

### **EB-199/320 Top-of-the-Line ALL-FET MM/MC Phono Preamp**

A new vinyl age? Do you have a record collection of more than three thousand records, mostly from the 60s and 70s? And do you like to listen to these frequently and enjoy the emotional involvement they give you?

Do you have a beautiful turn-table like this?



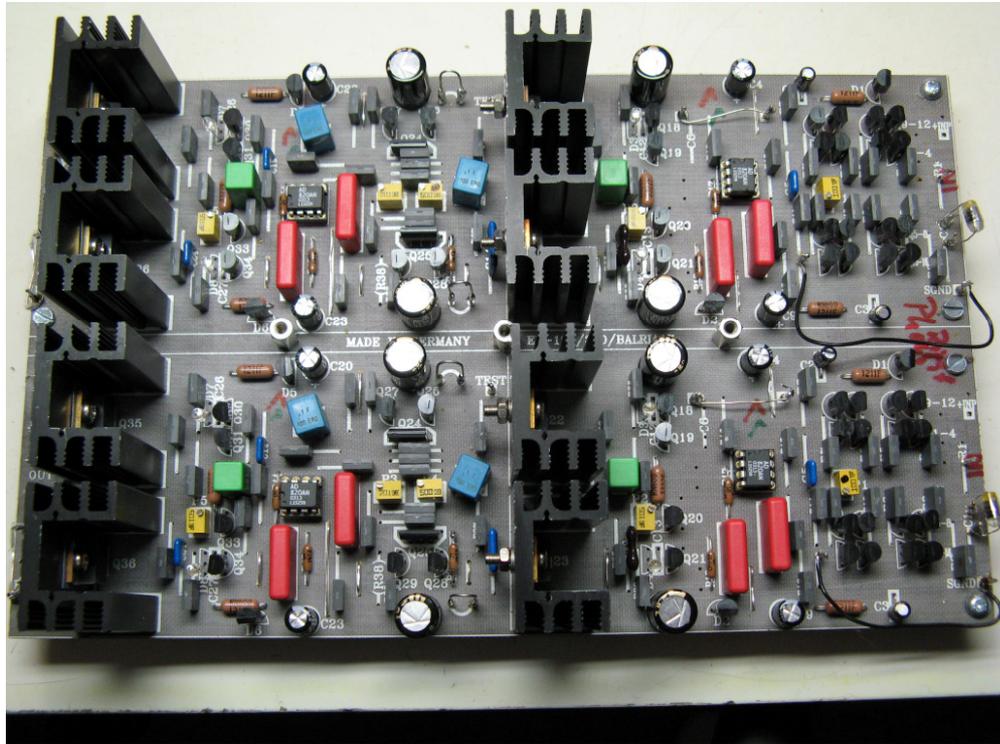
Courtesy PBN Audio California.

Or a great “oldie” like the Garrard 301:



Courtesy of Tai-Shen Lee, Taiwan.

Either way, you can get more out of your vinyl using our phono preamps.

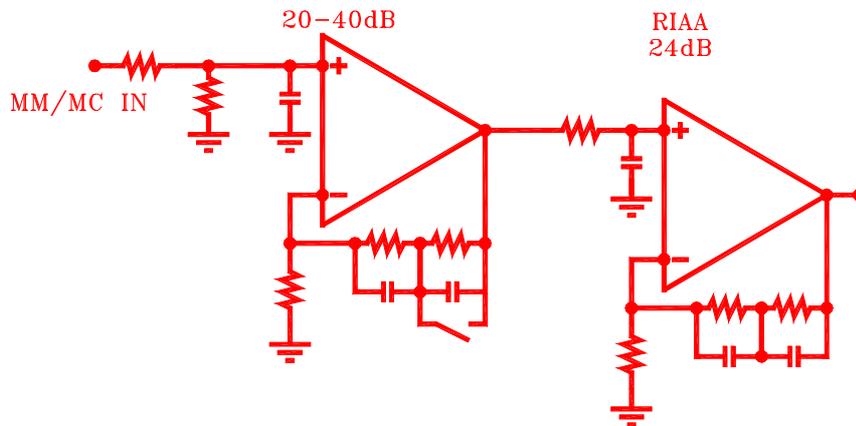


The EB-199/320 phono preamp on Teflon PCB and mostly Caddock resistors. Other upgrades are available.

