

The *Resolution Series*® 268-C

Precision Preamplifier / Harmonic Linearizer



The FM 268 is a dream for music aficionados.
Now the FM 268-C. Practically identical but with an important new feature

- ♪ Unique acoustic resonance compensation circuits increase listening pleasure and realism
- ♪ Proprietary enhanced Class A circuitry
- ♪ CMRR of 100 dB (\approx 100-1000 times better than other so-called "balanced" equipment)
- ♪ Passes critical "pro float test" with flying colours
- ♪ Unbalanced and pseudo-balanced signals are automatically balanced right at the inputs
- ♪ Tremendous headroom and reserves in input signal handling capability (+21 dBv!)
- ♪ All input & output impedances are identical and perfectly linear over full frequency range
- ♪ Sensors in the outputs automatically analyse and analyze and adjust for optimal performance with balanced or unbalanced loads
- ♪ Fully discrete circuitry using special curve-tracer analysed and listening-selected semiconductors
- ♪ The only **truly** balanced preamplifier incorporating a unique Harmonic Linearizer
- ♪ Outputs drive any load and longest cables with absolute stability
- ♪ No more matching problems between electronics and cables
- ♪ No relay type, stepped, optical or inferior sounding digital volume control
- ♪ Zero overall feedback/feed-forward
- ♪ Internal transformer utilises a special dual shield that prevents stray fields.
- ♪ Extremely low impedance power supply
- ♪ Individual circuit stabilisers inside each module
- ♪ Hand-selected, individually matched components of DIN, IEC & MIL standard
- ♪ Modular concept. The FM 268-C does not become obsolete
- ♪ The *Resolution Series*® 268-C is THE precision Preamplifier / Harmonic Linearizer, featuring six truly balanced high-level inputs and a precision true balanced tape / auxiliary loop

After a tremendous research program that extended over 10 years and after dozens of rejected circuit topologies, the combination of several unconventional ideas brought the final breakthrough: with the new FM 268-C Harmonic Linearizer the improvement and linearization of any type of source signal as well as room resonance is now possible.

The FM 268-C Harmonic Linearizer is the epitome of Control Center / Preamplifier with the unique linearization capability that brings astounding improvements in any professional and domestic application, be it audio, film or audio-video.

The proprietary, truly symmetrical balanced input and super-coupled output stages of the *Resolution Series*® 268-C set an absolute new standard. These magnificent circuits allow a **much** higher accuracy of balanced signal transfer, (about 100 -1000 times - 40-60dB ! - better) than other so-called "balanced" preamplifiers.

One of the technical terms that defines the accuracy of the balancing is the "Common Mode Rejection Ratio", in short: CMRR. This value indicates the rejection of signals that enter both lines symmetrically, e.g., hum interference and noise. It expresses how strongly interference signals entering the lines or the circuit are attenuated. The higher the CMRR value, the better the balancing of the circuit. The CMRR values of existing so-called "balanced" equipment is as low as 30-60 dB, a somewhat disappointing result not really warranting such terms as "balanced", "symmetrical" or "floating".*

Such a low CMRR is not acceptable, as the lines and circuits are **not** well balanced at all. A CMRR of at least 80-90 dB over the full frequency range is required for optimal results.

Of course there are more aspects to balancing than the CMRR alone. The quality of the interconnect cables play a very important role. Together with other characteristics, highly efficient interference shielding over a frequency band extending far into the MHz range is of highest importance.

* True balancing requires much more than just the presence of two signal lines!

What so far has been called "balanced" preamplifiers have been units with simple op amp or op amp style input circuits. In such a configuration the non-inverting and inverting signal paths do not have the same electronics or performance. This in no way warrants the term "balanced". A balanced circuit must be **totally** symmetrical in relation to ground and shield.

Often "balancing" is just the addition of a 180° inverting stage. As two conductors and a shield are now used to transfer the signal, the layman thinks that his system is now balanced. This, however, is far from a true balanced signal transfer.

It is not difficult to detect these more primitive pseudo-balanced circuits. One of the tests: if the output impedance of the **un**balanced output is lower than that of the balanced output, it is likely that a simple phase inversion circuit is being used, e.g. output impedance rating reading something like "Balanced 600 Ohms, Unbalanced 300 Ohms". This is **not** a high performance symmetrical or "balanced" output and will **not** perform like one.

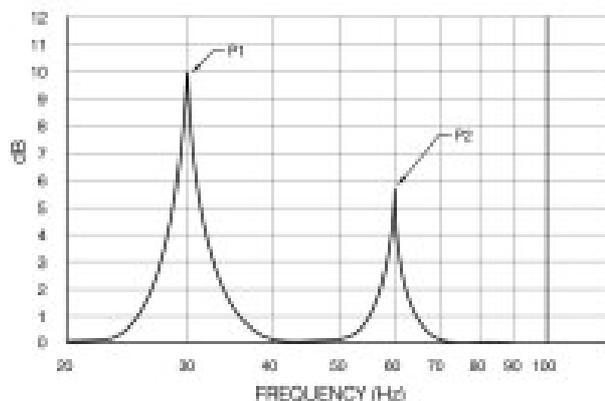
The combined knowledge of the engineers from *Precision Interface Technology*® (cables) and FM ACOUSTICS (electronics) has resulted in every detail of the entire signal transfer chain being optimized to an unprecedented level. *Precision Interface Technology*® Interconnect cables will guarantee perfect interfacing between any unbalanced, quasi-balance or true balanced equipment and extract the ultimate performance.

ACOUSTIC RESONANCE COMPENSATOR

The FM 268-C features novel circuits which improve the reproduction in any room:

Acoustic Resonance Compensators (ARC)

The ARC minimizes room modes and other resonances. Room modes occur when parallel surfaces create one or more pronounced resonances (a sharp Sound Pressure Level (SPL) increase at specific frequencies).



In a typical rectangular room the 1st principal resonance is occurring at 1/2 wavelength of opposite walls (this is why it is not a good idea to listen while sitting close to walls) - in above graph this is "P1" (graph is smoothed to only show the two principal resonances). The 2nd resonance is at double this frequency ("P2").

Depending on room size the 1st and 2nd resonances can occur anywhere from around 100 Hz down to below 20 Hz. Such a resonant peak is superimposing itself on the actual music mainly resulting in boominess and poor low frequency definition.

Professional studios can ameliorate such room modes but size, construction limits and cost preclude this for home environments. Usual "hi-fi" absorbers work relatively well for middle and higher frequencies but with reasonably sized domestic absorbers such low frequencies room modes cannot be attenuated efficiently.

The ARC circuits are also ideal if there are resonances from other sources in the room, e.g. air conditioning or any other resonating surface or room component.

These circuits are unique to the FM 268-C. They are pure analogue circuits and do not interfere with the music. No A/D and D/A conversion is done. The integrity of the existing system's signal reproduction remains.

The set up of the ARC needs test equipment and is performed for FM 268-C owners by FM ACOUSTICS official distributors.

