

## Re: 4017 Counter skips under load

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*Source:* <http://sci.tech-archive.net/Archive/sci.electronics.design/2007-07/msg00411.html>

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- *From:* Jim Thompson <[To-Email-Use-The-Envelope-Icon@xxxxxxxxxxxxxxxx](mailto:To-Email-Use-The-Envelope-Icon@xxxxxxxxxxxxxxxx)>
  - *Date:* Wed, 04 Jul 2007 09:15:18 -0700
- 

On Wed, 04 Jul 2007 09:00:22 -0700, jcargile2001@xxxxxxxx wrote:

On Jul 4, 12:56 am, "David L. Jones" <[altz...@xxxxxxxx](mailto:altz...@xxxxxxxx)> wrote:

On Jul 4, 5:12 pm, jcargile2...@xxxxxxxx wrote:

On Jul 3, 4:58 pm, "David L. Jones" <[altz...@xxxxxxxx](mailto:altz...@xxxxxxxx)> wrote:

On Jul 4, 8:54 am, jcargile2...@xxxxxxxx wrote:

On Jul 3, 3:14 pm, "David L. Jones" <[altz...@xxxxxxxx](mailto:altz...@xxxxxxxx)> wrote:

On Jul 4,  
6:50 am,  
jcargile2...@xxxxxxxx wrote:

On  
Jul  
3,

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1:24  
pm,  
Joerg  
<notthisjoerg...@xxxxxxxxxxxxxxxxxxxxxx>  
wrote:

jcargile2...@xxxxxxxx  
wrote:

On  
Jul  
2,  
3:24  
pm,  
"David  
L.  
Jones"  
<altz...@xxxxxxxx>  
wrote:

On  
Jul  
3,  
7:11  
am,  
jcargile2...@xxxxxxxx  
wrote:

I  
have  
a  
fairly  
simple  
circuit  
that  
consists  
of  
a  
4017  
decade  
counter  
and  
nine  
relay/LED  
combinations.

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The relays are very small and the circuit operates just fine with no load, or when I connect an LED to the relay output. But when I try to operate the circuit under load (it is being used to fire nichrome ignitors), then the counter simply skips the loaded relay and

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moves  
right  
to  
the  
next  
output.  
So  
if  
I  
send  
the  
counter  
a  
series  
of  
5  
clock  
pulses,  
and  
put  
a  
load  
on  
the  
relay  
attached  
to  
output  
3,  
then  
the  
count  
goes  
1,2,4,5,6.  
The  
final  
count  
ends  
up  
being  
one  
off,  
so  
it's  
almost  
like  
the  
output  
in  
question  
doesn't

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exist.  
What  
I  
don't  
understand  
is  
why  
this  
is  
happening,  
since  
the  
relay  
is  
what  
bears  
the  
load,  
not  
the  
4017.  
Shouldn't  
the  
output  
requirement  
on  
the  
counter  
be  
the  
same  
regardless  
of  
what  
the  
relay  
is  
switching?

Yes,  
it  
should  
be,  
but  
only  
if  
you  
have  
used

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proper  
circuit  
physical  
circuit  
layout  
techniques  
to  
ensure  
that  
there  
is  
no  
ground  
or  
power  
bounce.  
Think  
"star  
grounding"  
and  
power  
decoupling.  
Very  
common  
trap  
for  
young  
players.

Dave.

I  
installed  
the  
final  
power  
setup  
(on  
the  
tests  
I  
just  
had  
the  
board  
jumpered  
onto

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the  
power  
supply)  
and  
now  
it  
will  
fire  
the  
ignitors.  
The  
problem  
is  
that  
the  
counter  
is  
now  
behaving  
irrationally.  
It  
will  
skip  
several  
counts  
when  
receiving  
a  
clock  
pulse  
and  
will  
jump  
around  
with  
the  
slightest  
change  
in  
ground  
(even  
connecting  
a  
single  
lead  
from  
the  
multimeter  
to  
any  
point

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on  
ground  
advances  
the  
count).  
I've  
tried  
several  
different  
caps  
(.01–10  
uF)  
connected  
directly  
to  
the  
power  
leads  
of  
the  
4017  
with  
no  
luck.  
All  
of  
the  
info  
I  
can  
find  
on  
decoupling  
keeps  
talking  
about  
selecting  
the  
capacitor  
based  
on  
frequency.  
But  
I'm  
only  
sending  
a  
single  
pulse  
of  
about

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25  
ns  
every  
10–20  
seconds.  
Does  
this  
mean  
I  
can  
use  
a  
larger  
cap?  
I'm  
seriously  
freaking  
out  
at  
this  
point  
cause  
I  
only  
have  
24  
hours  
to  
get  
this  
working.  
Thanks  
for  
the  
help!

How  
on  
earth  
do  
you  
get  
a  
25nsec  
pulse  
out  
of  
a  
CD4017?

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That's  
like  
clocking  
a  
moped  
at  
100mph.

Anyhow,  
since  
things  
seem  
to  
become  
desperate  
over  
there  
I  
can  
only  
suggest  
to  
build  
it  
up  
again  
on  
an  
experimental  
board  
that  
has  
a  
ground  
plane.  
And  
no,  
you  
do  
not  
have  
to  
select  
decoupling  
caps  
based  
on  
frequency.  
A

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0.1uF  
plus  
a  
nice  
10uF  
electrolytic  
should  
do,  
more  
if  
your  
power  
supply  
is  
wimpy.

