Versatile and Low Cost Digital Counter

by trebuchet03 on September 5, 2006

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Intro: Versatile and Low Cost Digital Counter
This hack will transform a cheap easily sourced calculator into a versatile counting machine. It can be used as a cheap method to measure distance using a wheel, reed switch and magnet (think bike odometer).

So what else can it do you ask? Well, how many times does your central A/C turn on in a day? How often does that radiator fan in your car kick on? How many times does that refrigerator door open in a day/week/month? And the list goes on and on... in fact, have an idea of something repetitive to count? Do post what and the method to count it ;)

Distance meter: Wheel of known circumference, reed switch, magnet
A/C: Relay on thermostat line
Radiator Fan: Relay on fan circuit
Fridge Door Open: Relay or photo sensor on light or reed switch/magnet

In the spirit of the magnet challenge - this is going to be built as a distance meter for a bike and I'm going to measure how many times certain doors around campus open/close during a specific time interval (just for fun :P)
**Step 1: BOM - Bill of Materials**

Quick list of materials and tools you may want on hand.

**Tools**
Soldering Iron
Solder
Some form of adhesive (to attach magnet to a spoke -- or make a holder -- etc.)

**Materials**
Calculator using a PCB
Wire (nothing heavy duty - little scraps and leftovers are perfect for this)
Reed Switch
Magnet (suitable for activating the reed)
A Zip tie or two

**Step 2: Testing and Disassembly**

First, turn on your calculator and press: "+ 1 =" It should display "1." Now (This is very important), press "=" again. Does it read "2" as the answer? If yes, continue forward. If not, you need a different calculator that will do this.

The fun part -- take apart your calculator. With any luck, your calculator uses a graphite pad to close the circuit on a printed circuit. Just like most keyboards. You want a calculator that you'll be able to solder onto - so if your calculator printed circuit is printed on a plastic - you're likely to have a lot of trouble (like I did).

Now locate the printed section for the "=" button and fire up the soldering iron.
**Step 3: Soldering**

Now, note there are two sides of the key switch. You'll want to solder a bit of wire on one side of the switch and another length on the other side of the switch.

Now, again, press "+1" and then short the two wires you have just soldered. If all is well, the answer "1" will be displayed.

Reassemble your calculator but be sure to have the wires come out the side of the casing. A quick touch of the soldering iron should melt a nice little pathway or your two wires.

**Image Notes**
1. solder ball that would not stick to the other calculator...
2. oopse, forgot to put the battery back in!

**Step 4: Attach Reed Switch**

Solder the two wires to your reed switch. If you have a different method of attachment, go right on ahead ;) Heat shrink or plastic dip at will, but it's not necessary. As you can see, I used alligator clips to test :P

Again, enter "+1" -- swipe your magnet near the reed switch and make sure "1" is displayed as your answer. If not, go back and make sure your reed switch is working and everything is connected properly. Do this a few times and watch it count away.

Now, use 1 or 2 zip ties to secure your reed switch to the front fork of your bike.

**Image Notes**
1. the magnet
2. the switch
Step 5: Collect Data!

My reed switch has a adhesive backing... So go ahead and stick where you want.

I collected from two doors on campus. The first as an entrance to my school's Student Union. I placed it there for one hour during lunch. I dropped off my cargo and grabbed a "Boston Dog" from a nearby restaurant... An hour later - 424. Minus 1 from me opening the door.

So that's 62 minutes and 423 openings of said door. that's about 6.82 openings per lunch minute (12:00-1:00) on monday. Of course, a suitable sample would be to return the next mondays, collect the same data and then calculate a mean, tolerance etc. But hey, I don't have a month to do that - nor do I want to use this to calculate how many times per hour a specific door opens.

Door two is not as exciting.... Same time period - on a teusday...It's a lonely door in the back of the Engineering building. It goes from the atrium to the back service area that leads to the parking lots... A sad 23 in 58 minutes. 2.52 opening/lunch minute. Which makes sense, why go out for food when you can stay at a table in the atrium studying for your next exam you're likely to fail :P
manicmonday says:
Oops. Correction. It worked for a few minutes correctly, then the stiff wire started causing the "=" to go off on it's own multiple times. So then I tried another wire that wasn't so stiff, and it worked for a few minutes, then stopped getting connection. So, unless someone knows of a glue that is also a conductor, then that kind of calculator doesn't work for this application.

