



ELBERG MD12 MK2

Multicurve Disc preamp

78 RPM and RIAA Record Preamplifier



Recording engineers and serious record collectors know the problem playing 78s and early EP/LPs. An ordinary RIAA phono input equalization does not match the recording eq.

And especially 78s have a lot of different eq settings depending on period, placement, and recording company. Even within the same company, there may be differences depending on which engineer was on job that day.

Because I have not been able to buy a preamp, which can do the correct eq settings of 78s and early EP/LPs, I have designed the **ELBERG MD12 MK2** in cooperation with B Elberg, ELT, Denmark.

Elberg is well known and highly respected in Denmark for his "ELBERG SERIES 15" professional recording mixers. Among the users are Danmarks Radio (DR - Radio Denmark).

This custom-built preamp is a product with professional specifications. But the preamp is useful for record collectors, who want the right equalization of especially their 78 RPM records:

- **ELBERG MD12 MK2** has 12 "presets", but it is possible to tweak it to nearly all existing eq curves.
- For audio professionals and LP collectors, the preamp will be interesting because of its fine sound quality, and 4 eq settings for 33/45 RPM, and 8 pre settings for 78 RPM.
- It has selectors for: Stereo, Mono, Mono playing of right or left channel (groove wall) and switch for playing vertically cut records (Pathé/Edison).
- The preamp is equipped with volume- and a stereo balance potentiometer. This means that the preamp is able to drive a power amplifier directly.
- It is build with a lot of LEDs for easy operation.
- The stereo output is AES balanced with gold plated Neutrik XLRs. As an option, we can deliver cables for connecting to consumer equipment.
- **ELBERG MD 12 MK2** is mounted in a one unit 19" metal rack box.
- Input impedance for MM cartridge is standard 47 kOhm.
- MC inputs are with 3 switchable load impedances: 50, 100, or 200 Ohm.

Since the first series, we have made a lot of modifications:

Improved noise figure, more precise equalization curves, and more noise free switching. The electronics are totally redesigned for better performance and excellent sound quality. **ELBERG MD12 MK2** will as standard include vertical/lateral switch, and switchable inputs for MM/MC cartridges. MC inputs offer 3 switchable load impedances: 50, 100, or 200 Ohm. We decided to include these as standard, because 90 % of our customers ordered these as option.

And a few words considering long life of all electronic equipment: Most potentiometer types can stand severe wear for decades, but dust - and especially smoke - can make them noisy when operated in just a couple of years. Tobacco smoke is ALMOST as dangerous for a pot as it is for your health!

Special thanks to Claus Byrith, Allan Rasmussen and Roger Wilmut for their great experience and help with constructing the original ELBERG MD12.

I wish you good luck with your purchasing of the **ELBERG MD12 MK2**, and I will be happy to hear about your experiences with it.

Gammel Holte, Denmark, May 1, 2004

Jørgen Vad

VADLYD Mastering & Audio restoration

ABOUT RECORD PREAMPLIFIERS

When playing records, you use a cartridge input in your amplifier, often called a RIAA (Recording Industries Association in America) input. The RIAA equalization curve means, that you with a turnover at 500 Hz down to 50 Hz are turning the bass down with 6 dB/octave (first order filter) up till -17 dB at 50 Hz, and at a turnover of 2120 Hz, you are turning the treble and middle up with 6 dB/octave until 13.7 dB at 10 kHz. The turnover frequency is where the sound is changed ± 3 dB. To compensate for the cutting equalization, it is necessary to do the opposite when you play back the records, and that's why you use a RIAA input.

Normally this is working well on Single-, EP- and LP records, issued from 1955 and later. But on LPs from earlier (some record companies didn't use RIAA before 1960), this curve is not the right one.

The cutting equalizations on all 78 RPMs and LPs before 1955 have been very different, and specially, the 78 RPM curves are very different from the RIAA eq curve. Because of that it is not possible to use The RIAA input on your amplifier, if you want a good quality when playing 78 RPMs.

