

# Re: How can I subtract one frequency from another ???

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*Source:* <http://sci.tech-archive.net/Archive/sci.electronics.basics/2006-01/msg00277.html>

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- *From:* "Andrew Holme" <[andrew@xxxxxxxxxx](mailto:andrew@xxxxxxxxxx)>
  - *Date:* Sun, 8 Jan 2006 20:46:53 -0000
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Frank wrote:

> Hi all,  
> A pretty basic question, but I seem to be having a brain block about  
> what approach to take for this application.  
>  
> I would like to take 2 different frequencies, between lets say DC to  
> 1000Hz, and subtract them from one another to get the output signal  
> frequency as the difference between the 2 signals.  
>  
> For example, 400Hz in one input, 410Hz in the 2nd input, the output  
> will be 10Hz.  
>  
> My first instinct was to use an op amp as a comparator, then I  
> thought of a differential amplifier, then, I stumbled across some  
> mixer schematics, and PLL schematics, and then some really complex  
> filter IC's, by that time I was well confused.  
>  
> I just want this to be as simple as possible, one IC if at all  
> possible and some periferal passives.  
>  
> Could one use an LM324 configured as a differential amp? What  
> confuses me is the CMMR part of it, and the fact that the  
> differential amp seems to only "differentiate" voltage differences,  
> and not "frequency" differences, however the common mode rejection  
> will reject like frequencies from both inputs.  
> I'm pretty rusty on my op amps, so I was hoping someone might be able  
> to at least point me in the right direction with this.  
>  
> Thanks!  
>  
> ;)

You were on the right lines with mixers. Apply the two input signals to a balanced mixer, and you get output components at the sum and difference frequencies. A mixer is a multiplier, and can be understood by thinking about the following trig identity:

$$2 \cdot \cos At \cdot \cos Bt = \cos (A+B)t + \cos (A-B)t$$

## Re: How can I subtract one frequency from another ???

Given your example of 400 and 410 Hz inputs, the sum and difference outputs would be 810 Hz and 10 Hz, and you would need a low pass filter to remove the unwanted sum product.

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- **Follow-Ups:**

- ◆ **[Re: How can I subtract one frequency from another ???](#)**

◇ From: Frank

- **References:**

- ◆ **[How can I subtract one frequency from another ???](#)**

◇ From: Frank

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