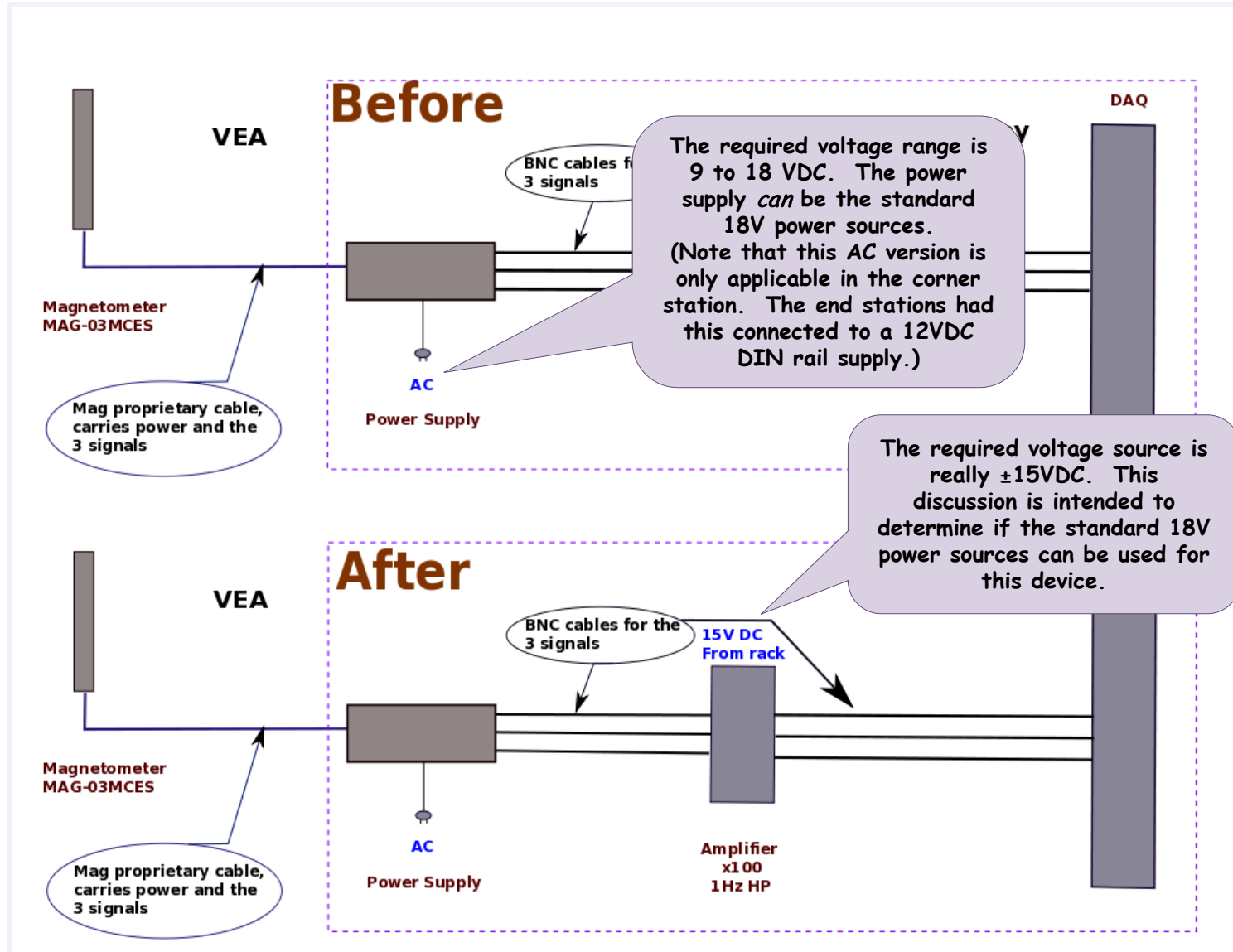


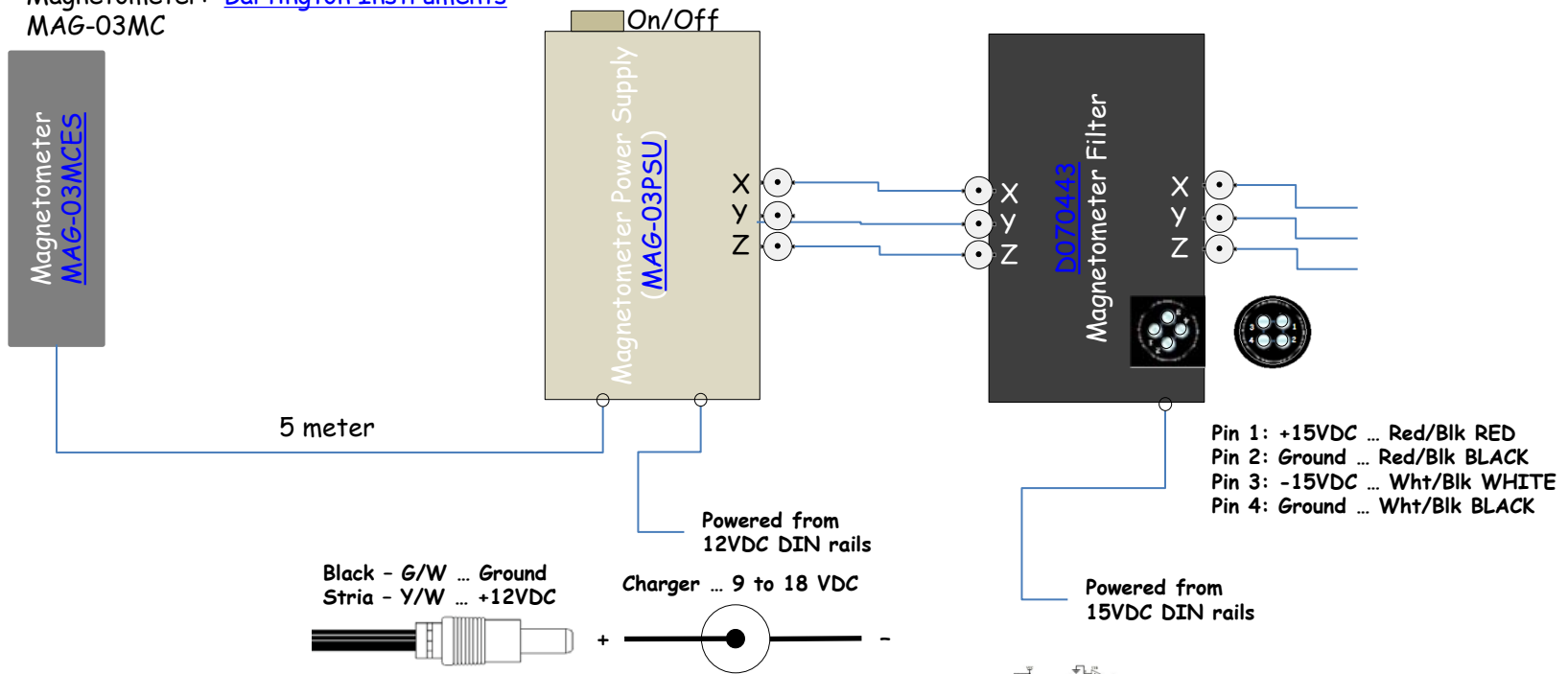
Magnetometers are distributed in the corner station and both end stations. The complete chain of one setup consists of a Magnetometer (Barrington MAG-03MCES), its special cable that connects it to a Magnetometer Power Supply (MAG-03PSU), its four cables - one power and three signal that more recently (see [here](#)) connect it to a Magnetometer Filter Box, its four cables - one power and three signal that connect it to a D1001421, aLIGO AA Filter Chassis (32 BNC, x10 Gain).

The Magnetometer Filter Box (known as D070443, but secretly D030574) is simulated in LTSpice for the purpose of determining the effects of increasing its input drive voltages from $\pm 15\text{VDC}$ to $\pm 18\text{VDC}$.