DIYShared says:
Look at my page how to do it with that kind of calculator: http://diyshared.com , click on Homemade Measuring Wheel. I have put also instructions on how to do a kind of conductive glue.

beehard44 says:
graphite mixed with glue will do the trick
you can shave pencil leads for the graphite, should be mostly graphite over glue

XOIIO says:
Ta-Dah!

PyroMonger says:
there is a type of conductive glue but thats all I know on the matter. I don't know what its called or where you can get it from, sorry

XOIIO says:
Ta-Dah!

DeathunT says:
My problem is that after 5 min, if nothing append, the calculator switch off!!! How can I prevent that?

beehard44 says:
use a different calculator

beehard44 says:
maybe if i attach that to the NO pin of a relay and attach my input to the coils then maybe i can use it to detect electrical signals.....
i can see a tipping bucket counter here...

DIYShared says:
To complete my previus post, if you are interested I show in my video how to use a calculator with flex circuit keyboard:
**DIYShared** says:  
Aug 28, 2010, 1:09 PM  
I have used the concept to make a Measuring Wheel. As a matter of fact I didn't know your project before. True! Anyway you did it first.  
http://diyshared.com/MeasuringWheel/MeasuringWheel.htm

**Bob1356** says:  
Apr 22, 2010, 1:37 PM  
The counter is an absolute great circuit. What I need to do is step it up to the next level. I would like to start with a particular number and count down and once it got to zero I will have to test but I believe that if I start with the number 50 and did "-1" then short the leads connected to the equal button will allow the circuit to count down. I would need an output when it read zero. Thoughts and comments!

**TOCO** says:  
Mar 11, 2009, 2:57 PM  
http://www.radioshack.com/product/index.jsp?productId=2419298 here is the link for the reed switch at radioshack.

**DeathunT** says:  
Mar 8, 2009, 5:42 PM  
How to you keep your calculator to auto-turn-off? Most calculator turn off after 5 min... PLEASE HELP!

**sampie** says:  
Jun 13, 2007, 12:56 PM  
I had at home a IR sensor so i all put it on my basketball ring and let the calculator on 2 so every time i scored my calculator at 2 points. Sorry for my bad english

**Derin** says:  
Feb 27, 2009, 11:58 AM  
What if you shoot foul shots or 3-pointers?

**Herminator** says:  
Dec 24, 2008, 10:24 PM  
nice idea ;)

**rsgino7** says:  
Oct 29, 2008, 3:12 PM  
Hey, this is a really cool, yet so simple idea. Great Job! I do have problem with the soldering. I do have PCB however the solder does not stick to the board. Any tips?

**manicmonday** says:  
Aug 22, 2008, 4:37 PM  
I bought that exact clear calculator, and it was easier than another than had an actual PCB. I wasn't able to solder the PCB at all, and that was if I was right about the place to solder it anyway. It was very confusing. But the clear calculator was much simpler, and I noticed that there were holes at critical junctures. I placed stiff wire in the 2 holes that lined up with the "+", bent it double, and crimped it down. It was no problem.

**yarnspin** says:  
Oct 9, 2006, 11:06 AM  
Who could start making these to sell with my skein winders. I need a silent counter to count number of revolutions. What would you charge to make 3 to test with?

**handyScrapper** says:  
Jun 13, 2008, 9:05 PM  
ur telling me you cant make one yourself?

**yarnspin** says:  
Jun 16, 2008, 7:00 AM  
I just do not have the time. Need someone to make me six at a time or more. Nels Wiberg

**yarnspin** says:  
Jun 14, 2008, 4:29 AM  
Yes, the calculator that I took apart was a printed circuit board and I do not know how to connect the sensor to that. I'm also too busy making spinning wheels to make fibers into yarn. If you would be interested in making them for me let me know. It would help with my Skein Winder sales.

**Patented** says:  
Dec 9, 2007, 6:06 PM  
it's a nice idea...i never think to do this!
handyScrapper says:
wat r u foreign or something? lol jk but to be honest the grammar really sucks.

Jun 13, 2008, 8:59 PM  REPLY

Patented says:
Lol im not a foreing but I speak french

Jun 14, 2008, 9:40 AM  REPLY

frank26080115 says:
I got an idea to resolve the problem with the different calculators doing different things when you press "+=", this uses 2 switches though
You know how it calculates when you press "+=" or any other signs? instead of wiring the "+=" button to the switch, wire the "1" and the "+, have the magnet or something trigger the "1" and then the "+", shouldn't be a problem to do for a spinning object, might look ugly on doors though.

Nov 3, 2006, 9:00 PM  REPLY

handyScrapper says:
exellent logic.

