FM ACOUSTICS NEWS

Volume 1, Autumn 1987

INTRODUCTION

Our clients have frequently expressed the desire to be kept areast of developments at FM ACOUSTICS by some form of news release. Today's audio professional and end-user is constantly being bombarded with advertisements, promotional material and a wealth of papers with allegedly important information. However, a considerable amount of these piles of paperwork is pure marketing offering little real information. We at FM ACOUSTICS do not want to bother our clients with any additional superfluous printed matter lacking in informative content. Our newsletter will be published sporadically, only then when we feel we have something to say. It will explain new technology and products, offer technical hints and tips, feature reports about interesting installations and special applications, contain field reports, express the views of users and more. To meet broader interest a newsletter needs input and feedback from users. FM ACOUSTICS welcomes all reports and infomation. If you think you have an interesting contribution we invite you to write us. Naturally photos, sketches or any supplemental material will help enrich your contribution.
If you do not wish to receive further issues of our newsletter please let us know.

FOREWORD

Almost 14 years have passed since FM ACOUSTICS was founded. During these years an incredible amount of effort has gone into the design of every single one of our products. It is true that our engineering team has always had an unprecedented advantage in that costs have never been a consideration in the design or manufacturing of our products . Without this advantage it would have been impossible to create products of such a standard. Ultimate performance of every single unit that leaves the factory is

paramount. Our success story would never have been possible without the truly outstanding motivation and unmatched craftsmanship of our staff with their perfectionist approach that is quite unique today. It is therefore not surprising that visitors and journalists who see our operation are impressed and full of praise for our staff's dedication and efficiency. We also owe a great deal to our distributors and clients, who helped us achieve our leadership by assisting our clients, giving tips for improvements and general feedback. We extend our gratitude towards all those who helped us reach the goal of producing the world's most accurate precision audio electronics. FM ACOUSTICS products are setting the true State of the Art in performance, sound quality and reliability the world over. The continued efforts of our distributors

together with the support of our loyal staff guarantee that FM ACOUSTICS will stay at the leading edge of technology. Due to the fact that FM ACOUSTICS has remained totally independent we are free to direct our research and development at striving towards the ultimate without the need to accept compromises, a sound base that very few other companies have the chance to build upon.

Occasionally it has been said that we produce to excessively high standards. I personally think that this is a matter of perspective. In a profession where absolute reproduction accuracy is of prime importance and failures not only cost hundreds of dollars per hour but also ruin the creative flow, there can be no such thing as an overdesigned product. FM ACOUSTICS never adhered to the "fashion of the month syndrome" and does not think it is desirable to restyle products every few months or so just to make the client believe that there have been new developments. The majority of the usual purported improvements are either cosmetic-redesigns which serve no purpose or cost-cutting procedures that certainly do not improve performance. Rather than following trendy designs our efforts are directed to continuous R+D and improvements made inside the units while the style reflects our philosophy of designing products that stand the test of time.

It is rewarding to see that more clients than ever before are admiring our approach.

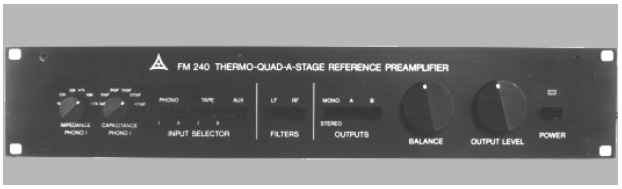
Manuel Huber, President

SPOTLIGHT

The London AES exhibition was one of the most successful exhibitions ever. FM ACOUSTICS' booth - designed and built this year again by Wemer Schnell Design Munich - was constantly crowded and it was often impossible to have enough time for everyone. A thanks to those who waited patiently and sometimes for hours! As expected there was keen interest in FM ACOUSTICS power amplifiers and the FM 236 family of linear-phase electronic crossovers, but the units that probably attracted the most interest were the FM 214/FM 216. Many producers, engineers and recording studios conveyed their appreciation for FM ACOUSTICS' quality standards. Major interest came from broadcasters from all over the world. There were many questions relating to the use of the FM 214 and FM 216 in CD transfer, applications in OB vans, in interfacing, for line driving in fixed as well as mobile installations. Great interest was also shown by record cutting studios and recording studios.