FEATURES

- The FM 268-C uses unique true balanced input stages which achieve an amazing 100 dB of CMR (Common Mode Rejection). This, without succumbing to the use of instrumentation amplifiers (which do not provide great audio performance). The outstanding CMRR performance is achieved with proprietary, finely tuned, totally discrete enhanced Class A circuitry resulting in truly singular performance.
- The FM 268-C works optimally with **all** types of input and output circuitry. Performance variations and matching problems are a thing of the past.
- All inputs have identical sensitivity and are absolutely linear. This is the case with both balanced as well as unbalanced sources and any mixture of them.
- Signals from non-symmetrical/unbalanced sources are automatically balanced at the input.
- The FM 268-C can drive any load (even high capacitance loads) with perfect reproduction and absolute stability. Even capacitance of 100000 pF (corresponding to hundreds of meters of quality cable) present no problem.
- The outputs employ sensors that automatically analyse and optimize differences in balanced and unbalanced connections, another feature unique to the FM 268-C. It's sensors analyze the type of source and load and automatically adjust for optimum performance with any balanced or unbalanced equipment.
- Tremendous reserves in headroom and output capability allow perfect interfacing to all professional, semiprofessional and consumer equipment.
- The output has a drive capability of up to +29 dB(!) This allows to run higher signal levels and therefore achieve a better signal to noise ratio of the system.
- All outputs are short-circuit proof.
- The FM 268-C easily passes all professional connection tests. Only very few balanced circuits will pass the pro float test, a most efficient real-world test.
- In the FM 268-C absolutely no overall feedback or feed-forward is used. It employs FM ACOUSTICS' ingenious true balanced Class A stages. Freedom from noise and interference, stability and pristine signal handling surpass anything that has ever been available.
- A phase inversion switch on the front panel performs precise 180° phase inversion of the main outputs without any additional circuitry. The signal does **not** enter an additional 180° phase inversion stage. "In-phase" and "out-of-phase" signal lines are absolutely identical and correct phase is assured.
- A special biasing system guarantees that the *Resolution Series*® 268-C does not have any form of distortion or changing tonal characteristics when warming up. It reaches its operating temperature within a few minutes; there is no hour long warm-up required.
- Tape monitoring/Auxiliary connection: Many preamplifiers use only a passive switching arrangement in their auxiliary (tape) monitoring function. This is **not** satisfactory because equipment that uses the tape monitoring loop can have massive difference in input and output impedance and in the characteristics of input and output circuits. The corresponding variations in loading result in inconsistent interfacing giving non-predictable reproduction. To avoid such errors the *Resolution Series*® 268-C employs discrete Class A circuits. Absolutely consistent signal transfer is guaranteed whatever equipment is connected. No interfacing errors can provoke frequency non-linearity, distortion, compression, limiting etc. which may occur in usual tape monitoring arrangements.
- Thanks to the built-in power supply, the stabilization circuits can be located right next to the individual amplification stages*. The FM 268-C's exemplary noise and distortion performance even surpasses that of today's best professional equipment.
- The back panel assembly is a precise honeycomb -style construction that guarantees perfect stability. XLR input and output connectors are hand soldered directly into the pcb/back panel assembly.
- With the usual arrangements hum, interference, noise and stray fields can enter the audio path through the potentiometer, relays, connectors and switches. Not with in the FM 268-C where special shielding techniques are used.
- The output level and balance controls are precision laser trimmed and then additionally hand-selected at FM Acoustics for utmost performance. Ultra low-noise performance and superb tracking accuracy are the result.**

* The advantage of **internal** power supplies is that there are much shorter distances between the actual supply and the amplification stages. The corresponding impedances are lower than when power supplies in a separate housing is used.

** Instead of a switched (stepped) attenuator, VCA circuits, digital controls, optical encoders or a relay matrix, laser trimmed selected precision potentiometers are used in the FM 268-C.

With a stepped attenuator the limit of resolution is determined by the individual steps. Music levels, however, do not come in steps but rather must be finely tunable to achieve realistic reproduction. Therefore continuously variable controls are required.

VCA (Voltage Controlled Amplifiers) and the circuitry of optical encoders are known to be detrimental to audio quality.

Multiple switched relays have the same limitations as a stepped attenuator and in addition have poorer long-term reliability (partly due to additional electromechanical component count).

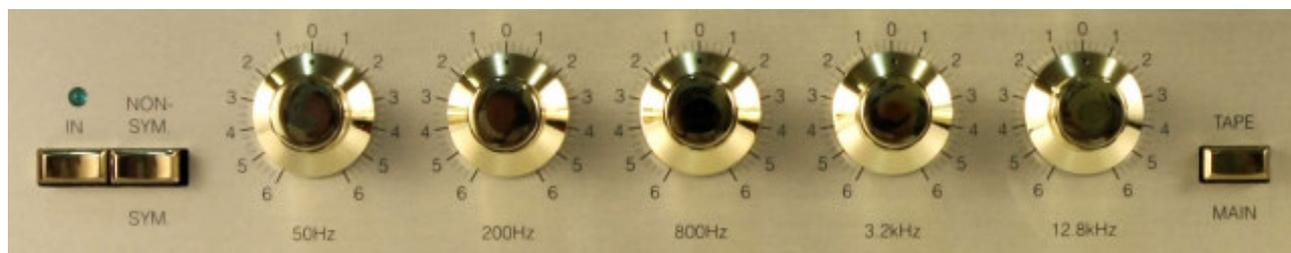
While not "fancy", the fine tuned precision potentiometers achieve better results and are the optimal choice.

- Phenomenal signal to noise ratio, and total freedom of hum and other non-audio signals are achieved. The FM 268-C betters existing designs and this with an *internal* power supply. No wonder that experts call the performance of the FM 268-C "unrivalled". Any kind of hum, noise, magnetic or electronic interference is properly rejected and conducted to earth. The FM 268-C demonstrates this improved performance in an unparalleled manner.
- The precision Output Level Control avoids any variations or changing characteristics, (varying sound quality when turning the controls is a thing of the past).
- The super-wide "spread" Balance control - another exclusive feature - provides a unique centring system. When the knob is turned +/- 45° from the center, the level adjustment range is within 1 dB. A resolution of 0.02 dB in the center area is obtained allowing to set the balance perfectly. At the end stop the level of the corresponding channel is fully attenuated. This is of advantage for test and checking purposes.
- All of the interconnect cables required for perfect interfacing are available in the *Precision Interface Technology*® line.
If required, cables with other types of connectors are available on special order basis. Contact the factory for special requirements.
- The Swiss-made relays are hermetically sealed. Four specially coated contacts guarantee perfect operation, even after millions of switching cycles. Hermetical sealing assures that environmental factors cannot have a negative effect on the contacts. There is no degeneration of sound quality or performance.
- The *Resolution Series*® 268-C employs proprietary controls and protection circuitry that performs various tasks:
- Of course, delayed switch-on is incorporated. During switch-on outputs are disengaged and the preamplifier checks itself. If everything is found to be perfect, the control circuitry frees the outputs. Within ten seconds of switch-on the preamplifier is fully operational.
- Another protection circuit safeguards the preamplifier against extreme over- and under-voltage. The FM 268-C (150%) over-voltage, but in addition a separate sensor also protects the unit and the equipment connected to it from heavy under-voltage that could result in non-optimal performance, transients or DC instability endangering the amplifiers and speakers.
- The FM 268-C's mechanically damped chassis design effectively isolates all sensitive electronic components from induced resonances.
- The *Resolution Series*® 268-C is THE ultimate ultra-precision Control Center that additionally incorporates FM ACOUSTICS unique Harmonic Linearizer. It provides six truly balanced high-level inputs, a precision buffered and truly balanced tape/auxiliary monitoring loop and a true balanced output
- For applications where ultra precise vinyl and shellac reproduction is demanded, the *Resolution Series*® 223 and 222-MKIII have been designed to complement the FM 268-C. They come as separate, shielded units. A special connector on the back panel of the FM 268-C provides power for these units.
- The *Resolution Series*® 268-C achieves a level of performance that is absolutely singular. The techniques and the ingenious singular circuits are proprietary to FM ACOUSTICS.
- The FM 268-C will not be subject to obsolescence. Thanks to its entirely modular construction, any future breakthroughs can be readily incorporated. By simply replacing the corresponding module (a 20 minute affair), it will be possible to keep the FM 268-C at the forefront of technology and performance.