### **EB-199/320 ALL-FET MM/MC Phono preamp.**

The EB-199/320 is the Top-of-the-Line ALL-FET MM/MC phono preamp with 44dB for MM and 54, 64 or 73dB gain for MC. It can handle all low-output MC pickups on the market. RIAA accuracy is better than 0.1dB. Due to its use of only FETs as active elements, it has an extremely high resolution. Together with the Caddock/PRP/Vishay-Dale resistors, ELNA CERAFINE or ELNA SILMIC II electrolytic and polystyrene or MICA capacitors they produce excellent dynamics, natural and transparent sound and offer super bass control. The 320 is only available on Teflon PCB. The ALL-FET EB-199/320 Phono preamp outperforms most phono preamps on the market, irrespective of price.

The EB-199/320 is using a two-amplifier approach instead of the usual single amplifier. This allows you to optimize it for low noise, RIAA accuracy, high gain and dynamic range. The block schematic is shown in fig. 1.



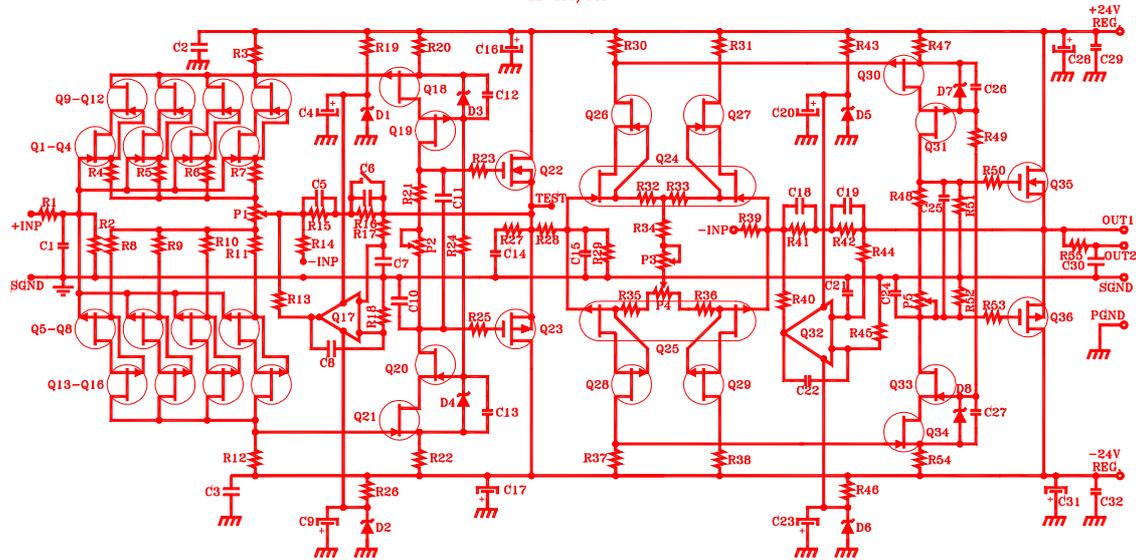
ALL-FET MM/MC PREAMP  
 WITH PASSIVE HF ROLL-OFF  
 AND ACTIVE BASS-BOOST

Fig. 1. Block schematic for EB-199/320.

In fig. 1 the amp on the left is a high-gain amplifier with extremely low input noise and flat frequency response. It can be used with 20, 30, 40 or 49dB gain by changing the feedback resistors. The R-C network between the two amplifiers provides the 75-microsecond roll-off for the RIAA equalization. The second amp provides a further amplification of 24 dB at 1kHz and at the same time boosts the bass according to the RIAA characteristics.

The two channels of the EB-199/320 are laid out on one PCB, size: 240x145mm. The phono-preamp requires a power supply with  $\pm 24V$  at approx. 200mA per channel. Regulators are not included on the PCB; however ALL-FET series and shunt regulators are available separately under the number: EB-208/418 and EB-604/255H respectively. A high current power supply and suitable mains transformers are also available; see our price list on the homepage. For highest performance it is recommended to operate the phono preamp from the EB-108/291 choke PS with 4-pole Jensen capacitors and the 418 regulator.

ALL-FET MC PHONO PREAMP.  
EB-199/320



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Fig. 2. EB-199/320 Top-of-the-Line ALL-FET phono preamp.

**Circuit description.**

The schematic of the EB-199/320 is shown in fig. 2. The first amplifier is a linear one, using 4 pairs of low-noise Cascoded JFETs at the input. The second stage is also made up of low-noise Cascoded JFETs. The output stage is a complementary MOSFET source follower. The gain can be changed with the feedback resistors to 20, 30, 40 and 49dB. R28-C15 provides the high frequency roll-off of the RIAA equalization.