Booth of FM ACOUSTICS at London AES exhibition March 1987

From 16th to 19th of October 1987 the important AES exhibition will take place in **New** York. The show will be at the Hilton as well as at the Sheraton. FM ACOUSTICS has secured booth No 237a in the Hilton. This booth is dose to the one we had at the 1985 AES exhibition. The whole range of FM ACOUSTICS products will be exhibited.



FM 240 *Reference Preamplifier*

The FM 240 is a product that has been a long-standing success. This preamplifier is truly unique in many aspects. It has a proprietary thermo-coupled multiple class A circuit, built from hand- and ear-selected discrete components. However selection is not limited to transistors! The precision capacitors as well as resistors are all hand-selected for highest accuracy of the RIAA equalisation curve (guaranteed to be within +0,08dB over the whole frequency band). Audition an FM 240 with corresponding quality equipment! Its' non-precedented transparency and complete lack of any colouration is quite a revelation! And now is the time to listen to them, because - to guarantee perfect system performance - an FM 212A MC pre-amplifier is supplied free of charge with every FM 240. This corresponds to savings of about US$ 1000.- and guarantees that the moving-coil preamplifier will be in the same class as the preamplifier.

NEW PRODUCTS

FM 214 *Precision Balanced Line Driver* With the introduction of the FM 214 Precision Balanced Line Driver and the FM 216 Precision Line Level Interface the ultimate interface units are now available. The FM 214 guarantees that unbalanced 10dBv signals of semi-professional and consumer equipment remain absolutely pure while being amplified to professional balanced levels. The FM 216 performs the inverse function (step-down and unbalancing). Engineered and manufactured to the unequalled FM ACOUSTICS standard the FM 214 and FM 216 are complete stereo systems that resolve any impedance and level mismatch between semi-pro/ consumer and balanced professional equipment. In many applications, such as broadcasting, OB van interfacing, in CD manufacturing, audio/video post-production, (e.g.: bringing unbalanced low-level signals of video tape and video disk players u p to professional balanced lines) and - last but not least - recording and mastering studios, signal purity is of prime importance. Detailed information on how such unique performance is achieved can be found in the data-sheet. Write or phone for a copy.

TECHNOLOGY

Delivery of the FM 236/4 series of Linear-Phase Electronic Crossovers began in June 1986. All field reports are thrilling: e.g. one client phoned a few days after he received his pair of FM 236/4-4L and enthusiastically reported that investing in these units really paid off. He remarked that the FM 236/4 saved him a planned purchase of additional speakers and amplifiers in the region of US$ 40'OOO.OQ! Just by replacing his previous crossovers with the new FM 236/4-4L, he realized a dramatic distortion reduction and achieved between 3 and 7 dB higher sound pressure levels (depending on frequency-band) from the same p-a. system. Considering the additional savings thanks to reduced equipment requirements, increased product lifetime, much lower transport and stagehand costs etc., his enthusiasm is quite under