One filter circuit (from the three identical ones in the [filter board circuit diagram](#)) is modeled. Its responses are calculated over both input drive ranges, and compared.

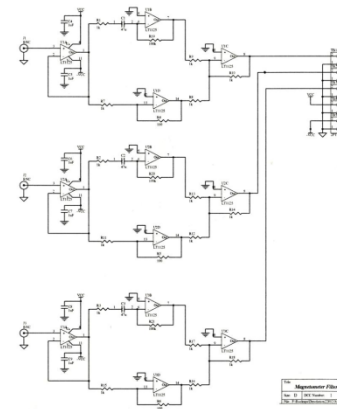
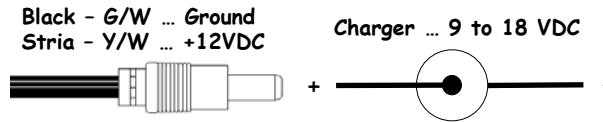


Magnetometer: [Bartington Instruments](#)
MAG-03MC



Pin 1: +15VDC ... Red/Blk RED
Pin 2: Ground ... Red/Blk BLACK
Pin 3: -15VDC ... Wht/Blk WHITE
Pin 4: Ground ... Wht/Blk BLACK

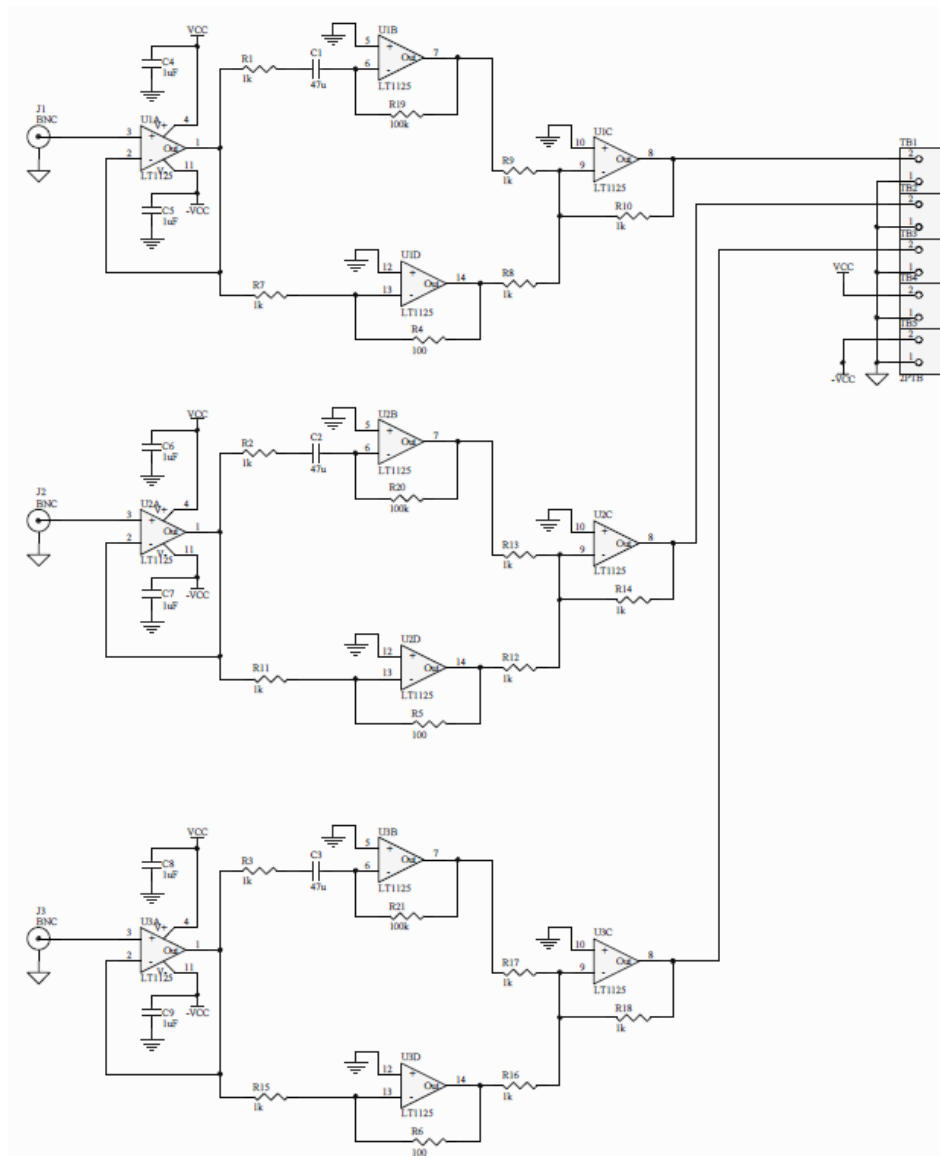