The following pages explain the unique Harmonic Linearizer used in the FM 268-C.

A dream come true...

THE FM 268-C HARMONIC LINEARIZER



Today, the major limitation in music reproduction is no longer so much the standard of the reproducing equipment. The most limiting factor is the often mediocre sounding sources, be they CD's, LP's, DVD's etc. Whatever the audio system, its reproduction is only as good as the source. There has been a profound lack of equipment that allows the restitution and improvement of music sources. Until now.

The FM 268-C is a preamplifier / control center. However, it provides much more than that as it allows precise rectification and linearization of non-optimal recordings. It does this in an absolutely unique way.

LINEARIZER CIRCUITS

The FM 268-C features a built in Harmonic Linearizer that allows adjusting the strength (or weakness) of critical frequencies. Thanks to this absolutely unique solution which only uses five easy to adjust controls, **any** frequency (or group of frequencies) in the entire audio band can be optimized and this **without** negative influence on the audio signal. The FM 268-C does what musicians, engineers and music enthusiasts the world over have been dreaming about for dozens of years.

For the first time, obnoxious sounds from any source can be attenuated (subtracted) and weaknesses of certain parts of the music spectrum can be strengthened. All this is done whilst the characteristics and transparency of the original signal are kept pristine and while remaining purely in the analogue domain. The improvements are described anyway from "amazing" to "quite incredible".

The unique concept guarantees that all of the above is done without any negative influence on the signal path. In fact, the method of operation is rather intriguing as can be seen from Fig. C: the **entire audio signal** is directed right through from input to output avoiding phase changes and all other negative influence. The actual response improvement is done by a unique additive/subtractive phase accurate bank of 5 individual Linearizers that combined can correct any frequency aberration in the audio band. The signal always passes **straight through** from the input to the output even when the strength of a band is adjusted via the front panel controls.

While looking at the control panel of the FM 268-C linearizer section one could be reminded of an equalizer. However, the FM 268-C Harmonic Linearizer's mode of operation is rather different and avoids all the problems of equalizers. It's singular characteristics allow linearization of any source by only **adding** or **subtracting** critical areas of the audio signal to/from the **direct-through** signal.

The result: in the FM 268-C there is **no ripple** in the pass band and **no phase shift / discontinuity**, which results in pristine signal coherence and superb transient response.

A further unique characteristic is that when all level controls are in full boost position there is no change in frequency response; a linear gain over the entire frequency range is achieved; this is unique, the sign of perfect linearization.

The FM 268-C Harmonic Linearizer has been designed with optimal reproduction of *musically relevant* information in mind. Therefore, boost and cut levels are kept to an optimal but not excessive range.

To achieve this ultra-accurate selection extremely tight component tolerances are required. No op-amps, IC's, transformers or hybrid circuits can be used. In the tradition of FM ACOUSTICS discrete enhanced Class A precision buffers are employed to assure that no loading, phase changes, non-linearity or other negative effect can occur.

Thanks to the unique characteristics of the FM 268 it is now possible to linearize audio signals with the assurance of only positive effects on the direct through audio signal.

A good demonstration of the inherent transparency of the FM 268-C is to first listen to the standard signal having all controls in the center detent position. Listen carefully to all frequency ranges. Then turn one of the control, say the 800Hz control and while turning the control, concentrate on another frequency band, say the lower range of voices and low/mid based instruments. You will realize that when turning the 800 Hz control there is no negative effect in the other frequency range! Only the one frequency range that is subtracted or added is changing while the signal remains pristine and totally transparent, exactly like the original signal!

However, do not try to work with the FM 268-C like with an equalizer. It does not work that way. On the FM 268-C Linearizer section every control is dynamic, every movement of one control influences the other. So it is best to control the individual Linearizers dynamically: move one control until you hear it is too much addition or subtraction, then move it back to the point where it becomes a realistic correction. Next, move the control adjacent to it (say the next lower frequency) by turning that control until again it becomes excessive. Turn it back until the setting becomes correct, then readjust the previously set control mildly until the optimum setting between these two controls is found. Then move to the next higher control and repeat the procedure.

After an hour of practice or so users get rather comfortable with the controls and often adjust two controls simultaneously. This way they are able to control dynamically and find the optimum setting in seconds.

Listeners "come to grips" rapidly with the Harmonic Linearizer's controls. An initial hesitation quickly reverses to enthusiasm as soon as a few recordings have been linearized.

Sometimes one needs to adjust the linearizer controls during playing of a CD, LP, SACD, DVD or other sources. The reason is that titles or movements of works were recorded on different dates, by different engineers and sometimes even in a different location. So it is not uncommon to hear some quite drastic changes in sound from one title / movement to another.

The linearizer controls are special level accurate controls that have a center position. This center position is not just a center detent like e.g. found in usual balance controls: here, the center position employs a separate additional contact that guarantees a 100% true bypass when the control is in the center position, a solution unique to FM ACOUSTICS.

While some great recordings will not need much of the linearizer function, others will become even greater; mediocre recordings will become very nice and some downright unlistenable recordings will become quite listenable; an absolutely amazing feat for any music enthusiast.

Unexpected is the astounding increase in dynamics despite the fact that no signal processing at all is done. When analysing why this is possible one comes to a somewhat unexpected but logical explanation: as for the human hearing the apparent loudness is not a linear function, even a small subtraction or addition can have a noticeable effect on the audible dynamic range.

As it depends on the contents of the musical signal - which is continuously changing - no currently established measurement can give any indication of this increase, but its effect are instantly audible.

In any function the entire circuitry remains non-inverting but in case the source signal itself is phase inverted, the "Phase" switch on the front panel allows instant 180° phase inversion.

SIGNAL ROUTING

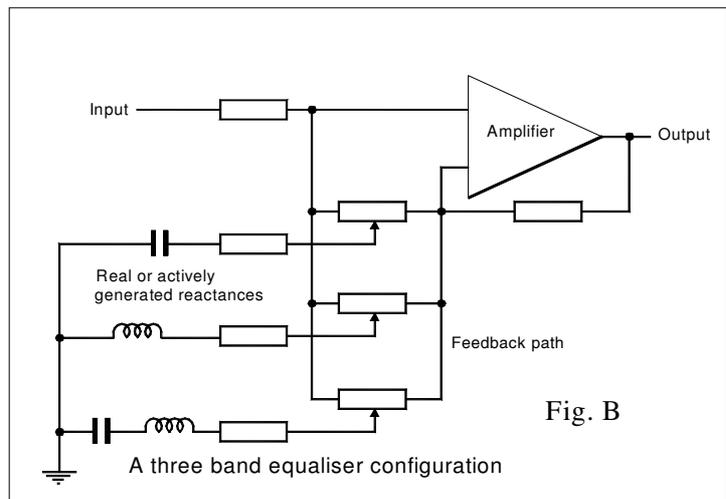
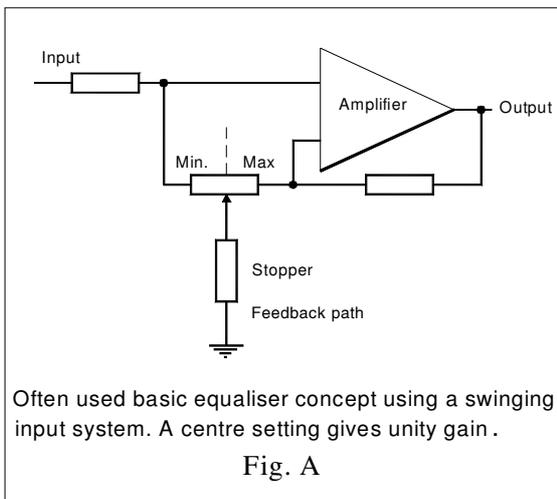
Another priceless feature is the signal routing function on the output of the Linearizer section. Thanks to this it is now for the first time possible to record *one's own music* selection with the linearizer function in action. This means that standard recordings can be improved / re-mastered and then be transferred to a new media! A huge advantage and the base to build one's own linearized and improved music collection.