standable! Around the world test reports on the FM 236 series of crossovers confirm above-mentioned findings.
The phenomenon of distortion reduction/SPL increase was initially detected when crossovers from other manufacturers were compared to the original stereo-2-way version of the FM 236, but this effect was not easily explainable at that time. Once the FM 236 was installed a remarkable reduction in distortion was observed in every installation. This effect was fully attributed to the transparency and clarity of FM ACOUSTICS unique circuitry, rather than to any specific characteristic of the units. The logical explanation for the SPL increases was duly discovered when FM ACOUSTICS' engineers came up with the idea of comparing a driver's diaphragm excursion versus frequency when using various filter types. At a given SPL a driver's voice-coil/diaphragm excursion quadruples for each octave of lower frequency. Therefore, a high-pass filter must have a continually increasing attenuation slope toward lower frequencies. The frequencies that push a diaphragm/voice-coil out of its linear excursion are not the ones directly below the crossover point, but those at least an octave below and lower. It is at those frequencies that an optimal filter must have highest attenuation. This is not the case with standard filter types. If such a standard filter having a steep attenuation just below the crossover point is used (such as a high-order Butterworth or Chebyshev filter), then high overshoot, ringing and still not high enough attenuation at the really critical lower frequencies must be accepted. Fig. 1 shows the diaphragm excursion in relation to frequency of a typical first order 6dB/octave filter, an 18dB/octave Butterworth filter and the proprietary filter circuits used in the FM 236 series of crossovers. When using FM ACOUSTICS' unique filters, the reduced excursion results in greatly lowered distortion and much reduced load on the driver. At 1/4 of the normalised frequency the difference in attenuation is a dramatic 30dB in case of the 6dB/octave filter or lOdB in case of the third order Butterworth filter! The driver can actually handle much higher signal levels from the amplifier which results in strongly reduced distortion at the same SPL. As the thermal power handling capability of today's drivers is very high, the limitation of low electrical power handling is no longer a problem. In almost all situations it is the linear excursion limitation together with the overshoot problems that are the restricting factors. This explains why in practical system installations SPL increases between 2dB and 8dB have been reported, or at a given SPL a corresponding dramatic distortion reduction can be achieved! The result is higher headroom, reduced non-linearities and distortion as well as total freedom from overshoot and ringing! With a low-pass filter the situation is similar. The low-frequency speaker

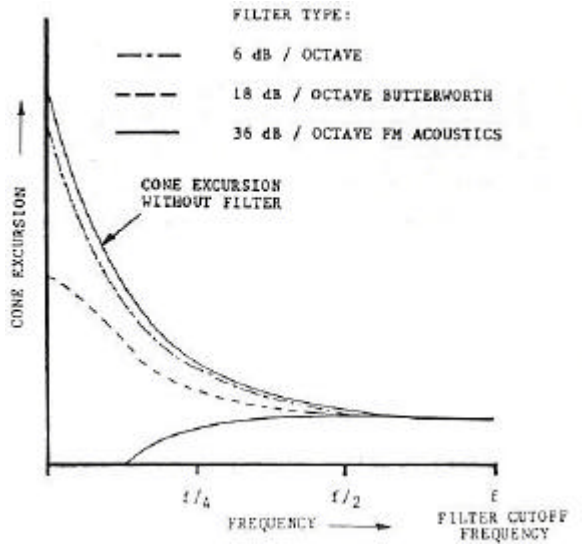


Fig. 1: Diaphragm excursion vs. normalised frequency of various filter types

should radiate as little mid- or high frequencies as possible to avoid cone distortion and breakup, beaming and lobbing, phase problems and a multitude of other aberrations. For more detailed information ask for a reprint of: "Electronic crossovers: Design and application". Sound and Video Contractor, April 1987.

Some of the world's most advanced and accurate loudspeakers are also some of the most difficult loads for an amplifier. Amongst those are many electrostatics such as the Dayton-Wright, the Acoustats, the Quad Electrostatics, many higher class dynamic speakers such as B&W 801 and 808, many of the Infinity range such as the 4.5, RS1 and IRS, the Apogee's and other ribbon based speakers and most studio monitors as well. Research into the amplifier behaviour with such loads has led to the development of special versions of the FM 600A and the FM 800A which feature unique drive capability to lowest impedances. Using dynamic material, the "LI" (Low Impedance) versions of the FM 600A and FM 800A can drive down to 1.5 Ohms without any limiting, compression or other negative influence on the signal. However, some of the above-mentioned loudspeakers resemble a dynamic impedance equal to or even less than 1 Ohm! This requires an incredibly high output current capability, absolute stability and an ultra-fast high-current, lowest impedance power supply. In FM ACOUSTICS power amplifiers these are inherent design criteria. For such complex loads the "ULI" (Ultra-Low Impedance) versions are recommended. The "ULI" versions of the FM 600A and FM 800A are able to drive the most critical loudspeakers with absolute accuracy. Actual tests in top class recording studios, leading concert halls and demanding domestic systems produce superb results. Even the relatively small FM 300A is capable of driving the above-mentioned difficult loudspeaker loads perfectly and with astounding transparency. It is obvious that the FM 600A and FM800A provide a higher dynamic range. With impedance-critical loudspeakers the special versions of the FM 600A and FM 800A produce absolutely astonishing results. You owe it to yourself to audition them if you own loudspeakers presenting the amplifier with a difficult load.