Powered from
15VDC DIN rails



Magnetometer Filter Board



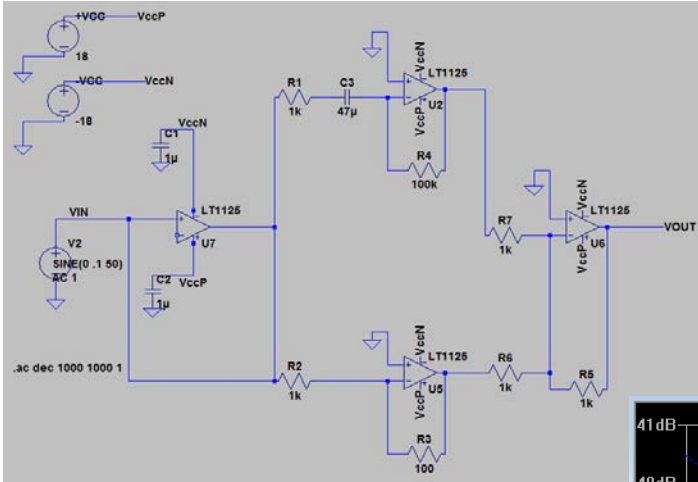
D030574



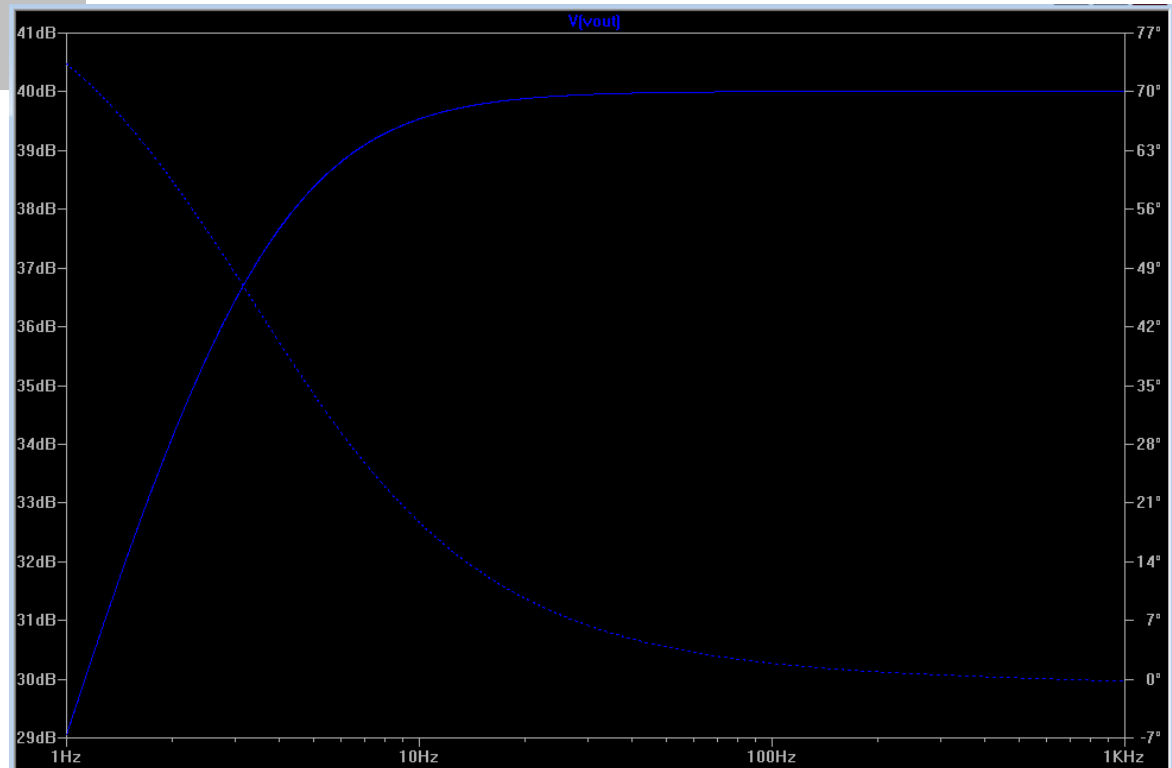
One filter circuit was modeled in LTSpice. It was assigned input control voltages of $\pm 15\text{VDC}$ and its transfer function and transient response were calculated. When the circuit gain was observed, two stimulus voltages were chosen (.1V and .175V) that would demonstrate the difference in clipping results.

