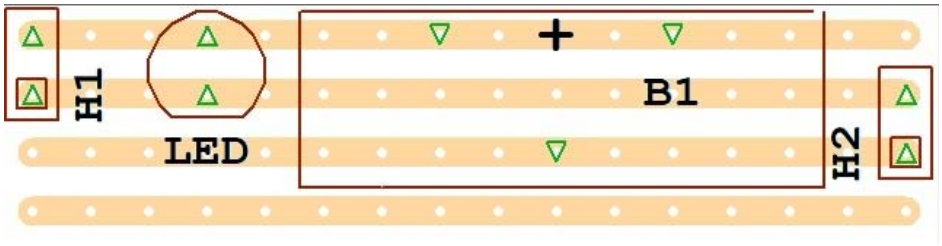


FIGURE 3.

The little break-out boards are available on the internet and from suppliers such as Sparkfun.

Sparkfun part numbers are as follows:

Type A USB : BOB-12700
Micro-B USB : BOB-12035
Mini-B USB…: BOB-09966
Jumpers F/F : PRT-11710 or 12796

What does OTC mean?

OTC is short for “On-The-Go”.
OTC USB cables are made with 5 pins at the Micro or Mini end instead of 4.
The extra pin (#4) is sensed by OTC capable Android devices in order to allow them to communicate with peripheral devices such as USB storage, keyboards etc.
This pin is marked as “ID” on the breakout boards and is usually connected directly to ground pin #5.
This easily verified using the USB cable checker.

Connecting an LED directly to a Li-ion Coin cell

At first glance you may wonder why the led does not burn out, when connected directly across a 3V coin-cell battery without the usual series current limiting resistor. The main reason is that coin-cell batteries like the CR2032 already have a built in internal series resistance (IR). This IR may range from 10 to 50 ohms or higher as the cell discharges.

Also note that blue or white LED’s are a good match to the battery, with Vf’s of approximately 2.9V at 10mA. If you use a red. green or amber led, whose Vf’s are lower around 1.8 to 2.0 volts, it would be good practice to add an external series resistor of 68 ohms.

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