The following figures and explanation help to better understand the results of this unique development that revolutionizes the way music is reproduced.

LINEARIZER SECTION

To appreciate the massive difference between the FM 268-C Harmonic Linearizer and filter/equalizers circuits some explanation is helpful. Fig. A shows a block schematic of a typical equalizer/filter and Fig. B shows a more detailed schematic of such a unit. One can see how the linear signal is tampered with, introducing all kinds of negative effects to the signal while trying to correct some arbitrarily chosen frequency bands that are not necessarily music related. In Fig. A and Fig. B the filter circuits containing resistors/capacitors/coils or - even worse - active reactance are connected in the feedback loop. By changing them the feedback configuration of the circuit is changed also! This is a poor solution because if feedback is used, it must be linear and identical for *all* frequencies. With frequency-dependent feedback - as in such circuits - some of the music range will have higher distortion, intermodulation and other negative effects than other parts of the music range.

Furthermore, one can easily see that such an equalizer configuration creates massive phase errors.



In contrast, Fig. C on the next page shows the block schematic of the FM 268-C linearizer section.

The input signal enters FM ACOUSTICS exclusive discrete Class A linear amplifier stage from which the signal goes 100% *direct-through* to a discrete Class A linear output amplifier. At the same time the input signal is routed to individual linearizer controls and then enters a bank of constant phase additive/subtractive Linearizers. These have the unique capability of either *subtracting from or adding to* the direct through signal without creating any negative influence. This unique system allows very fine corrections to be made without the usual drastic phase changes, frequency-dependent feedback distortion and other negative influences on the audio signal.

The result: massive improvements in reproduction without any negative influence on the audio signal.

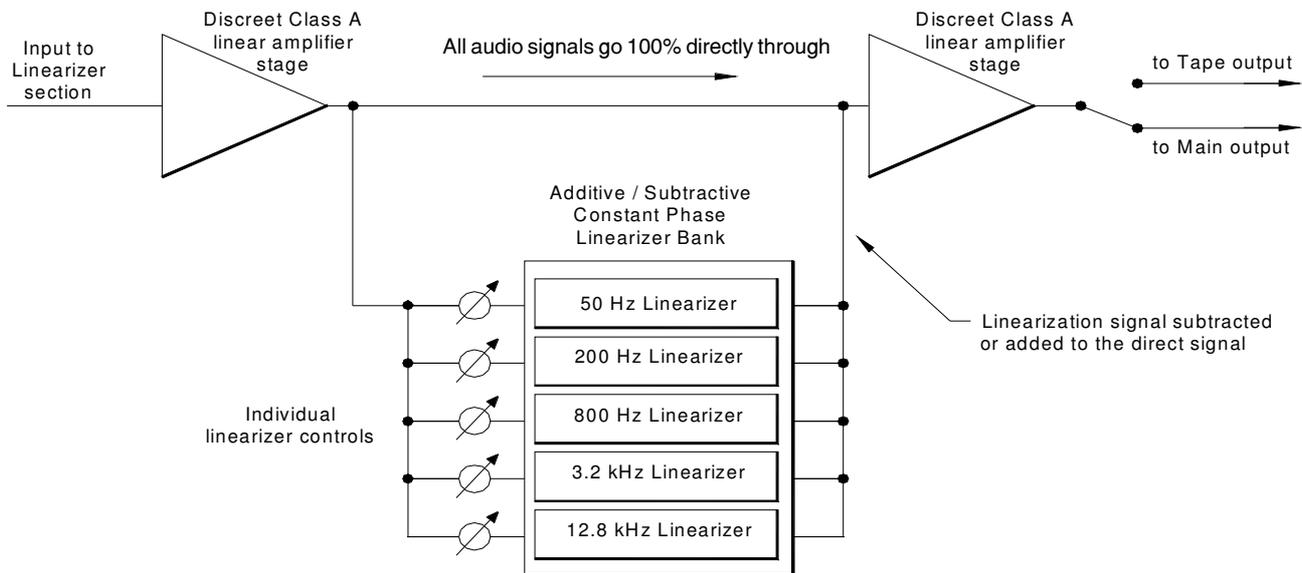


Fig C: Block schematic of the FM 268-C Harmonic Linearizer showing the direct through signal and the constant phase linearizer bank that only adds to or subtracts from the direct through signal.

SYMMETRICAL / NON-SYMMETRICAL CORRECTION

On the left side of the Linearizer section there are two switches. The left one allows activating or bypassing the entire Linearizer section (hardwire bypass). The switch next to it is a special switch that allows selection of either *symmetrical* or *non-symmetrical* addition/subtraction of the audio signal. Why symmetrical and non-symmetrical?

Linearization must not be the same for boost and cut curves as the ear reacts differently when *adding* a certain band of frequencies than when *subtracting* it. In reality, the most objectionable sounds are resonances. Therefore, often a different response is required when *attenuating* frequencies than when *increasing* frequencies (one does not really want to create a resonance!)

The function of the controls are best illustrated with a few actual frequency response curves.

Fig. 1 shows the response when the symmetrical/non-symmetrical switch is in the *symmetrical* position (out) and set to a 6dB subtraction at 800Hz. The result is a mild, musically pleasing correction curve.

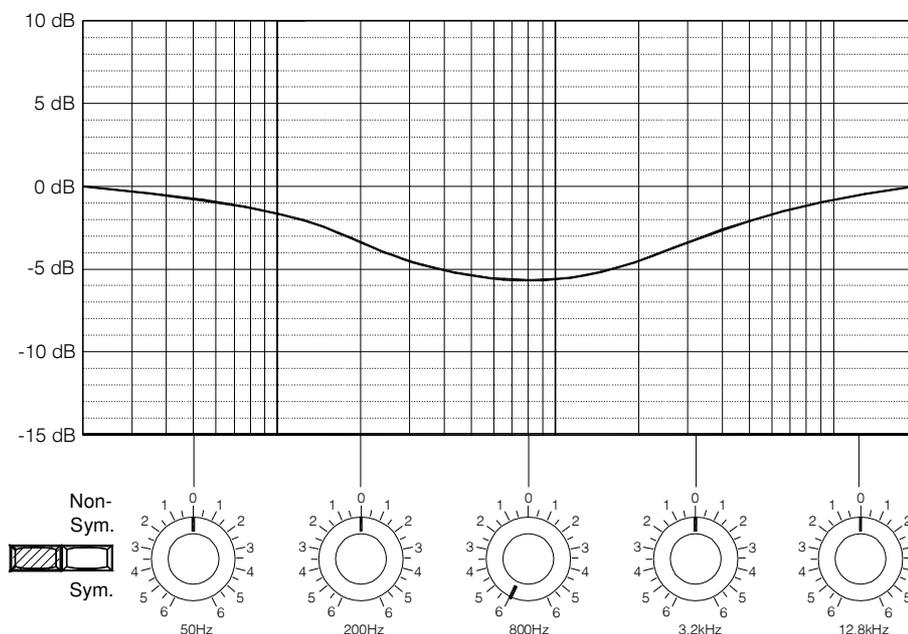


Fig.1

Fig. 2 shows the same setting of the linearizer section but this time with the non-symmetrical switch pushed in. The curve is quite distinctly different from that in Fig. 1 resulting in more concentrated correction in the non-symmetrical position.

