Subject: Tachometer building notes
Sent: 9 Oct 99

Tested a Radio Shack (Archer) cat no. 49-201 Infrared Photoelectric Relay - Intrusion detection unit (out of date originally sold for 69.95). Attached the Radio shack Infrared Photoelectric Relay with a .1 uf capacitor on the output to filter the 60/120-cycle nose that was showing up on the frequency meter. The result was workable up to about 11 Hz before the circuit stopped switching. This is equivalent to about 660 RPM. Does work but is hard to get it to line up and reflect off the tape on the rotating shaft. This is because of the invisible infrared beam. Not really that portable or easy to use. Currently runs off 115V AC but with some modification could run off 12V DC. I didn't think it was worth going any further with this.

Next Attempt: Tried an old hand held cassette tape recorder that had a good audio amp with a mic and speaker jack. A small solar cell was attached to a microphone coax cable and plugged into the microphone jack on the recorder. A 200-ohm variable resistor was attached across the solar cell. Hand held laser pointer to reflect off the aluminum tape on a rotating shaft. The output of the speaker wire went to the DM 645 frequency meter and an oscilloscope for testing. The pot was adjusted to allow the frequency meter to select different amplitudes in its calculation. All AC lights (florescent and incandescent) near by needed to be turned off to cut down on the 60/120 cycle picked up by the solar cell. By adjusting the pot sometimes one can get the correct frequency. Most of the time the frequency measured was way too high. The frequency response of the audio amplifier in this typical small tape recorder was not high enough to work. Was taking the pulse and changing it into a decay sign wave. Which was to be expected. This introduced lots of higher frequencies. Thus this approach is not recommended.

The best approach so far has been to use a solar cell attached to an oscilloscope with a laser pointer bouncing off aluminum tape stuck to the shaft. The timing is then done by counting centimeters on the scope screen and

multiplying by the sweep rate to get fraction of a sec between pulse, or for one revolution. 60 sec/min is then divided by the fraction of a sec or number of sec for one revolution. This then gives RPM.

After much research: The most reasonably price off the shelf unit that I can find that will measure low RPM is Photo/contact Tachometer ($155.00 part no. 01DT2236) from Elctronix Express (800) 972 2225. This unit measures between 5 to 100,000 RPM using the photo approach and .5 to 19,999 RPM using contact.

Note: The frequency meter used above was a DM 645 ($38.95 part no. 01DM645) from the same place. Being able to measure to one HZ is really not enough. 5 Hz measured is 300 RPM, 1 Hz is 60 RPM. As you can see this is not very good accuracy at low RPM. Thus all in all I think it better to purchase the above unit.

My next action is to purchase one of these, for portable use unless I have missed something easy to try. I don't think I want to spend the time designing or finding a circuit for a solar cell that will amplify the square wave pulse keeping the original shape rejecting 120/60 Hz noise.

Mike, please forgive the time delay.

What I use in these applications is a multi-meter with a frequency function. I attach a reflective strip to the shaft, and then use an old laser security light system to monitor rotations in time. It's easy to set up, and can be used anywhere.

Be well.

Jay K. Mullin "The Wind Works"
http://www.users.uswes.net/~jaybo/index.htm

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 wrote:

>
> I have one of those older model Radio Shack - pass through the door
> infrared laser that reflects back to a sensor activating a buzzer or
> whatever. Is this the kind of unit you are talking about? Did you need
> to get on the other side of the relay that carries the load to pick off
> the frequency signal? Can't find it right now to check it out.
>
>
>

Mike, yes. Same type of device. I'm not familiar with the
Radio Shack device, but you can make it work. You need a
filtered dc signal out from the receiver to the meter. A
small diode bridge and electrolitic capicitor will work here
if needed. Remember, what you are essentially doing is
using your meter as an event counter, so you need a flat
line for each event or revolution. A 1 to 5 volt output
works well with both meters and scopes. Your meter will
read Hz in seconds so it's hz * 60 = rpm. When you find
your unit let me know and I'll help with the conversion,
simple stuff. Many hand held meters with a frequency
function have a minimum 20 hz reading. So their low end
reading cannot go below 20 * 60 = 1200 rpm. My meter does
fractional and decimal equivalents, but there pretty spendy.
Look for a meter that will read 1 hz, there are many around.

Take care.

Jay

"Jay wrote:
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> function have a minimum 20 hz reading. So their low end
> reading cannot go below 20 * 60 = 1200 rpm. My meter does
> fractional and decimal equivalents, but there pretty spendy.
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Yes I understand, my current one has the 20 hz minimum.

I ordered a meter that works from 1 Hz to 20 MHz with up to 10% error.
Cost is $38.95 from Electronix Express 800 972-2225. Digital Multimeter
with cap/frequency/transistor tester model DM645 part number 01DM645.
In the mean time I plan to used my scope.

I found it works to use a laser pointer and a silicon photo cell hooked
to an oscilloscope. I put a small square of aluminum tape on the
shaft. By holding the laser pointer in one hand and the silicon solar
cell in the other I could get it to bounce off the aluminum tape and
light up the solar cell. The scope was adjusted to .01 volts/division,
with a sweep rate of 20 msec/cm. Some times on slower speeds I used 50
msec/cm. I adjusted the trigger to trigger on the start of the pulse
reflected from the aluminum tape. The output voltage was about one to 2
cm or .01 to .02 volts. I would then count off the divisions between
similar peaks. Number of divisions or cm times sweep rate gives the
number of msec for one revolution. This divided by one and multiplied
by 60 gives RPM.

A scope works fine but it's not vary portable, so I plan to make a more portable unit, when the frequency meter comes in. I will talk about my results of what I measured in another E-mail.