I want to thank Roger Wilmut for basic information about reproduction of 78 RPMs and allowing me to use his eq settings. For better understanding of the problems of reproduction of records, read the following articles (with a few edits from my hand), with kind permission, taken from Roger Wilmuts home page: "Reproduction of 78rpm records"

EQUALIZATION OF GRAMOPHONE RECORDS

The simplest form of disk-cutter consists of a amplifier, similar to that used to drive a loudspeaker, connected to a cutting-head having a stylus connected to a coil, which is placed in the field from a strong magnet (or, more usually in later designs, a magnet within a coil). When the signal is applied to the coil, the stylus moves and engraves a groove in the blank disk. (There is of course a lot more to it than that, but we are considering only the basics here.)

However, because the cutter head's movements translate the amplitude swings of the original signal into velocity - the rate at which the stylus moves during its swings - low-frequency signals would be recorded with a much larger swing than high-frequency signals of the same original amplitude. In order to keep the movements of the groove much the same at all frequencies (given equal level signals) it is necessary to use a circuit to introduce - in the theoretical situation - a 6 dB/octave cut as the frequency decreases - i.e., halve the frequency and you halve the voltage.

In the reverse situation, that of a reproduction head, the principal is that of a wire moved in a magnetic field - it is the rate of cutting 'lines of force' that matters. The cutter head works exactly in reverse, like a simple motor, where increased voltage means increased speed. Therefore the constant amplitude groove theoretically achieved produces a signal where the bass is low and the treble high: so a 6 dB/octave cut with increasing frequency would be called for.

In the real world, losses in the head with increased frequency complicate the issue. Early cutter heads were highly inefficient, and so, while the bass cut described above was used, the treble tailed away, resulting in equal groove modulations (movements) up to mid frequencies, but decreasing above that.

To compensate for this, the playback characteristic boosted the bass below 200 Hz but left it flat above that - effectively providing a 6 dB/octave boost to the higher frequencies (and the surface noise). With the later improvements in cutters, it was possible to pack more treble onto the records, and so new equalizations provided for a 6 dB/octave cut above a turnover frequency which varied between 3.4 and about 6 kHz depending on the system. This meant that the surface noise became less obtrusive. It was also common to flatten out the bass at the very lowest frequencies to reduce the boost of rumble from the turntable.

Similar techniques were applied to microgroove records, and the final standard, RIAA provides for a bass boost below 500.5 Hz and a treble cut above the lower frequency of 2,125 kHz - the latter reflecting the considerably increased amount of treble which can be cut onto an LP.

It can therefore be seen that playing a 78 with RIAA equalization - all that is available to many people - produces far less down. (Turning it right up gives an improvement, but doesn't touch the important mid-range.)

Use of the correct curves when reproducing 78s produces a startling improvement in the quality (although admittedly the surface noise can become a problem); many of these recordings are much higher quality than you might suppose.

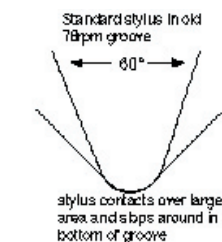
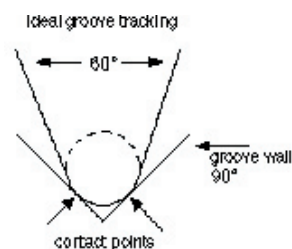
STYLUS TRACKING

At the time the format disappeared the recommended stylus size was 60μ (0.0025") conical tip. This would be satisfactory for records made in the final few years, but for the great majority of the time since the beginning of 78s in 1896 the grooves were wider than the 'standard', with the result that a 60μ stylus skates about in the bottom of the groove, seriously increasing the surface noise.

The basic stylus is conical, with a spherical tip; the included angle of the cone is 60 degrees. Most modern styli are elliptical: i.e. they look the same from the front, but from the side they have a much narrower angle. This enables them to track movements in the groove more easily (as the groove moves from side to side it effectively narrows - not across its direct width but across the diameter of the conical tip, at an angle to the direction of travel: consequently a spherical tip will ride up in the groove).