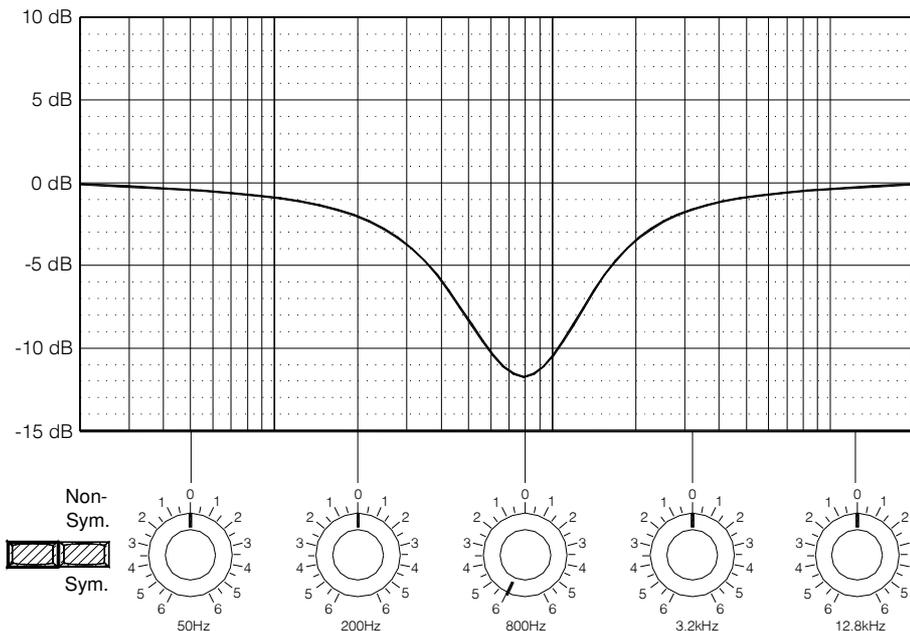


Fig.2

Fig. 3 shows signal addition at 800 Hz. This curve is identical for both the non-symmetrical as well as the symmetrical switch position. The reason for this is that the ear reacts differently to a boost in frequency response than to an attenuation. Attenuated frequencies in music are often not sharp but rather soft "valleys" and can be linearized by equally mild addition as Fig. 3 shows.

This is another characteristic that all current frequency range correction circuits do wrong. It is a great feature of the FM 268-C to have the possibility of linearizing the signal in a *musically correct* way.

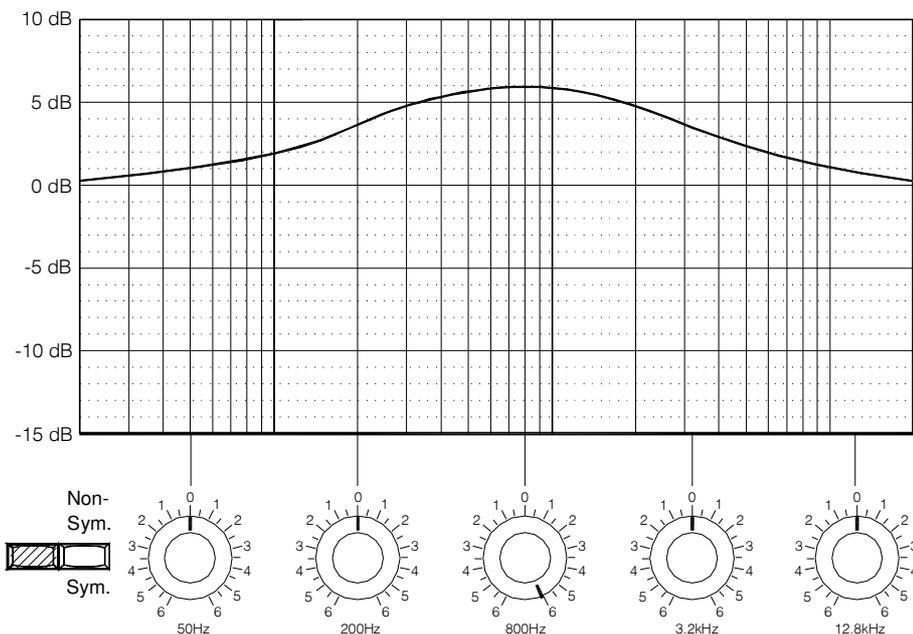


Fig.3

The curves following below show a number of even more exciting possibilities:

Fig. 4 shows - with the non-symmetrical switch pushed in - the response when the 800 Hz and the 3.2 kHz band are subtracted (each is set at -3.6). As these are unique additive/subtractive Linearizers the linearizer banks can be combined to provide an unlimited number of curves!

Because of this combining possibility the numbers printed on the front panel do not correspond to an absolute dB level but are changing with the settings of adjacent bands.

The smooth subtraction curve is centered at 1.6kHz, midway between the 800Hz and 3.2kHz (in music terms better explained as being precisely centered between the lower and higher two adjacent octaves).

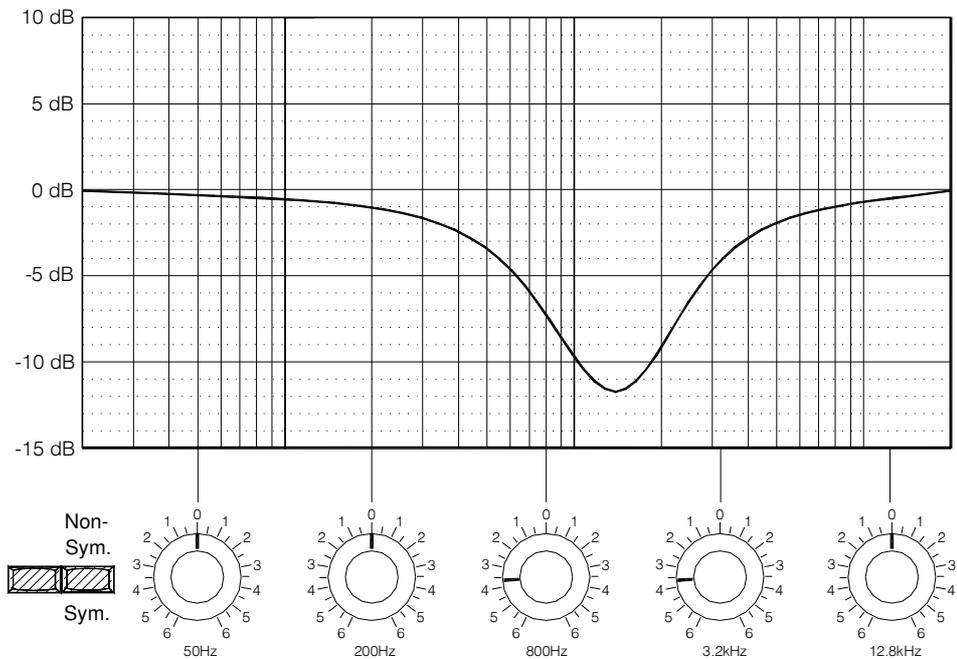


Fig.4

It is easy to see the absolutely smooth response with no ripple (valleys and hills) as is usually the case. Adjacent bands add perfectly without ripple or discontinuity and transient reproduction is superb.

