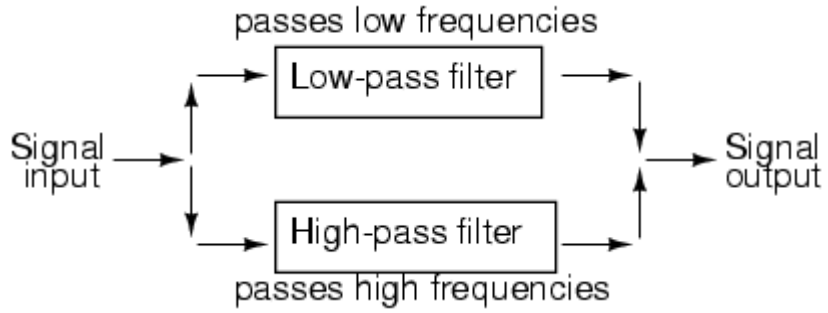
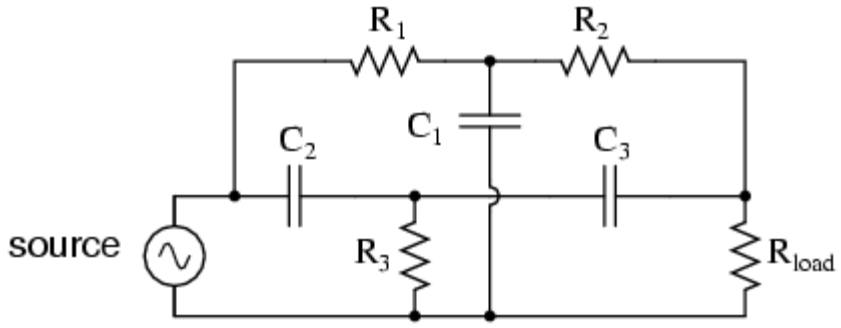
Band-stop filters

Also called *band-elimination*, *band-reject*, or *notch* filters, this kind of filter passes all frequencies above and below a particular range set by the component values. Not surprisingly, it can be made out of a low-pass and a high-pass filter, just like the band-pass design, except that this time we connect the two filter sections in parallel with each other instead of in series. (Figure below)



System level block diagram of a band-stop filter.
Constructed using two capacitive filter sections, it looks something like (Figure below).



"Twin-T" band-stop filter.

The low-pass filter section is comprised of R_1, R_2, and C_1 in a "T" configuration. The high-pass filter section is comprised of C_2, C_3, and R_3 in a "T" configuration as well. Together, this arrangement is commonly known as a "Twin-T" filter, giving sharp response when the component values are chosen in the following ratios:

Component value ratios for the "Twin-T" band-stop filter

$$R_1 = R_2 = 2(R_3)$$

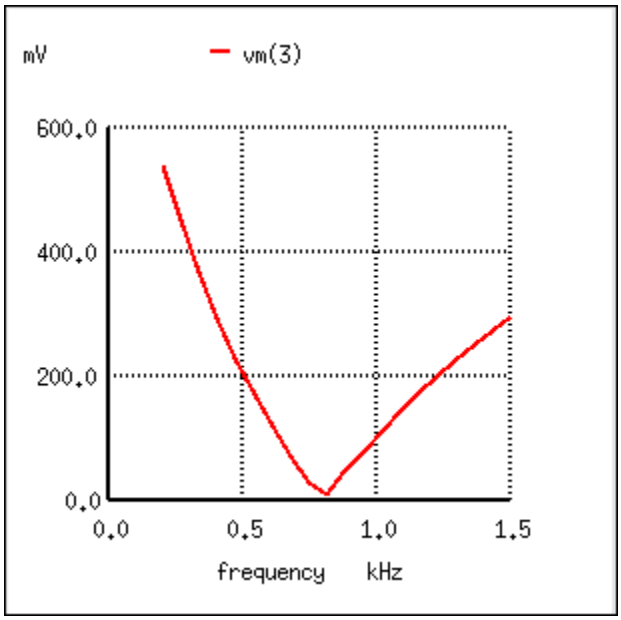
$$C_2 = C_3 = (0.5)C_1$$

Given these component ratios, the frequency of maximum rejection (the "notch frequency") can be calculated as follows:

$$f_{notch} = \frac{1}{4\pi R_3 C_3}$$

The impressive band-stopping ability of this filter is illustrated by the following SPICE analysis: (Figure below)

```
twin-t bandstop filter
v1 1 0 ac 1 sin
r1 1 2 200
c1 2 0 2u
r2 2 3 200
c2 1 4 1u
r3 4 0 100
c3 4 3 1u
rload 3 0 1k
.ac lin 20 200 1.5k
.plot ac v(3)
.end
```



Response of "twin-T" band-stop filter.

REVIEW:

- A *band-stop* filter works to screen out frequencies that are within a certain range, giving easy passage only to frequencies outside of that range. Also known as *band-elimination*, *band-reject*, or *notch* filters.
- Band-stop filters can be made by placing a low-pass filter in parallel with a high-pass filter. Commonly, both the low-pass and high-pass filter sections are of the "T" configuration, giving the name "Twin-T" to the band-stop combination.
- The frequency of maximum attenuation is called the *notch* frequency.

Source: http://www.allaboutcircuits.com/vol_2/chpt_8/5.html