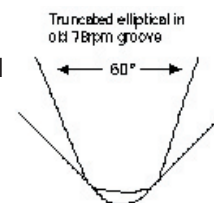
The illustrations below could apply equally to a spherical tip and an elliptical tip seen from the front: in practice I would always recommend elliptical.

A modern record groove should be a neat 90 degrees, with the stylus making contact at only two points part-way up the groove wall, thus avoiding any debris in the bottom of the groove. (Some modern microgroove styli have a flat section at the contact point, giving a wider area of contact which reduces wear: however it can also increase noise from worn or damaged groove walls and I would be dubious about its use for 78s).



However older 78s were cut to be used with steel needles, on the assumption that the needle would wear down to fit the groove in the first few seconds: when this wider groove is tracked with a 2.5 thou stylus the result is 'bottoming' as can be seen here.

Here the combination of a larger basic size: 70μ (0.0028") works on the majority of records, although larger sizes may be helpful with very old records - and the truncated tip (which is spherical down to the contact points but truncated below) result in vastly better tracking. Like LPs, Records in good condition, will be better reproduced if the stylus is elliptical. This brings a considerable improvement in distortion and will be with reduced surface noise and greater analysis. With records in poor condition, you often will have a better reproduction with conical styli.



Serious mastering engineers and collectors often have a collection of styli sizes, conical truncated as well as elliptical truncated. A good starting point could be:

Records from	Conical truncated	Elliptical truncated
Before 1920:	100μ (0.0040")	$100\mu \times 30\mu$ (0.0040" x 0.0012")
1920 - 1939:	90μ (0.0035")	$90\mu \times 30\mu$ (0.0035" x 0.0012")
1939 - :	70μ (0.0028")	$70\mu \times 25\mu$ (0.0028" x 0.0009")

A good address for buying cartridges and styli, as well as re tipping of styli, is

Expert Stylus Company
P.O. Box 3 - Ashted
Surrey KT21 7QD - England
Tel: +44 01372 276604

SPEEDS

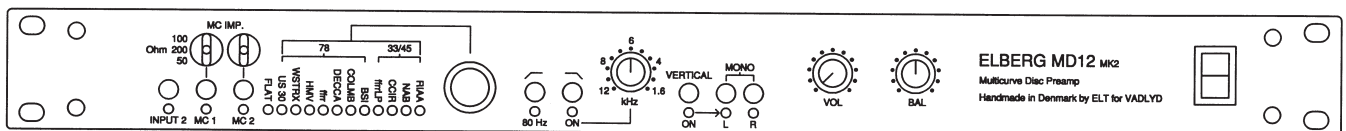
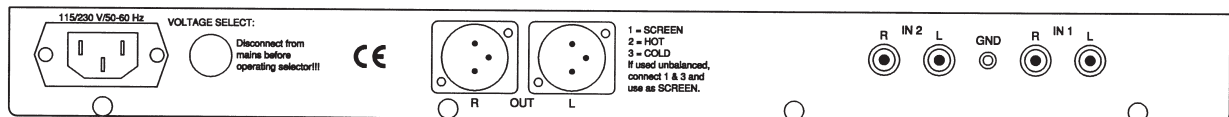
By no means all 78s were actually recorded at 78 rpm. Even in the late 1920s English Columbia was still using 80 rpm, and prior to about 1921 speeds were widely variable. Some of the audio tracks included in the Music hall section of this site were transferred at speeds as low as 74 rpm, and I have come across records where the speed was as low as 68 or as high as 84 rpm.

To make matters worse, relatively few records state the speed (and when they do it's not always accurate). If the work is a classical piece such as an opera aria, it is possible to check the correct pitch against a score or a modern recording: but as occasionally singers would transpose, this isn't completely reliable. My best recommendation is to gradually reduce the speed of a record until it starts to sound sluggish, and then increase it slightly (in my experience the ear is much more sensitive to low speeds than high speeds). I'm afraid it's all rather rule of thumb; and the narrow bandwidth of old records doesn't make it any easier.