Compare this with **Fig. 5**, which shows the frequency response of a typical equalizer. Apart from the non-desirable response curve and the ripple in the pass band which proves the existence of non-linearity, the phase response is poor ruining most of what was on the original audio signal.

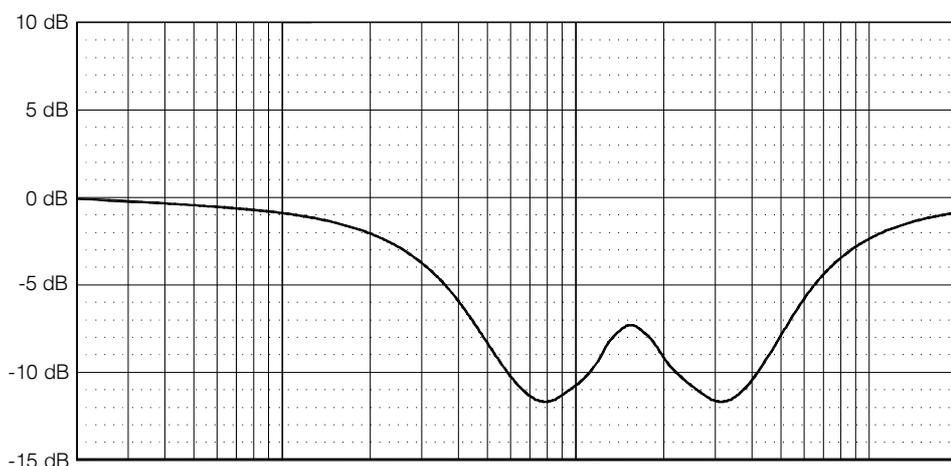


Fig.5

Fig. 5: Attenuation of a typical equalizer with frequency controls set as in Fig. 4.

Fig. 6: Another great feature of the unique FM 268-C is that one is not limited to the five center frequencies! If a signal aberration at say 1000 Hz needs correction the FM 268-C allows to do this without resorting to any poor sounding parametric/state-variable filters or other musically non-satisfactory equalizing circuits. By simply decreasing the subtraction at 3.2 kHz and increasing the subtraction at 800 Hz the center frequency now moves down to any frequency requested, in this case the required 1000 Hz.

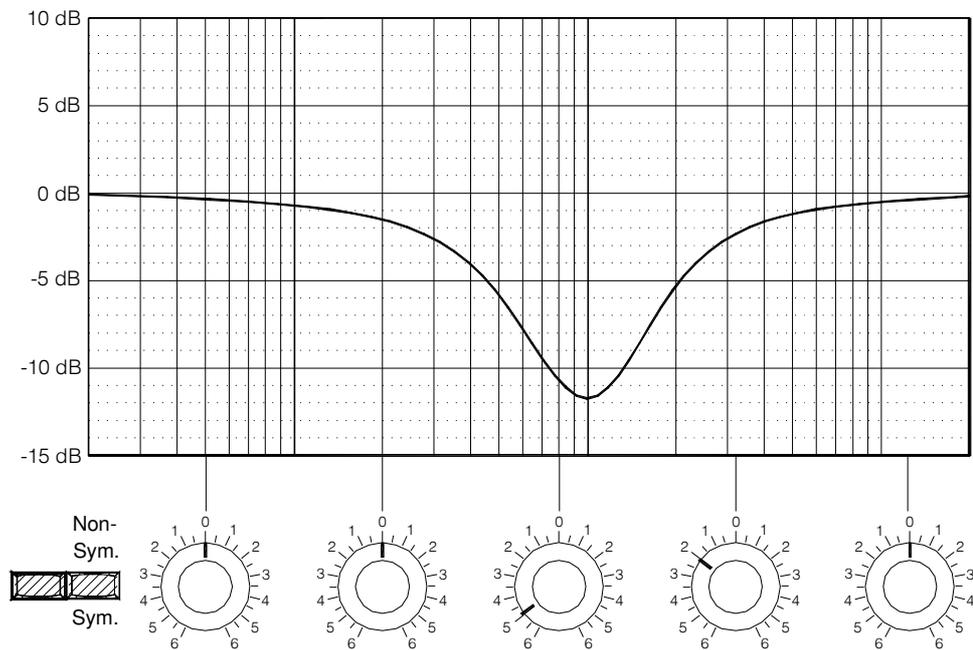


Fig.6

In this way it is possible to *select any frequency* in the audio band and at the same time continuously vary the addition or subtraction level of these frequencies to whatever is required. Remember, the attenuation can still be increased or decreased *at the same time* as changing the center frequency (!), which allows unlimited control of the frequency addition and subtraction over the entire audio reproduction range!

Fig. 7 shows again the attenuation centered on 1 kHz but this time with less attenuation than in Fig. 6, both controls having been moved to somewhat less subtraction the 800 Hz and 3.2 kHz.

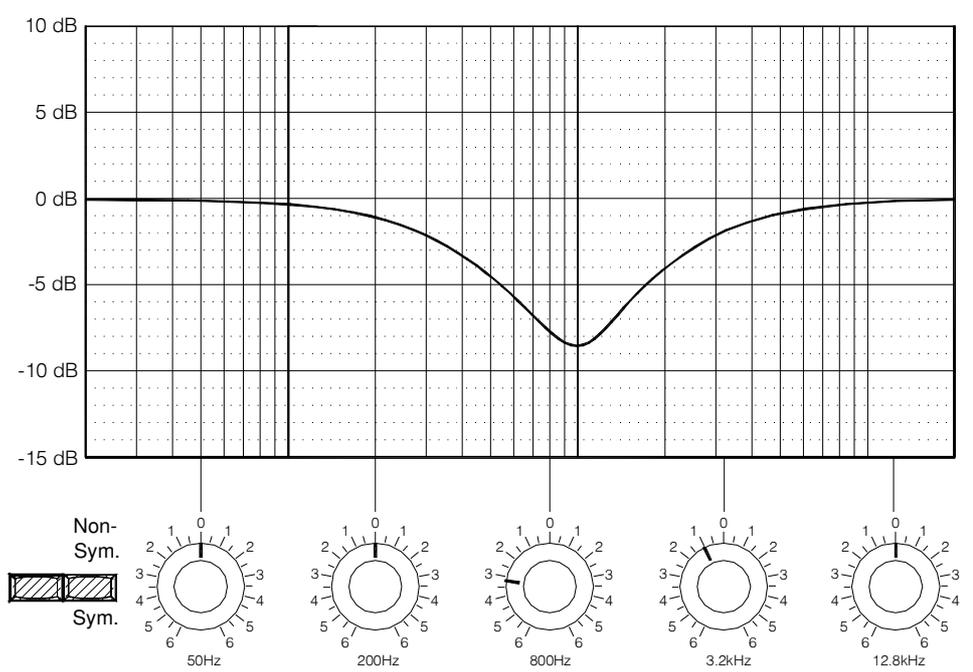


Fig.7

Fig. 8 displays the attenuation curve when two of the controls, in this case 200 Hz and 800 Hz, are set to *full subtraction* and the non-symmetrical switch is pushed in. This way one is able to achieve very pronounced attenuation.

