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Subject: Valve Phono Preamp

Posted by [gofar99](#) on Sat, 02 Jul 2011 02:58:34 GMT

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Hi vinyl listeners. As promised I have the phono preamp at a stage where I feel comfortable in posting it. It has gone through many iterations and now sounds like I think it should. It is not a simple project but neither is it super complex. The write up and photos are fairly extensive and I am not sure how to get it out to you all. It is 1.8meg and should fit here. I will give it a try. It says it went. Comments are always welcome and I owe an Oddwatt "T" shirt to Shane for coming up with the name. If he will PM me his address I'll be happy to send it. I hope large is OK.

### File Attachments

1) [Valve Phonograph Preamp Project.doc](#), downloaded 705 times

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Subject: Re: Valve Phono Preamp

Posted by [FL152](#) on Sat, 02 Jul 2011 20:49:11 GMT

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Hi, Bruce - I saw your preamp, and I must say that it is in some ways similar to mine. Interesting, it is also similar to RIAA preamp from Vanderveen's book I wrote about. He used 12AU7/12AT7 tubes, both in SRPP with passive RC filter between stages. He wanted low Cin, and used low-mu first tube...but resultant amplification is also lower. He used anode out (not low-imp. out) in the first stage, similar to my approach.

Back to your preamp - you stated amplification like „60 dBv", and this is probably a mistake. We can expect maybe A~50 from 12AX7 SRPP stage, and about 10x attenuation after 1st stage through RC filter on 1 kHz. Then, total amplification can be about  $A \sim 5 \times 50 = 250$  times, or 48 dB maximum on 1 kHz. Still respectable.

What seems strange to me is a large value of series RIAA resistor, 113 k. Theoretically, relation between two RIAA resistors is 6.877, and that means value for 113k resistor about 75k, rough calculation without series Rout from SRPP and parallel 1 Meg resistor (about cancelled each other). Is 113 k value empirically found?

About noise - it is hard to do better without high-S tubes...an economical alternative can be EF184, but then we need four tubes/sockets and more current, plus two heater supplies, probably.

I like your shielding ideas.

P.S. speaking of „tube books" did you see this „ultimate" book about RIAA preamps and noise? Based on free sample pages, serious book but, the price is more than serious, too.  
[http://www.amazon.com/Sound-Silence-Lowest-Noise-Phono-Amps-Designers/dp/3540768831/ref=sr\\_1\\_14?ie=UTF8&qid=1309638744&sr=8-14](http://www.amazon.com/Sound-Silence-Lowest-Noise-Phono-Amps-Designers/dp/3540768831/ref=sr_1_14?ie=UTF8&qid=1309638744&sr=8-14)

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Subject: Re: Valve Phono Preamp

Posted by [gofar99](#) on Sat, 02 Jul 2011 21:50:42 GMT

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Hi, Good comments. It seems that there are only so many ways to do some things. I wanted to avoid a third actual gain stage as it would invert the signal. This can be a problem in a system with other sources that do not invert. As is now I have to swap the speaker polarity when I use the gain portion of the Line stage preamp (seldom as everything has enough drive to use the passive mode). The resistor value is PC generated and includes the 1M following grid resistor. The value when it is not included was right on 75K. It also was verified by measuring the output vs input. The deviation is slight. The worst was at 20HZ where the output was approximately 1 db above the curve. Elsewhere it was within 0.5 db. Generally closer. The 60db is the gain without considering the loss of the RIAA network. I used the value to emphasize the need for careful layout and construction. The overall gain is just under 40 db. The loss in the RIAA network and the use of a cathode follower account for the difference.

I have not seen the book you mentioned and will check it out. Good reference materials are hard to find. As you implied, noise is a serious issue in this type of circuit. Several techniques are available to reduce it, but they seemed to add more complexity to the circuit than I wanted. I admit to being of the simpler is better bunch. Plus it makes it more expensive and harder for diyers to build. As it is now, it is somewhat more complicated than I would have wanted. With respect to noise, I found that an active RIAA filter designed much like you would for an OP amp was a bit quieter, but I didn't like the sound. The 20 plus db of NFB was probably the issue. With actual IC OP amps you can get around the use of NFB as they have very high gain/bandwidth products and fast slew rates. In tubes the need to keep the stages to a minimum works against you in this area.