TECHNICAL TIPS

A factor that is generally underestimated is the power requirement of FM ACOUSTICS amplifiers. An amplifier is a servo system and can only provide clean high power levels if the mains supply is capable of delivering the necessary current without restrictions. FM ACOUSTICS amplifiers require considerably higher current than usual amplifiers:
when operating at high power into complex loads a monophonic FM 1000 can draw peak currents in excess of 40A from a 220V mains supply (corresponding to about 80A with a 117V mains supply)! The continuous currents will obviously be lower but the amp will easily draw 10A (at 220V) or 20A (at 117V) continuous when driven hard. This must be taken into account when selecting stabilizers and transformers, otherwise it is impossible to extract full performance from FM ACOUSTICS power amplifiers. Such factors must also be observed in A-B tests, otherwise false test results are obtained!

Please note the following recommendations **on** input connection. Despite the fact that they are explained in detail in the instruction manuals, reports of faulty installations are still received.

a) Groundlift switch: In 99% of all installations and certainly in all studio applications the groundlift switch must be in the lift position. Despite the fact that the groundlift switch is secured to the lift position with an angle, some installers removed the angles and pushed the switch into the non-lift position. This obviously can result in groundloops with all their consequences (for details see FM ACOUSTICS Technical Bulletin No: 5 "Grounding Rules" that is included with every instruction manual. Make sure that the groundlift switch is in the lift position! In the latest models the groundlift switch is either fixed in the lift position or completely removed because of these repeated installation faults. In all FM ACOUSTICS equipment the chassis has no connection with electrical (system) ground.

b) In almost all cases the third (earth) wire on the mains plug must be connected, as without this the chassis has no shielding function (see Technical Bulletin No: 5)

c) Since the proceeding equipment will be earthed in practically all cases (in recording studios often at

the mixing console) the shield of the connecting cable must not be connected to Pin 1 on both XLR connectors. Only connect the shield to Pin 1 at the end of the proceeding equipment

For non-inverting operation connect the XLR as *follows:*

Mixing desk/preceding equipment	Amplifier
From balanced output	
Pin 1-Ground (shield)	Pin 1= **NOT** connected
Pin2=Cold	Pin2= Cold
Pin3=Hot	Pin3=Hot
From unbalanced output	
Pin 1 = Ground (shield)	Pin 1= **NOT** connected
Pin 2= Not connected	Pin2=Cold
Pin3= Hot	Pin3=Hot

Please note that the input sensitivity of all amplifiers has been changed to the +6dB standard used in professional equipment. If new units are combined with older FM ACOUSTICS amplifiers this must be taken into consideration. The level of the older units must be reduced accordingly to obtain the same input sensitivity.

It is understandable that customers want to listen to their FM ACOUSTICS immediately upon receipt. However, it is not correct to just connect the unit and switch on. During a single week two clients reported disappointing reproduction quality and both blamed the FM ACOUSTICS amplifier respectively crossover the true cause found in a recording studio was out of phase wiring of the input cables. The culprit in the second case was a design fault of the british-made electronic crossover used in a PA-system: all outputs of one channel are wired out of phase with the other channel! It is rather astonishing that such a fault that results in inferior performance remains unnoticed in a manufacturer's design as well as production and final test departments (and this even after hundreds of units have been sold!). "Professional" is a word used much too often and for far too many at best mediocre products.... FM ACOUSTICS units must be carefully interfaced with true high-quality equipment to obtain optimum performance. Take the few additional minutes to carefully check all wiring and components (see Technical Bulletins) before switching on and drawing quick conclusions!