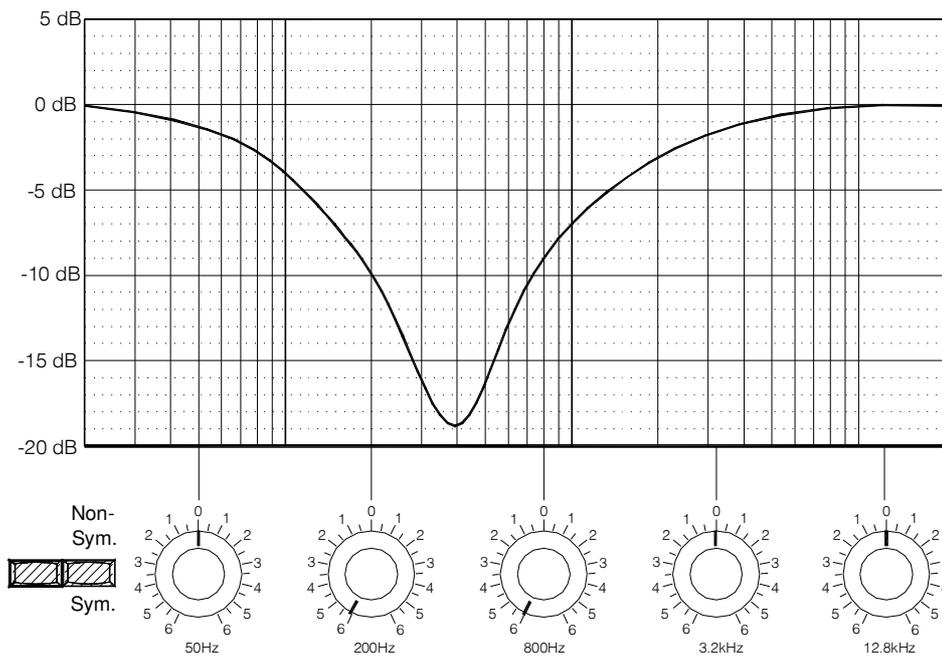


Fig.8

Note that as both controls are set to the same level of subtraction the center frequency is at *exactly* the *harmonic middle* between the two controls (200 Hz and 800 Hz), in this case 400 Hz showing the musically correct function of the Linearizers.

FIG. 9 If, for instance, certain sharper resonances in a recording (e.g. horn resonances of early recordings) have to be subtracted from the original signal, a good example is displayed in **Fig. 9**. Here the subtraction control is set to -6 at 800 Hz and -3.5 at both 200 Hz and 3.2 kHz. A resonance that - in this case - would be centered at 800 Hz could be subtracted from the direct signal with a quite profound attenuation of - in this case - 32 dB! Of course this is an extreme value and almost never required in actual use.

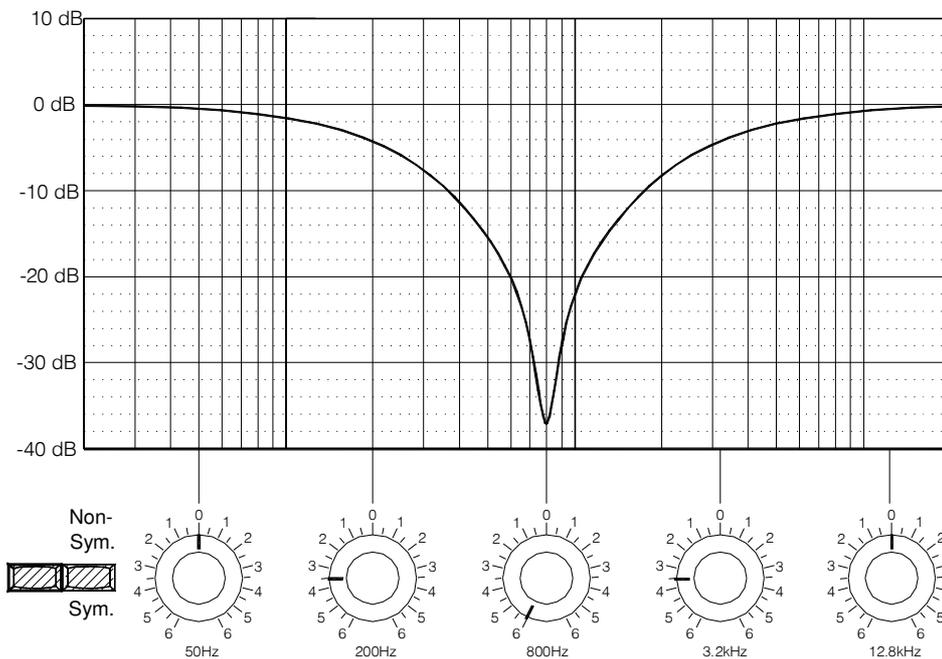


Fig.9

These figures only show a few of the myriad possibilities. The combination of just five dynamic controls allows a literally *unlimited* number of musically relevant linearization / correction curves to be created.

ROUTING SWITCH

From the linear output amplifier stage it is possible to either route the linearized signal to the main output or also switch it to the "tape" outputs. This is a great feature as it allows recording of the linearized signal onto whatever is connected to the tape outputs: tapes machines, blue rays, DVD's, CDR's and the like. This way the source signal can be re-mastered and allows the creation of one's own collection of improved and linearized recordings to whatever media is connected to the "tape" outputs!

The FM 268-C is *absolutely unique* as it allows *any* critical frequency in the audio band to be optimally linearized with just five dynamically interacting and easy to adjust controls, all of this with FM ACOUSTICS pure discrete class A analogue circuitry.

The ultimate goal of correcting errors without negatively affecting the audio signal and literally let the signal pass through *directly without negative influence* has finally become reality.

Now it is possible to achieve huge improvements in the weakest part of the audio reproduction chain: the source signal.

It must be noted that the Linearizer section of the FM 268-C is not designed for compensation of room acoustic problems, although sometimes improvements are possible. The task of the Harmonic Linearizer section of FM 268-C is the *linearization* of the *source* signal.

Room mode and resonance correction is done by the ARC circuits located on the back panel.

MUSICALLY ACCURATE REMOTE CONTROL

FM ACOUSTICS has managed to eliminate the disadvantages of the typical remote volume controls. None of the negative influence on the sound quality that digital volume controls exert, none of the cheap solutions such as poor sounding optical controls, no digitizing of the pure analogue signal, none of the problems of multiple relay switching and none of the limitations of the usual motorized potentiometers. Using a laser-trimmed and then hand selected slow speed / high accuracy motorized level control, the FM 268-C allows finest Output Level adjustment from its handy, Swiss cherry wood remote controller.

A MUTE function allows lowering the signal level by 20 dB (for accepting telephone calls, reducing excessive system gain and the like).

Furthermore, a very handy IN/OUT switch for the linearizer section of the FM 268-C is incorporated in the remote control. This allows quick comparison between bypass function and Linearizer function.