A general thought... there is a large number of individuals that don't like the use of SRPPs in audio. I personally suspect it is because they have been misused in the past. For strictly voltage amplification uses the problems that others seem to fear do not materialize. If I were to change the topology, I would most likely go for mu followers. Most of the benefits are the same and you have the potential for a bit more gain. Thanks for your thoughts.

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Subject: Re: Valve Phono Preamp  
Posted by [gofar99](#) on Sat, 02 Jul 2011 23:09:33 GMT  
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Hi,       Oops. I used two different sets of values the 113K matches a 220K grid resistor and an 82K matches the 1meg value. When I checked the actual final version it was the 82K and 1meg value. Thanks for the sharp eyes. I will replace the schematic with a correct one. I fixed the schematic in the file. Thanks again.

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Subject: Re: Valve Phono Preamp

Posted by [FL152](#) on Sat, 02 Jul 2011 23:31:03 GMT

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Hm, I'd try half of that 113k value, say standard 56k. As you said, suprisingly, there are not too much RIAA deviation with some resistor values changes (tenths of dB, or 1 dB "over" 20 Hz in your case), but those deviations are in "wide" frequency spectrum and can be heard.

Quick calculation gives  $R_{out} \sim 28k$  from SRPP (must be measured or at least calculated and/or simulated), and when we use about 56k for series resistor in parallel with 1 Meg, this gives:

$R = (28+56) \times 1000 / (28+56+1000) = 77,5 k$ , about right.

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Subject: Re: Valve Phono Preamp

Posted by [gofar99](#) on Thu, 14 Jul 2011 01:05:52 GMT

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Hi Everyone, Just an update. In my never ending search for whatever.... I continually try things. I rewired the phono preamp to use an ECC81 (12AT7) for the output stage. I believe I like it better than the 6N1P or E88CC or 6DJ8 all of which will work in the circuit. There were no component changes. Just heater rewire. For once the values fell right in line. Actually the ECC81 is operating in a better range than the 6N1P was. Also later I switched the WIMA MKS 4.7 uf output cap for a 4.7uf Auricap. Definite improvement. My budget this month didn't allow the Jantzen Silver Z that will probably be the next swap.

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Subject: Re: Valve Phono Preamp

Posted by [gofar99](#) on Sun, 17 Jul 2011 01:35:14 GMT

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Hi vinyl lovers, I had a diyer from overseas (thanks Vladislav) come up with some interesting comments and I wanted to share them with you. One thing that can be done with the preamp is increase the gain. This is mentioned on the schematic, but not explained in the text. If you bypass the cathode resistors on the SRPP (lower triode section only) you can increase the gain by about 3 db for each stage (a total of nearly 6 db). There is a penalty in the S/N area of about 2 db in doing so and since there is approximately 45 db of gain already I suggest it not be done unless there is some good reason. It will not be enough to allow use of a low output MC pickup. The more interesting comment was that bypassing the first stage will slightly upset the RIAA equalization. This is because the network is designed around specified time constants and takes into account the impedance of the tube and the loading of the following stage. With the indicated 68K resistor in place the value would appear incorrect, but with the JJ ECC83 tubes I used in the SRPPs and the JJ ECC81 in the cathode follower. It measured fine. The calculated value would be just about 51K for the un-bypassed application and actually close to 65K for the one with the cathode bypassed. The actual changes were small - in the order of 1db (mostly above 10K HZ), but can be audible. Tube brand and type (like NOS 12AT7 vs ECC83 / ECC803 etc) All this is a bit techie, but the message is that you can fiddle with the resistor a bit if you need to. Without a good signal generator and scope/meter it will be difficult to verify performance though.

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Subject: Re: Valve Phono Preamp  
Posted by [gofar99](#) on Mon, 29 Aug 2011 22:31:55 GMT  
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Hi Everyone, Just a pair of photos of the latest incarnation of the preamp. Tube brands and types have mattered. The quietest ones so far are JJ gold pin ECC83S with the ECC803S close behind. Others (Tunsol, Mullard new production and EH) were not as good.

#### File Attachments

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- 1) [phono3 front view 1b.jpg](#), downloaded 456 times
  - 2) [phono3 inside1b.jpg](#), downloaded 428 times
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