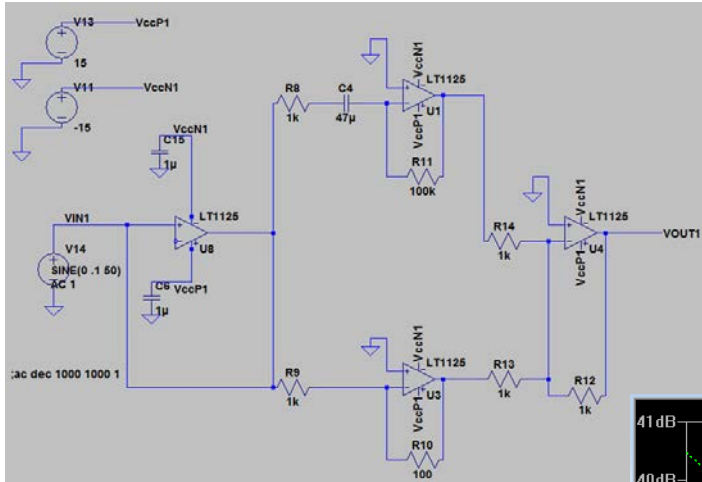
A second identical circuit was likewise modeled. It was assigned input control voltages of $\pm 18\text{VDC}$ and its transfer function and transient response were also calculated.

The responses were compared and are presented.