All of the above is done in a purely analogue mode that prevents any negative influence of the usual remote controls.

SPECIFICATIONS FM 268-C CONTROL CENTER / LINEARIZER

When choosing a product do not simply compare specifications sheets! Specifications are often misused, misunderstood or utilised only to **sell** a product instead of indicating its actual performance capabilities.

“Typical” specifications will not tell you much about the true value of a certain component. Only **guaranteed minimum specifications** as indicated below, together with carefully controlled listening tests, will show the differences and will permit to make the correct choice.

These guaranteed specifications indicate the absolutely unique standard of the FM 268-C Harmonic Linearizer / Control center and present those performance aspects that can be measured.

But words simply cannot describe the truly breathtaking reproduction of the FM 268-C. Only a carefully controlled audition will reveal the facts.

All specifications are guaranteed minimum figures for every single FM 268-C that leaves the factory.

Circuitry:

Proprietary discrete, enhanced Class A circuitry using hand-selected super-speed semiconductors. These are individually analysed, selected and are then subjected to FM ACOUSTICS' unique listening selection process. The entire unit is crafted with FM ACOUSTICS hand calibrated precision Class A modules.

Inputs:

6 identical truly balanced, symmetrical HIGH LEVEL inputs
1 truly balanced, symmetrical TAPE/ACCESSORIES loop.

Input features:

True symmetrical, electronically balanced discrete Class A circuitry, non-polarized, floating ground, non-inverting or inverting connection; works perfect with any balanced as well as unbalanced source. Unbalanced / asymmetrical signal lines are automatically converted to true balanced symmetrical signals at the inputs of the FM 268-C. Sensors automatically recognize what connection standard is employed and assure optimal interfacing to whatever unit is connected.

Input stage common mode rejection:

Typically better than 100 dB; guaranteed better than 90 dB, 20 Hz - 20 kHz.

Input impedance:

100 kOhm from both balanced as well as unbalanced loads; absolutely linear over full frequency band.

Headroom:

+21 dBv (9V^{RMS})

Input Sensitivity:

For 100 mV output at tape output: 100 mV input

Max. Gain:

Any Input to Tape output: 0 dB.
Any Input to Main output: 20 dB.

Frequency response:

20 Hz - 20 kHz +/- 0.03 dB

Bandwidth:

Without RF filter: 1 Hz - 2 MHz

With internal RF filter: 1 Hz - 100 kHz

The actual frequency response of the preamplifier is intentionally attenuated above 100 kHz with a linear-phase anti-RF circuit. For special application this can be bypassed.

Phase accuracy:

Without RF filter: better than -0° / +1° over full frequency range from 20 Hz - 20 kHz

Step response:

Perfect with no overshoot or ringing

Overshoot:

None

Resolution of Output Level Control:

0.02 dB

Center Resolution of Balance Control:

0.02 dB

Rise time:

300 nanoseconds = 0,3 uSec.
(capability of electronics, measured without RF filter)

Fall time:

300 nanoseconds = 0,3 uSec.
(capability of electronics, measured without RF filter)

Hum and Noise:

Below 0 dBv = Better than - 95 dBV

Better than -120 dB below full output 20 Hz - 20 kHz

Output:

True symmetrical, balanced, discrete Class A circuitry. Can drive any balanced or unbalanced load. Sensors automatically adjust output to optimal performance with whatever unit is connected; short-circuit proof; unit perfectly passes “pro float test”

Max. Output level:

+28 dBv (55 V^{PP} / 19,5 V^{RMS}) into 4,7 kOhm balanced load.

Stereo separation:

Better than 85 dB

Channel separation:

Better than 95 dB

Harmonic Distortion:Over full frequency range 0,003% at 3 V out.
No higher order harmonics at all**Mains voltage:**

100 - 120V / 200 - 240V, 50-60 Hz

Mains Over-voltage:Maximum short-term = 180% $V^{nominal}$
Maximum long-term = 150% $V^{nominal}$ **Mains Under-voltage:**80% $V^{nominal}$ before protection circuitry activates.
Stable operation within a voltage range of:
95 V to 140 V (in 115 V setting)
190 V to 280 V (in 230 V setting)**Power consumption:**

30 W continuous

Operating temperature:

-20 to +40°C

Operating humidity:Long-term: 0 - 85%
Short-term: 0 - 95%
continuous high humidity may shorten lifetime
of certain components somewhat**Burn-in time at factory:**

1000 thermal cycles, minimum 200 hours

Vibration test at factory:

50'000 vibration cycles, minimum 60 minutes

Average Live expectancy:36 years (at 25°C ambient, 10 hours per day,
365 days per year)**Phase:**Phase inversion switch assured phase accuracy
whatever the source.**Front panel:**

5 mm laser cut, brushed and then hand-polished 9000 aluminium; letters specially treated so they do not wear; precision centered Linearizer controls; hard wire bypass switch; symmetrical non-symmetrical switch; routing switch; Linearizer-on & Mute indicators; precision hand-selected OUTPUTLEVEL and BALANCE controls with dB calibrated scales. Precision long-life source selector switches with self-cleaning process, POWER switch, POWER indicator.

Back panel:

Same as front panel but using 4 mm brushed and hand-polished 9000 aluminium, lettering wear proof. All inputs and outputs are pretested XLR connectors. Chassis connected to mains earth wire. 4 Pin XLR power supply connector for use with FM 223 / FM 222-MKIII Phono Linearizer / Preampifier.

Connectors:**Input:** female XLR 3-pin
non-inverting: Pin 1: ground
Pin 2: (return) cold
Pin 3: (signal) hot
inverting: Pin 1: ground
Pin 2: (signal) hot
Pin 3: (return) cold**Outputs:** male XLR 3-pin
balanced: Pin 1: ground
Pin 2: (return) cold
Pin 3: (signal) hot**Spare parts availability:**

Min. 10 years; guaranteed availability of 99% of all parts ex FM ACOUSTICS stock.

Remote control:

Double emitter, four-function remote control

Dimensions:

446 mm wide / 120 mm high / 280 mm deep

Weight:

10 kg net / 12 kg packed

Applications:

Reference Harmonic Linearizer / Control center for mastering studios, music collectors and use in true audiophile systems as well as laboratory, institutional and a variety of other professional applications.

IEC, DIN and MIL (military) standards of components used:

| | | |
|--------------------|---------------------|------------------------|
| IEC 68 = 55/155/56 | DIN 384-4 | MIL-R-STD 202 Method |
| IEC 68 = 55/085/21 | DIN 40040 | 01, 103, 106, 213, 301 |
| IEC 144/IP 65 | DIN 40046 | MIL-R-11804/2B/G |
| IEC 40/100/56 | DIN 40050 P 54 | MIL-R-22097 |
| IEC 115-1 | DIN 41332 Type IIA | MIL-R-10509 |
| IEC 384-9 | DIN 44112 | MIL-R-55182 |
| IEC 384-8 IB | DIN 44356 | MIL-R-2268-C4 |
| IEC 384-2 | DIN 45910 Part 1201 | MIL-R-45204 Type 2 |
| IEC 68: 55/085/56 | DIN 45921-107 | MIL-R-23285 |
| IEC 68: 55/200/56 | DIN 44061 | MIL-C-19978 B |
| IEC 68: 2-6 | | MIL-VG-95-295 |
| | | MIL-S-23190 R.I.N.A. |
| | | Nr. 5/206/85 |

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