Can  
you  
post  
schematic  
plus  
photo?

--  
Regards,  
Joerg

<http://www.analogconsultants.com>–Hidequotedtext–

–  
Show  
quoted  
text  
–

Sorry,  
I  
mistyped.  
The  
clock  
pulse

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coming  
into  
the  
4017  
from  
the  
PC  
parallel  
port  
is  
25  
ms  
in  
length.

Ah, the  
alarm bells  
start ringing  
right there,  
no pun  
intended.  
You  
probably  
have  
ringing on  
your clock  
line from  
the PC.  
Keep the  
lead from  
the parallel  
port as short  
as possible.  
Are you  
able to view  
the signal  
with an  
oscilloscope?

Classic  
problem  
with PC  
parallel port  
driven  
equipment.

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Dave.–  
Hide quoted  
text –

– Show  
quoted text  
–

Unfortunately I don't have access to a scope. This is the kit that I'm using. The board itself is plugged directly into the parallel port. I then have leads soldered on to the board at the resistors so that I get a clean 12 volt signal from the parallel port. From there, that signal is run via ethernet cable to the firing controllers. In my initial tests, this setup worked fine with just an LED as the load. Because of safety reasons, I can't have the laptop and thus myself any closer to the controllers themselves.

<img  
src="[http://kitsrus.com/jpg/k74v2\\_1.jpg](http://kitsrus.com/jpg/k74v2_1.jpg)>

Ah, a picture tells a thousand words.

The board should work just fine *\*if\** you power your load from an entirely separate and *\*floating\** power supply relative to the plugpack

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or power supply which powers the board.  
You've said the board works  
just fine with an LED load, so obviously  
something is amiss with the  
power supply wiring for the load.

Dave.– Hide quoted text –

– Show quoted text –

I tried that earlier, but couldn't get the firing boards (running 4017) to recognize the clock pulses from the parallel port interface unless the grounds were connected. Am I doing something wrong there?

I don't get the whole picture here, so let's see if I have this correct...

The 4017's are located on your own board at the end of a long ethernet cable connected connected to this relay interface board?

Please explain in detail what the relay interface board does, what your 4017 board does, how they are connected together, how they are powered, and what lengths of cable are used. Unless you do that we'll all be going around in circles.

Dave.– Hide quoted text –

– Show quoted text –

Hopefully these pics will show the full set up.

[http://a548.ac-images.myspacecdn.com/images01/105/1\\_9f67b69cc9c5093d7535e07ff020383b.jpg](http://a548.ac-images.myspacecdn.com/images01/105/1_9f67b69cc9c5093d7535e07ff020383b.jpg)

This is the inside of the firing box. The barrier strip at the top brings the +12V and ground for the firing control boards (at bottom) as well as a separate ground for the igniters that is controlled by a safety switch. I added the cap to the barrier strip last night in an attempt to help stiffen the power supply to be boards, but have not yet tested it.

[http://a340.ac-images.myspacecdn.com/images01/79/1\\_d358560b9c651a8da68c084e88c6d0eb.jpg](http://a340.ac-images.myspacecdn.com/images01/79/1_d358560b9c651a8da68c084e88c6d0eb.jpg)

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The second pic is the top side of one firing control board. There are 5 of these in total. The IC at the top is the 4017. The black rectangular boxes at the bottom of the board are the SPST reed relays that activate the igniters.

[http://a502.ac-images.myspacecdn.com/images01/82/1\\_86a86c8ec7313a72a4931cf2d91b4e75.jpg](http://a502.ac-images.myspacecdn.com/images01/82/1_86a86c8ec7313a72a4931cf2d91b4e75.jpg)

The underside of the firing board. The wide trace on the right side of the board is the +12V and the left side is ground. Are these too small?

[http://a861.ac-images.myspacecdn.com/images01/82/1\\_5aafdf9e0837402f366a766f5936906c.jpg](http://a861.ac-images.myspacecdn.com/images01/82/1_5aafdf9e0837402f366a766f5936906c.jpg)

This is the Kit74 parallel port interface as well as the power supply. I only have them sitting this close in order to fit them into one picture. I have wired leads onto the Kit74 that goes to an RJ45 jack. That ethernet cable then goes to an identical jack where each line is connected to the clock pin of one firing control board.

So in theory the operation goes like this:

The system is powered up and all counters and parallel port are reset. The ignitor ground is then connected via a remote switch.

From there the software on my laptop plays the soundtrack and at set

intervals activates a single channel output on the parallel port. That signal is then sent from the Kit74 interface via an ethernet cable to the firing boards in the display. The 4017 in the firing controller advances one count, activating the next relay in line. The wire connected to the relay receives +12v which passes through the nichrome igniter and returns to ground through the safety switch. The wire heats, igniting the fireworks. The igniter typically burns up in less than 1 second. The process repeats until all 9 cues have been used.

Schematic showing how the 4017 is driving relay would help.

...Jim Thompson

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James E. Thompson, P.E.	mens
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America: Land of the Free, Because of the Brave

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