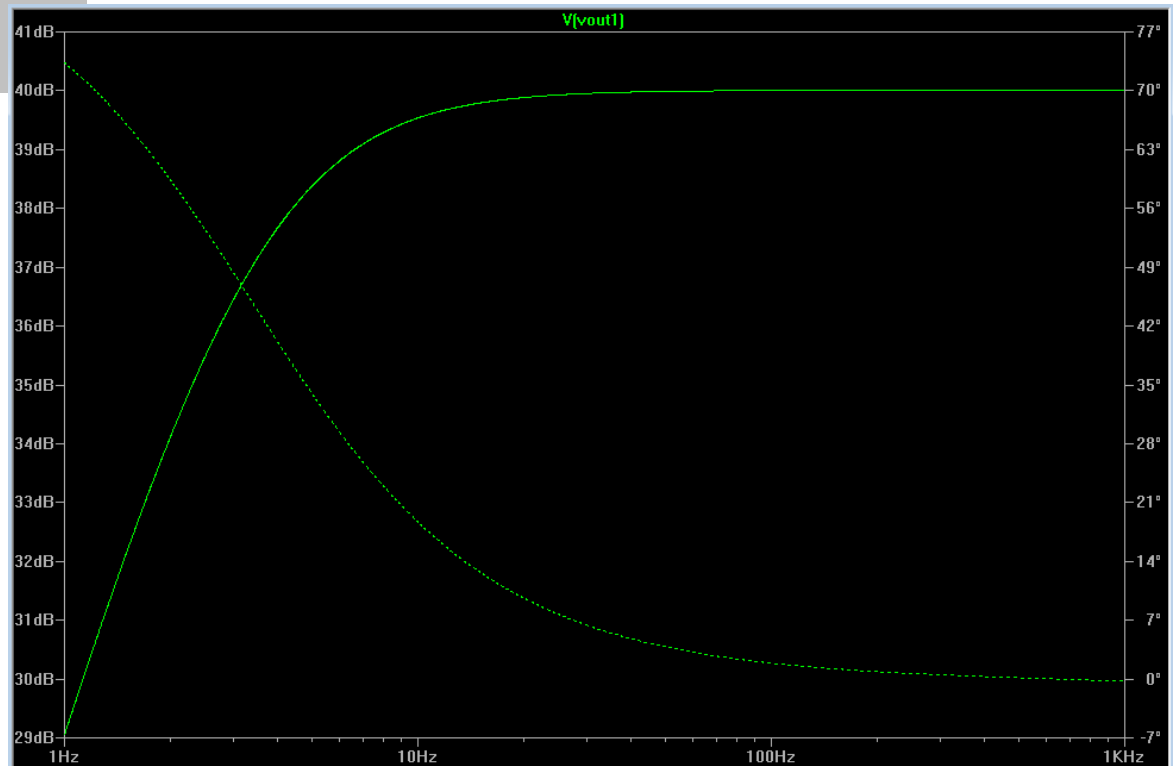


Circuit 1: Transfer Function

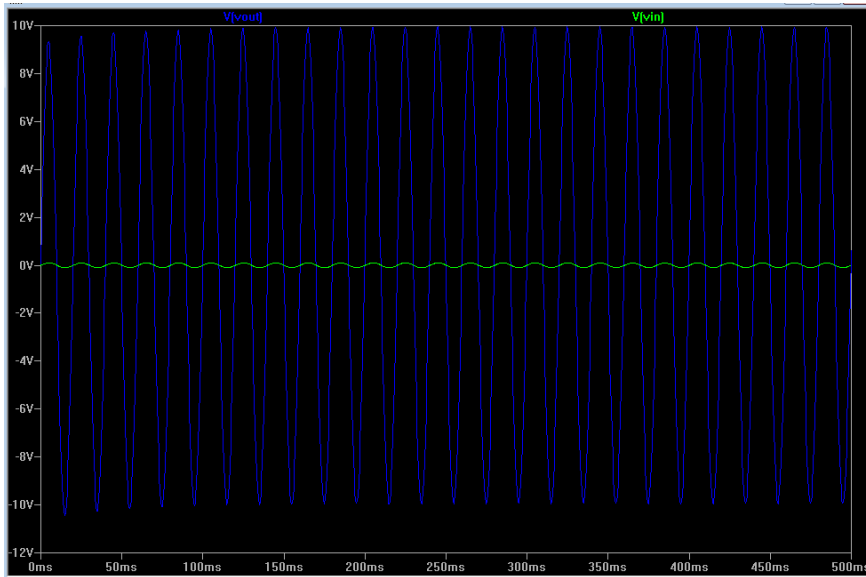




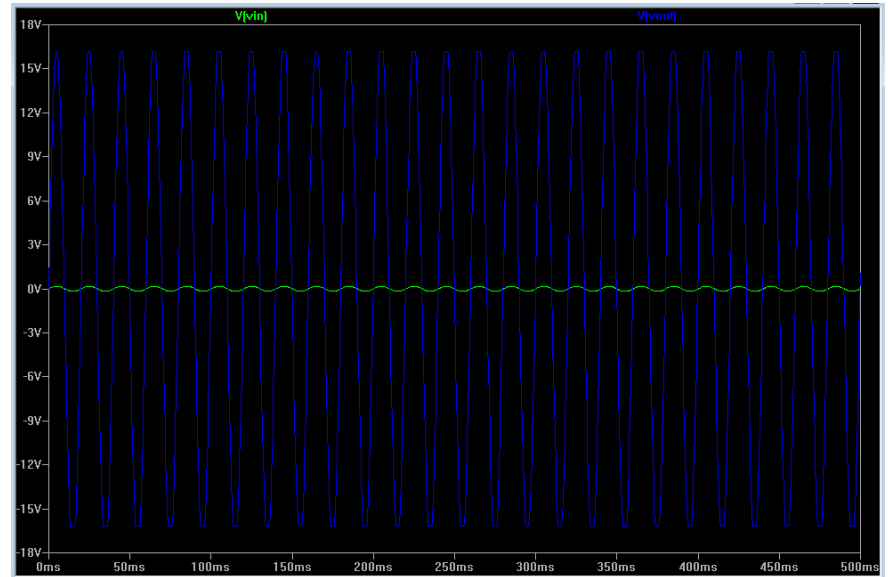