As to a turntable capable of coping with these speeds that is yet another problem. I don't know of any normally available turntable which has more than a tiny variation (usually 2 or 3 %), which is nowhere near enough; but electronically controlled turntables may be modifiable. You need a speed range of 72 to 82 to cover most records.

For further information. See Roger Wilmuts Web site: <http://www.rfwilmut.clara.net/repro78/repro.html> On this site, you will find a lot of information about 78 RPM and a lot of links.

HOW TO USE THE PREAMPLIFIER



The preamp is equipped with two identical inputs, which make it possible to have two record-players connected at the same time. Normally it could be a gramophone for LP/EPs and another gramophone for 78s.

Between the two sets of inputs, you have the grounding-screw. With nearly all turntables, it is necessary to connect to ground to avoid hum. Please work with this for the best use of ELBERG MD12s excellent Signal to Noise Ratio.

Outputs are balanced XLRs with pin 1 ground, pin 2 hot, and pin 3 cold. Professional users will be familiar with this. For connecting to consumer equipment with RCA Phono plugs, use pin 2 as hot (connected to the middle pin in the RCA plug), and pin 1 + 3 connected together as cold to the screen.

Next is a voltage selector 230 V AC or 115 V AC (50 - 60 Hz).

Be quite certain that the voltage selector is set properly to your power supply voltage! And never operate it while connected to mains!!!

On left side of this, you have the AC plug.

You are switching from input one to input two with the first left button at the front. A LED is lighting when using input two.

Next two are switches for MM/MC selections in bottom. When MC is activated, a switch for selecting load impedance at 50, 100, or 200 Ohm is above.

Next switch on the front is selecting eq curves, according to the upper form. You can see the active curve on the LED.

Next button is a 80 Hz first order bass cut (high pass) filter.

Next you will find a first order low pass filter continuously variable from 1.6 kHz to 12 kHz. You activate this filter with next button.

After this you have 3 buttons which are used for mono/stereo settings and vertical cut records. Pressing the first button only, enables you to hear vertically cut records played with a stereo cartridge as the mono function is automatically engaged. Pressing only 2nd button enables you to hear left channel (inner groovewall) alone in both speakers, and pressing no. 3 only, enables you to hear right channel (outer groovewall). Pressing 2nd and 3rd let you hear both groovewalls in mono. With none of these buttons activated, the **ELBERG MD12 MK2** is working in normal stereo mode.

Next you'll find a volume control, and after this a stereo balance control.

Finally you have the power on/off switch.

TO FIND THE CORRECT EQ SETTINGS

ELBERG MD 12 "PRESETS":

Switch for selection of EQ curve.

COARSE GROOVE (78 rpm)

SYSTEM	Treble turnover	Bass turnover	Lower bass t/o	Cut at 10 kHz	Boost at 50 Hz
Flat	Flat	Flat			
US MID 30	Flat	400 Hz	70 Hz	-	16 dB
WESTREX	Flat	200 Hz	-	-	15 dB
HMV	Flat	250 Hz	50 Hz	-	12 dB
ffrr 1949	6.36 kHz	250 Hz	40 Hz	5 dB	12 dB
Early DECCA	5.8 kHz	150 Hz	-	6 dB	11 dB
Columbia	1.6 kHz	300 Hz	-	16 dB	14 dB
BSI	3.18 kHz	353 Hz	50 Hz	10.5 dB	14 dB

MICROGROOVE (LPs and 45 rpm)

SYSTEM	Treble turnover	Bass turnover	Lower bass t/o	Cut at 10 kHz	Boost at 50 Hz
RIAA	2.1215 kHz	500,5 Hz	50,5 Hz	13.6 dB	17 dB
ffrr LP 1953	3 kHz	450 Hz	100 Hz	11 dB	12.5 dB
CCIR	3.18 kHz	500 Hz	50 Hz	10.5 dB	17 dB
NAB	1.6 kHz	500 Hz	-	16 dB	16 dB

First of all: Use your ears. It is very useful to know that the recording companies used a lot of eq settings, and sometimes the same company used several settings depending on which recording engineer was on job.