The second amp provides the bass boost of the RIAA curve. Except for the input stage, which is a complementary differential Cascode circuit, the amplifier has the same topology as the input stage. The second amp has a gain of 24 dB at 1 kHz, making a total gain of 54 and 64-73 dB for the phono preamp.

Due to the high gain at low frequencies (64-93dB!), both stages are using servo control for DC-offset. The offset control is provided by low-noise JFET-input opamps. The opamps are supplied with  $\pm 10V$  from shunt regulators.

The ALL-FET phono preamp is a very sensitive amplifier and is capable of picking up small signals not only through its inputs, but also through vibration. It is therefore very important to make the whole amp as "dead" as possible for vibration. It is recommended to mount the board in a vibration-free way. There are several possibilities here, one is to use rubber stand-offs, which are specifically made for this purpose. Further improvement can be achieved by mounting the whole board on a Teflon plate, 6-8mm thick. And a mumetal box will certainly put the icing on the cake...

## Typical Specifications.

Gain: 1 <sup>st</sup> stage:	20, 30, 40 or 49dB (20dB for MM)
2 <sup>nd</sup> stage :	24dB
THD 3VRMS/1kHz:	0.002%
Max. Output voltage:	approx. 9VRMS
Risetime (without RIAA network):	0.3/0.4usec
RIAA Accuracy:	better than 0.2dB
Equivalent input noise:	<100nV, 20Hz-30kHz

## POWER SUPPLY AND REGULATORS.

In order to preserve the low noise capability of the 320, the regulator also has to have very low noise. Recommended regulators for the 320 are the 418 ALL-FET series regulators and the 255 super shunt regs. The EB-208/418 consists of two dual wide-band, low-noise regulators, using only FETs (JFETs and MOSFETs) as active elements. The + and - phase are completely independent of each other to avoid cross modulation. Maximum input voltage is  $\pm 45V$  and maximum output voltage is  $\pm 40V$ . Maximum output current with 5V input/output voltage difference is  $\pm 200mA$ . The 418 regulator has less than 5 $\mu V$  noise over the audio bandwidth.

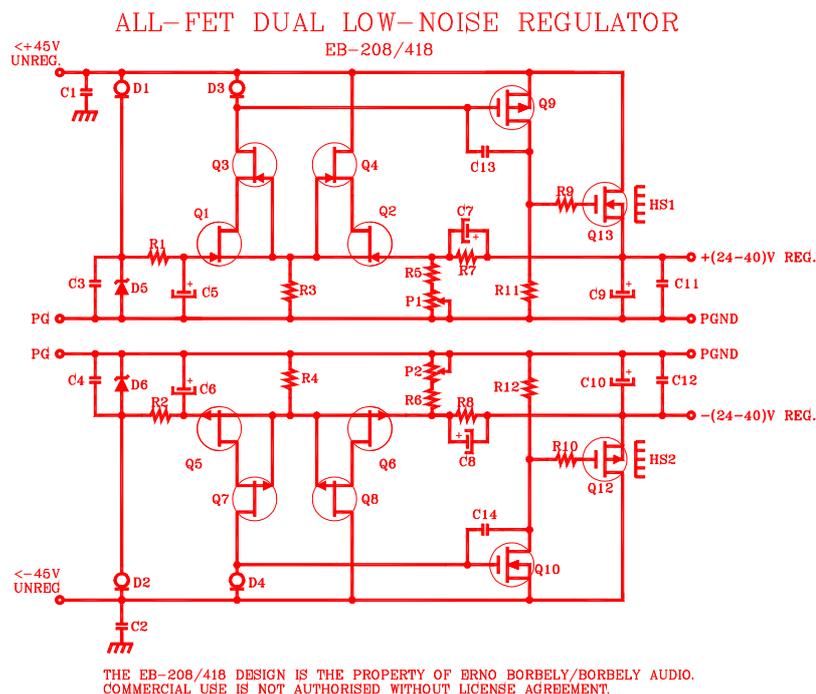


Fig. 3. The EB-208/418 ALL-FET Wide-band, Low-noise regulator.