Circuit 2: Transfer Function



Circuit 1: Transient Analysis @ .1V

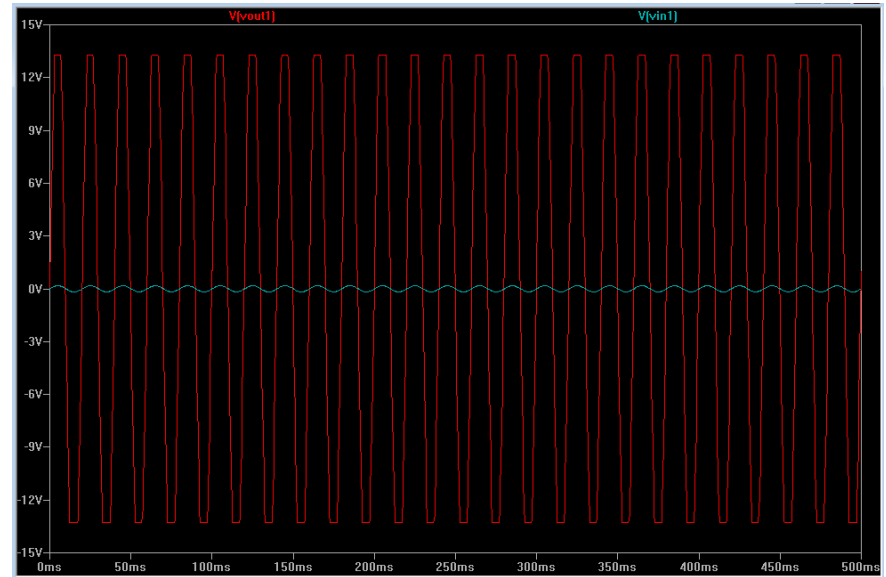
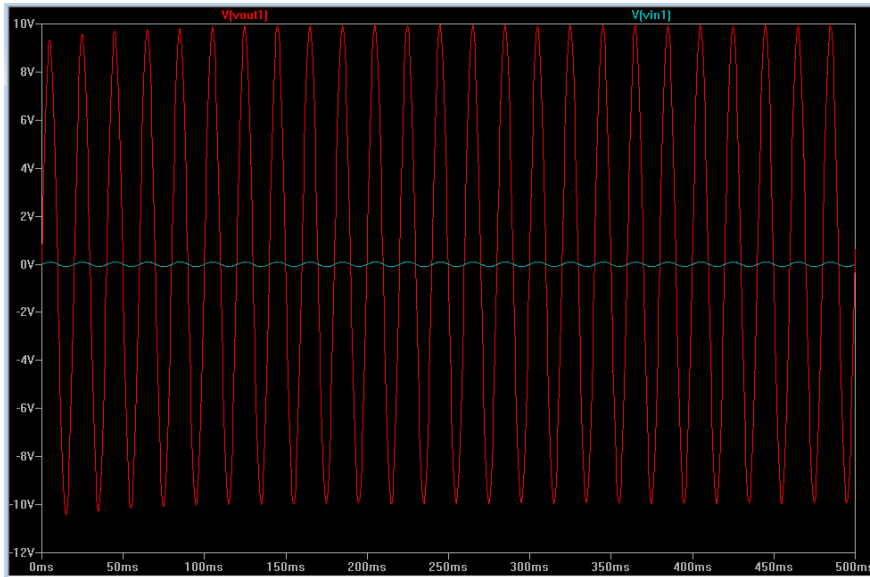