Jun 13, 2008, 9:04 PM  REPLY

Trans_Am says:
SWEET!!!

Sep 29, 2006, 5:12 PM  REPLY

Murf says:
Excellent Job. Is there a specific type of reed switch that one would use for this? (I live the idea of the fridge counter :P )

Sep 29, 2006, 5:29 PM  REPLY

handyScrapper says:
you could make a homemade one (look up here) or buy one from mouser.com, or whatever. As long as its a true reed switch it should work.

Jun 13, 2008, 9:03 PM  REPLY

trebuchet03 says:
I’m using one for a home alarm system… I believe it is a normally closed switch - but I'd think a normally open would work too - the count would just happen at a different time.

Sep 29, 2006, 5:34 PM  REPLY

thejrb says:
could u help me with your digi counter i want to know were to solder my wire on the equals wen i run my wire over it it will just keep counting

Jan 20, 2007, 6:15 PM  REPLY

buildingteen says:
How could you modify this to measure speed on a bike?

Nov 18, 2006, 11:11 AM  REPLY

binnie says:
not speed distance could be possible multiply the circumference of the wheel by the number on the calculator and that should tell you in the same units (metric / imperial / anything u invent ) that you used for the circumference of the wheels Speed works on a completely different set up you would need to get rid of the calculator all together as you are counting the certain number of pulses per min or so many secs

Jan 26, 2007, 4:05 AM  REPLY

handyScrapper says:
Are you the one in your profile picture and is it recent? Because if so you are a frickin genius.

Jun 13, 2008, 8:54 PM  REPLY

Jono1529 says:
You Could Just Do Distance Over Time

Mar 29, 2008, 7:10 PM  REPLY

trebuchet03 says:
Yep – you’d need a timer... You can adapt the concept to do so (I think someone has a speed sensor in the magnet challenge contest :)). But, it can do average speed if you keep track of time :P

Jan 26, 2007, 10:31 PM  REPLY

srilyk says:
I wonder if you could do that with just a reed switch, calculator, and stop watch...

Dec 21, 2007, 1:42 AM  REPLY

**wi-fi astronomer** says:

I did that a long time ago while in the Navy. I used it to keep track of my time left in the Navy by using a battery powered quartz clock with only the hour hand left. With two wired attached to the gauge glass of the clock, it acted like a microswitch. To debounce it I used a capacitor sourced from out in town. I was waiting for the day they would have a security scare from my short timer's clock. The calculator would subtract half a day with each revolution of the hour hand shaft. What gave me the idea was the ship's driveshaft odometer! Nobody in naval history ever heard of this "short timer's clock". The calculator had a D battery rigged to it for when it was dark in the room. A small improvement on the maker's reinvention, try a small capacitor across the leads of the reed switch matched for the anticipated fastest speed. With my version, I used a 220 microfarad cap because the crude switch so slowly made and broke contact and got "scratchy" for 2 hours per revolution.

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**lifelong-newbie** says:

Tis a pretty clever idea

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**unRheal** says:

Ok, I know this was from Sept, 2006... but I thought I'd point it out anyway... 23 openings in 58 minutes isn't 2.52 openings per minute ... you did it upside down - 23/58, not 58/23... think about it - 2 openings per minute for an hour would be 120 openings. I know, it's an easy mistake to make when you're just humming along and stuff... but as I say, just thought I'd point it out, for clarity's sake... Cheers :)

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**packrathacker** says:

Tres cool!

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**Varun R** says:

this is my counter on my bike i used a lot of tape and some epoxy pipe sealant to attach the reed switch onto the front fork

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**tyeo098** says:

as soon as i saw that i said "omg (not really) gotta have!" so, i built it. in stead of using a reed switch and a magnet i used two wires and alluminium tape.

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**PyroMonger** says:

out of curiousity, why would you put the counter on your fridge door? Is it for a survey or just generally to see how often the door is opened in a day?

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**trebuchet03** says:

Yep - to see how many times/day the door is opened... If it's being opened a lot, and it's not you doing the opening, you can talk with the people in your house to try and cut that down. After all, for most setups, when you open the door - lots of cold air falls out :p

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**PyroMonger** says:

Pretty cool way of doing it i guess.

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**srwoodruff** says:

How exactly did you utilize the aluminum tape?... sorry n00b here.
awesome :D There's so many (potentially useless but fun to know) bits of data you can collect with it -- all you need is the right method to hook up. So far, I think the most fun is the fridge counter :P I think I have (or had) that very same calculator :P