Talking about embarrassment:

A recent review of a New Zealand-made high power amplifier contained an amusing statement While the manufacturer's data-sheet quotes an output current capability of "30A continuous" the review indicated that there are line fuses for the DC supply voltage with "a value of 8A with a 15A blow rating". This is a remarkably bold effort to try to mislead clients. An 8A fuse will blow at 8A (plus/ minus a small tolerance). It may stand 15A for a second or so but the manufacturer would have to perform quite a miracle to pass continuous current of 30A through an 8A fuse! The above-mentioned power amplifier was quoted to deliver 1000 W RMS into 4 Ohms per channel. It will not be able to deliver anywhere near this figure because of its internal 8A fuses. Such specifications are unfair as they are strongly misleading the end-user. Recently the same company advertised the unit with a heading: "Warning: This amplifier is capable of delivering 4000 Watts RMS Instantaneous Peak Power" (whatever "RMS Instantaneous Peak Power" means...)! So much for truth in advertising.

The wattage rating of a power amplifier has - contrary to some statements - nothing to do with the accuracy of sound reproduction. In many A-B comparisons the FM 300A outperformed other power amplifiers rated up to 3 (three) times higher than the FM 300A with much better transparency and - astonishingly for many who thought this impossible - a tighter, more extensive and powerful bass. In several situations it produced higher distortion free sound pressure levels than these amplifiers, which - theoretically - should achieve much higher SPL's than the smaller FM 300A. This unique characteristic is intrinsic to all FM ACOUSTICS power amp lifiers. Therefore one must be careful when comparing data-sheets. One can find a variety of similar unrealistic statements such as the one by a German amplifier manufacturer the data sheet for his amplifier states an output power of "2x250W continuous into 4 Ohms" at an "electrical efficiency of 58%" (which means a power transformer delivering at least 862W is required). The single toroidial power transformer used in this amplifier carries a rating of 400W...

FM ACOUSTICS has no intention to criticize or judge other products, however it is important, that professionals are kept aware of such misleading information.

REFERENCES

In Japan an ever increasing number of studios are replacing their monitoring amplifiers with FM ACOUSTICS precision power amplifiers. Sound City Studio* of Tokyo report fabulous reproduction in all of their studios where three FM 801 have been installed. Freedom Studios, Hitokuchizaka Studios and Taihci Studios, all in Tokyo, also purchased

FM 1000 Ultra-High Power Amplifier, the absolute State of the Art

several FM ACOUSTICS Precision High-Power amplifiers and report major improvements over their previous amplifiers. After extensive listening tests and evaluations. Pioneer Electronics Corp. also decided to buy FM ACOUSTICS power amps for their reference laboratory where the TAD professional product lines are developed, tested and auditioned. "Japanese professionals are very quality conscious. Absolute accuracy, naturalness of reproduction and reliability are of prime importance" reports Manuel Huber after returning from Tokyo. "A hand-crafted product like ours that uses very advanced technology and provides the ultimate in fidelity results in a higher price than normally associated with audio electronics. But Japanese professionals are aware of the fact that you always get what you pay for! Initial price is not of prime concern to them. Accuracy and top performance is what really counts. Dedicated people in audio have never been more careful about their choice of amplifiers. They know precisely how much an accurate power amplifier helps to improve the performance of today's monitor systems and how this ultimately affects the studio's reputation. If perfect results are to be obtained, the whole monitoring system must be right and not just the speakers! The remarkable differences between various types of amplifiers, crossovers and other electronic circuitry are very audible and the Japanese are amongst the first to have recognized these facts. Here compromises are just not acceptable and ultimate performance is demanded. It fits the philosophy of FM ACOUSTICS 100%.

The following telex from Bill Foster of London's prime digital mastering suite 'Tape One' was received recently: 'To cope with the demands of digital recording, the latest generation of control rooms offer noise floors far lower than ever before. This places increasing demands on both acoustics and monitoring systems. To compliment Tape One's new Tom Hidley designed disc mastering room the choice of amplifier had to be FM ACOUSTICS. Our engineers are delighted with both smooth response and lack of colouration offered by the FM 800A series of amplifiers and when our new CD preparation suite opens you can be sure that it will again be an FM ACOUSTICS amplifier driving the monitors."