Circuit 1: Transient Analysis @ .175V

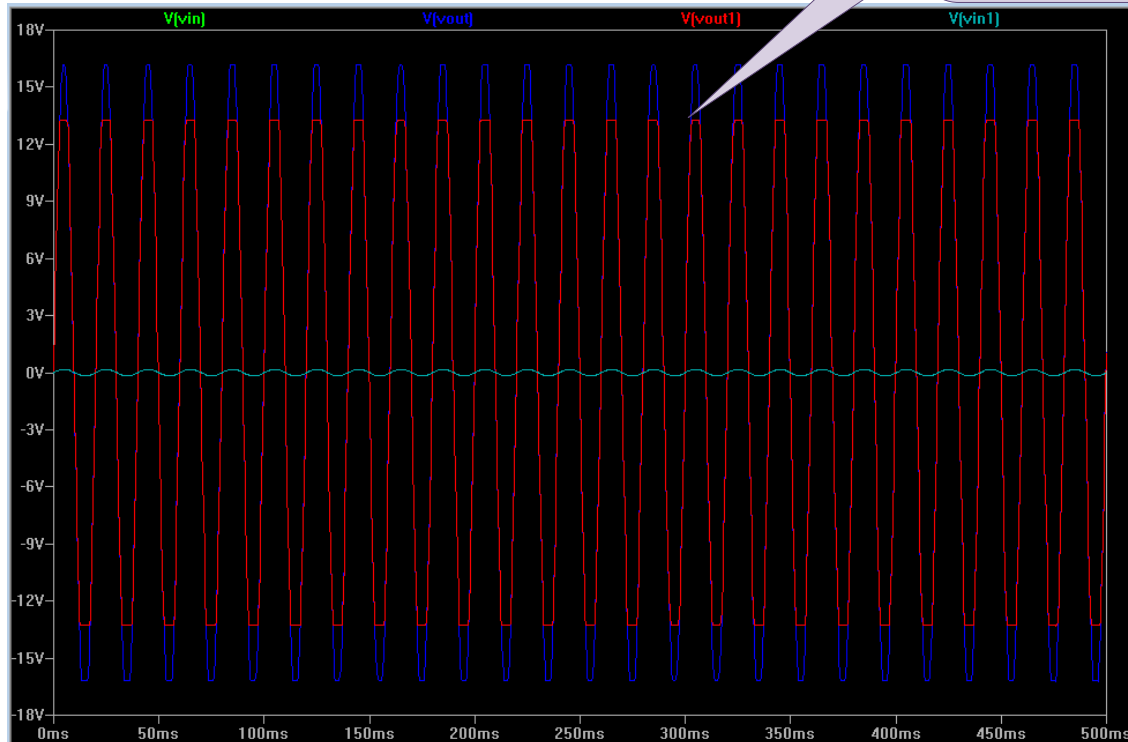


Circuit 2: Transient Analysis @ .1V

Circuit 2: Transient Analysis @ .175V



Clipping occurs as a function of input control voltage.



- 1) There is no difference in transfer function versus input voltages.
- 2) The difference in the clipping value follows the input voltages, that is, the effective full range of the output signal is increased relative to a larger full range of the input voltages. This is only a problem if these filters are *intended* to clip their signals at 15V.
- 3) The gain of the circuit is around 100, which makes the gain of each channel around 1000, due to the x10 gain in the AA channel.
- 4) The standard 18V power strips can be used to source the voltage for both the MAG-03PSU and the D070443 Filter Box.

On one of the MAG-03PSU power supplies (serial number 0539) there is an additional connector just below the DC power socket. It is a 3-pin LEMO and the pin-out diagram that is taped to the device is NOT correct. There is no internal connection of the -18v pin.

No internal connection exists
for the pin labeled -18v.