Also the power supply has to be a high quality one. The recommended PS is the EB-108/291 with 4-pole Jensen capacitors and L-C-filters. The + and - phase are completely independent of each other, like in the 418 regulator. Note that there is a voltage drop across the chokes, and the initial raw rectified voltage has to be higher than without the chokes, i.e. the transformer secondary has to be increased. If a 4-5H choke with 60 Ohm

DC resistance is used for the 320/418 (200mA per channel) then the secondary should be 45V. The 291 should then be tested with 150 Ohm/10W resistors to simulate the 200mA load. (See the description of the EB-108/291 PS.)

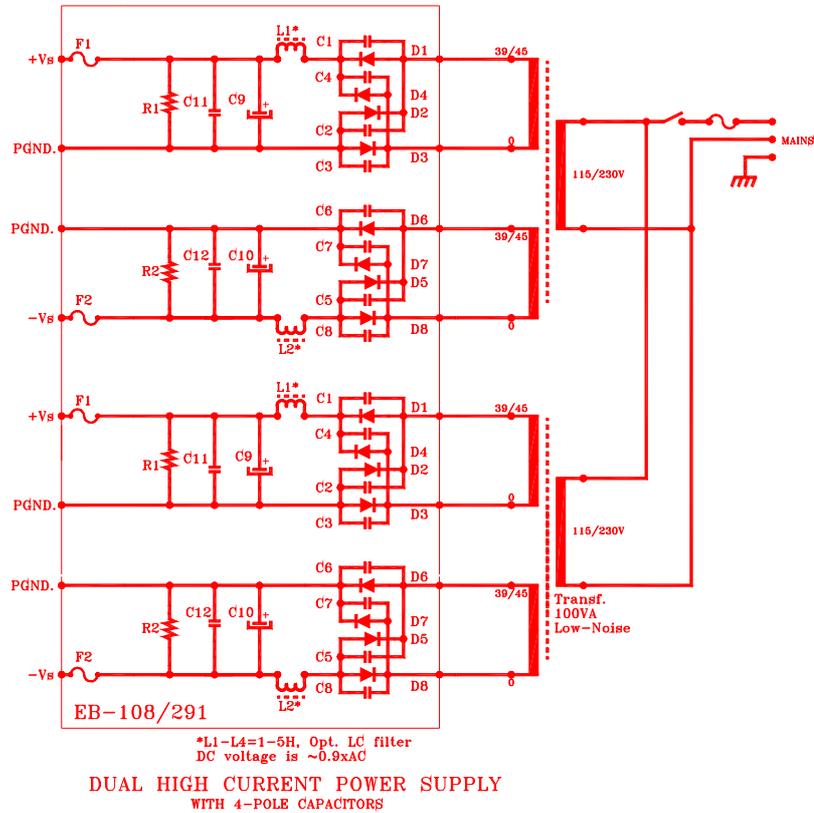


Fig. 4. The EB-108/291 High Current Power Supply.

### Customer feedback:

Erno, the FET phono stage and shunt regulator have fully broken in now and it is the best phono stage for MC's that I have ever heard. I get all the ambience of the recording site and if the record is quiet I get the quietest backgrounds that I have ever heard.

I was listening to recordings that were 25 years old and have been surprised on how much I have missed. I don't think there is a commercial phono stage that sounds any better whether it is tube or transistor.

I have the phono stage loaded with a 250 ohm resistor for the Koetsu and I use 47k with the Grado. Both sound very nice.

Dave

Subject: Re: 320 Phono

Hi Erno,

Finally I got the 320 up and running during past weekend. I supply the phono board with separated Jung-Didden regulators for each channel. While it's still under 10 hours of burning in, I am very pleased with its sonic virtues. The sound from my Linn LP12+Graham2.2+Lyra Helikon SL sounds full and rich. While most solid state designs can't compete with tube when talking about midrange. The EB-320 midrange is full body and as satisfying as any tube design. The top and bottom ends are clean and extended. Dynamic is also very good. All in all I am very happy with it. I am planning to add two more set of regulators to supply the board so each stage is supplied from its own regulator. Will let you know how it improves. I will show you the pictures too next time.

Best

Prakit

(Editor's note: Prakit has in the meantime installed shunt regulators for the 320.)

Hi Erno

I have built a fully balanced version of the 320 using 254 regulators with choke/capacitor power supply and TWO 450VA transformers – got to make sure I have enough power 😊

This is truly an amazing design, the resolution is simply astounding – compliments on another magnificent design.

Using Clearaudio Acurate / Dynavector Te Kaitora Rua on SME 312 arms with fluid dampers.

Thanks

Peter