But as a rule, there is a difference between American and European 78 rpm recordings. The American records were normally much louder cut with much more bass response and a higher bass turnover frequency. The two American record companies Columbia and Victor had different settings but both used basically the patent from Western Electric.

It is also important to know that one thing is theory and another practice, especially when cutting high frequencies. Besides, records in bad condition, have lost a lot of the high frequency response. And a majority of the 78s are in bad condition (read: Have been played a lot of times).

Ideally, use flat for old acoustic recordings. Sometimes you will find that you will get a better sound with a little bass lift. Then try one of the other eq settings and use the 80 Hz bass cut filter.

Next eq is "US MID 30," which is useful for a lot of American records. Normally you should use it together with the variable low-pass filter and find the right settings. Good for American Victor.

Use WESTREX (English Western Electric) for HMV 78s with a triangle matrix code and English Columbias with a "W" Matrix code.

HMV eq is used for HMVs with a square matrix code, and English Columbia with a "C" matrix code, or in both cases with no code (post 1945 up to about 1953).

ffrr 1949 is used by Decca and EMI.

Early Decca are Decca eq setting from 30s.

Columbia is an American Columbia setting used by Columbia since around 1930. But be aware: This setting is an ideal setting and only useful for records in absolute good condition.

BSI 78 useful for all post 1953 78s. Can also be useful for some earlier American 78s.

Use ffrr LP for early Decca LPs and for pre 1955 HMV and English Columbia LPs.

Use NAB (NARTB) for some early American LPs.

Use NAB simultaneous with the first order 80 Hz bass cut filter for American Columbia LPs.

RIAA is The World standard (in theory) of all EP/LPs after 1955.

CCIR used by European labels for early LPs and EPs

Reproduction of Pathé and Edison Vertical Cut records

Normally mono recordings are lateral, which means "side to side" in the groove wall. But some of the first recordings were vertically cut, also named as "hill and dale" recordings. Because of that, a mono cartridge is not able to reproduce a vertical groove signal. But a stereo record is a combination of a lateral cut and a vertical cut record. That's why you can use a stereo cartridge. You will get the best result with a special costum made stylus for this purpose. Ask your "Cartridge Man" for purchasing the right stylus.

For reproduction of Pathé and Edison vertically cut records, activate the "VERTICAL" switch.

Specifications for MD12 MK2

Power requirements: 230 V AC 50 Hz or 115 V AC 60 Hz

Frequency response: 18 Hz to 54 kHz (-1 dB)

Input impedance: 47 kOhm/47 pF (MM), 50/100/200 Ohm (MC)

Gain @ 1 kHz: 46 dB (MM), 71 dB (MC)

Max. out: +24 dBu (12.3 V)

Output impedance: 47 Ohm

Load impedance: \geq 600 Ohm

Deviation from RIAA-curve: max. 0.4 dB

Distortion @ +10 dBu out (20 Hz-20 kHz): 0.03 %

Noise: -90 dBA below 10 mV in (MM), -76 dBA below 1 mV in (MC)