Recently famous producers and engineers gathered together at the new Sound Stage studios in Nashville for a comparison of monitor amplifiers. Famous studio designer Tom Hidley was present and so were top MCA producer Jimmy Bowen, Glenn Meadows of Masterfonics studios together with various other leading figures of the Nashville music scene. Without exception all who were present agreed on the outcome of the test. Jimmy Bowen's comment reflects the results of this trial best: After hearing the FM 1000's he stated: "Well, we have no choice, have we?" Although Sound Stage had just bought new power amps a few weeks before, the FM 1000's were purchased on the spot. Just ten days later another order for a pair of FM 1000's for Back Stage, the second room at Sound Stage, followed. A couple of weeks later another comparison took place in Masterfonics much talked about Tom Hidley 110m2 20 Hz control room. The results were identical. Even promoters of competing amplifiers agreed that the FM ACOUSTICS clearly outperformed all the competition. Following these trials Masterfonics ordered 3 FM 1000's and 3 FM 801's for their rooms. Other Nashville studios quickly followed.

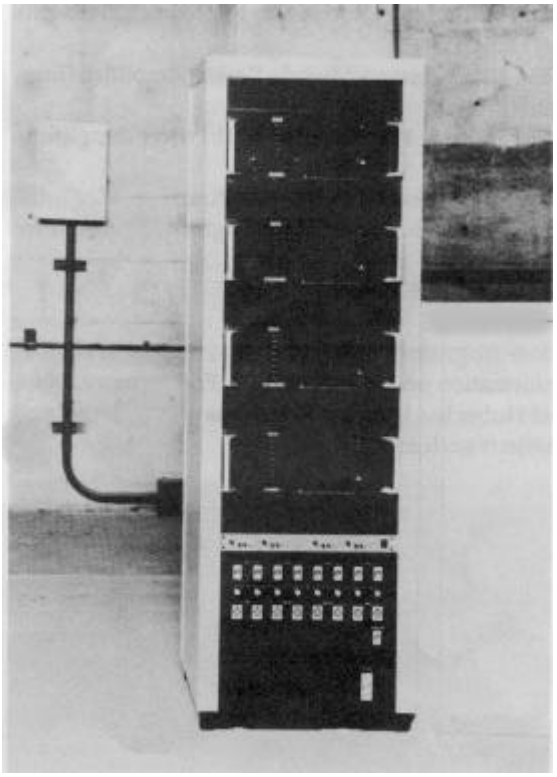

The new Tom Hidley designed 110m^2 Masterphonics 20Hz control room

After extensive trials of various products and 12 months use in his brandnew Million Pound studios, world famous producer Steve Levine expressed his feelings about FM ACOUSTICS power amps: "They are simply the world's best power amplifiers! There is no other unit that compares with them-1 will not work with anything else." Steve Levine uses an FM 300A to drive a pair of Westlakes BBSM 4 monitors and an FM 801 Precision High Power Amplifier for the BBSM 12's.

From a Yugoslavian audiophile the following letter was received: "I own several pre-preamplifiers (including Cotter, Datakustik, PS Audio and Audionote), but I was not quite satisfied with them. After many long hours of listening (at my friend M. Djonlic, who has a complete line of FM ACOUSTICS electronics), I found that the FM 212A is the absolutely best moving coil pre-preamplifier and decided to buy an FM 212A. My friend M. Djonlic and I also compared further FM ACOUSTICS components with some others, including Mark Levinson, Treshold, Nairn, Krell, RG and some esoteric tube products and we found that FM ACOUSTICS was definitely superior to all." T. Solarov, Yugoslavia