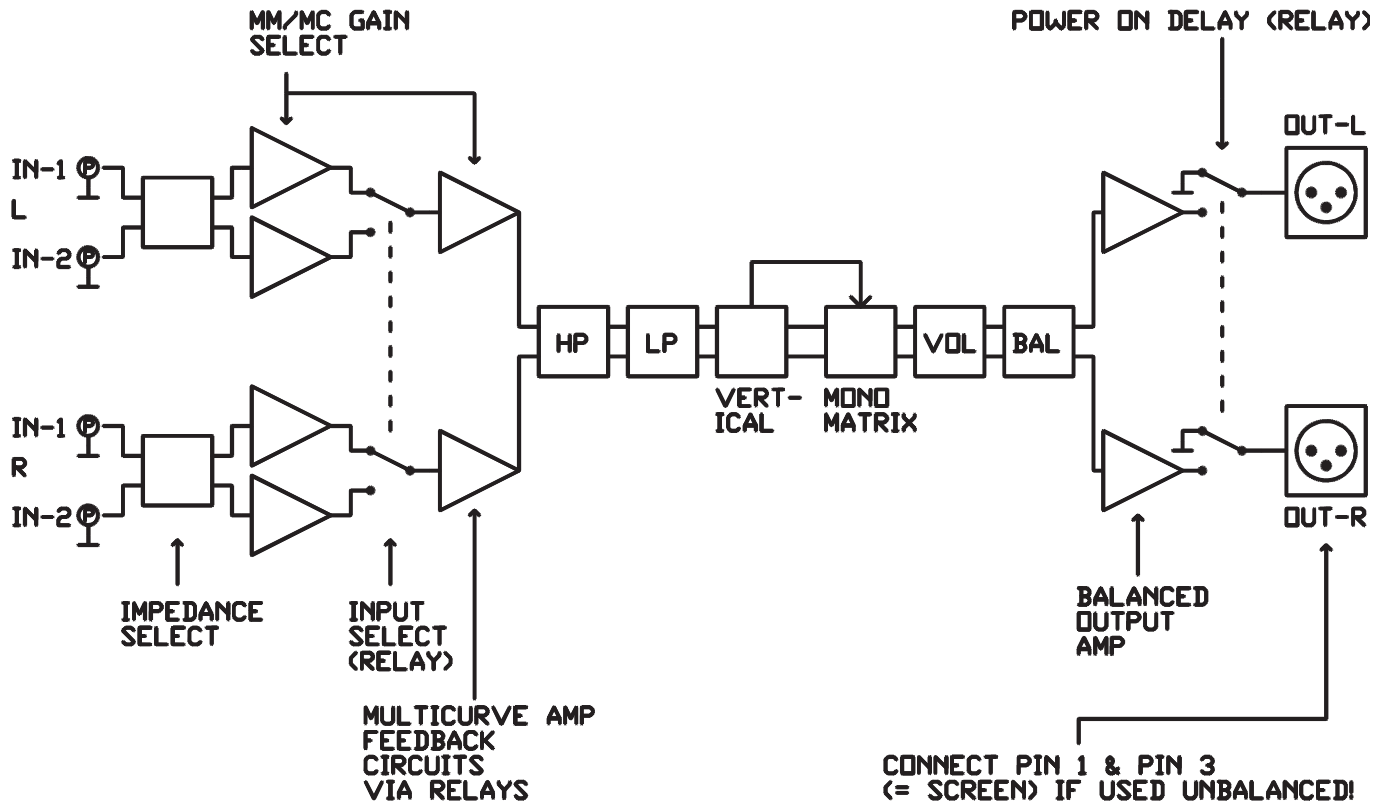
Channel separation @ 1 kHz: 66 dB

0 dBu = 0.775 V

XLR outputs:

Balanced: Pin 1 = ground, pin 2 = hot, pin 3 = cold.

Unbalanced: Pin 1 & 3 = ground (screen), pin 2: hot (conductor).



Two Years Limited Warranty

ELBERG MD12 MK2 is warranted for two years from date of purchase to be free of defects in materials and workmanship. In event of such defect, **ELBERG MD12 MK2** will be repaired promptly without charge. This warranty excludes defects due to normal wear, abuse, shipping damage, or failure to use product in accordance with instructions. This warranty is void in the event of unauthorized repair or modification, or removal or defacing of the product labelling. For return approval and shipping information, contact: VADLYD, Gammel Holtevej 46, DK-2840 Holte, Denmark, or by email: vadlyd@vadlyd.dk.