CONTRACTS

More than 20'000 Watts of FM ACOUSTICS power amplifiers were acquired by the prestigious Sun Plaza Hall in Tokyo termed as Japan's premiere concert hall. As the amplifiers had to be located as close to the speakers as possible (which are suspended from the ceiling and lowered with lifts), special versions of FM 600A and FM 800A power amplifiers were manufactured for Sun Plaza: an additional 5-way cable is run from each amplifier to the control room where level display and indicators for each individual amplifier are located on a special display panel. This way the level fed to each amplifier can be monitored directly from the mixing desk. The amplifiers were installed directly above the speakers to minimise the distance to the speakers. Sun Plaza decided to install FM ACOUSTICS amplifiers after extensive comparisons. Before, various P.A. systems had been evaluated in controlled listening tests combined with measurements. Responsible for the sound at Sun Plaza are Messrs: A. Nakanishi, K. Hashimoto and Mr. Kimura. They mentioned that they selected FM ACOUSTICS power amplifiers because of their outstanding performance and remarked that the audible difference to other amplifiers was so astonishing that no other power amplifiers could be considered. This second major success of Unicus International, FM ACOUSTICS' Japanese distributor, came shortly after they had won the sound systems comparison of the Japan Audio Society with FM ACOUSTICS power amplifiers. At those comparisons the Unicus system left competing systems way behind. It was at this comparison of the Japan Audio Society that the outstanding performance of FM ACOUSTICS amplifiers was demonstrated in Japan for the first time.



FM. 600A and FM 800A power amplifiers installed in Sun Plaza Hall, Tokyo

Interior view of Sun Plaza concert hall, Tokyo

LITERATURE

Is your documentation on FM ACOUSTICS complete?

Currently the following data-sheets are available:

-Folder (English)
-Short-Info on full line (English)
-Short-Info on full line (German)
-FM 212 A Reference Moving-coil preamplifier (English)
-FM 214 Precision Balanced Line Driver & FM 216 Precision Line Level Interface (English)
-FM 236 Linear-Phase Electronic Crossovers (English)
-FM 236/4 Linear-Phase Electronic Crossovers (English)

- FM 240 Thermo-Quad A-Stage Reference Preamplifier (English)
- FM 300A Thermo-Module Power Amplifier (English)
- FM 600A & FM 800A Series n Power Amplifiers (English)
- FM 801 Precision High Power Amplifier (English)
- FM 1000 Monophonic Ultra-High Power Amplifier (English)
- FORCELINES (English)

FM 236/4 *Linear-Phase Electronic Crossover*

More magazines are publishing editorial and other information on FM ACOUSTICS. Furthermore, Manuel Huber has been asked to write articles on several subjects such as:

-Important Aspects of professional power amplifiers" Studio Sound, November 198 Reprints of above are available free of charge

-"Electronic crossovers: Design and application" Sound and Video Contractor, April 1987

-"Aspects of professional power amplifiers" Audio Technology Yearbook 1987"

-“Important Aspects of professional power amplifiers" Studio Sound, November 198 Reprints of above are available free of charge.

The following list shows other documentation that is available from FM ACOUSTICS. Write for your personal free copy.

- Reference List
- Interesting comments and excepts of letters received from clients
- "Concert Sound in Tokyo", Description of Installation of Sun Plaza Hall Tokyo in Sound & Video Contractor, November 1985 (English)
- "La Filosofia di un Mito", Interview with Manuel Huber in Show Meeting, March 87 (Italian)
- "Unterschiede der verschiedenen Versionen der FM 600A/800A Endstufen und deren Erkennung" (German)
- Technical Bulletins: (all in English)

No. 1: "The amplifier-monitor interface and its importance to sound quality"

No. 2: "The advantages of individual transistor analyses in State of the Art circuitry"

No. 3 Revision 2: "Recommended combinations of FM ACOUSTICS' power amplifiers with various studio monitors"

No. 4: "Precautions" (supplied with every FM ACOUSTICS product)

No. 5: "Grounding Rules" (supplied with every FM ACOUSTICS product) No. 6: "Important aspects, hints and tips" No. 8. Revision 2: "Using the FM 236 in combination with Infinity IRS and RS1B loudspeakers"

FM ACOUSTICS LTD, Seestr. 5a, CH-8810 Horgen , Switzerland,
Phone: +41 1/725 77 77 Facsimile: +41 1/725 77 90