

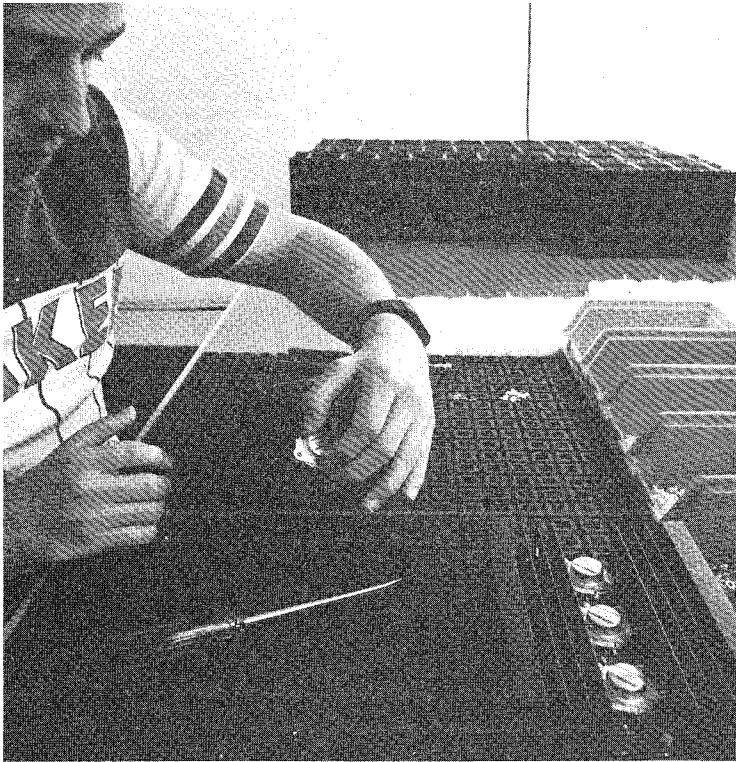
FM ACOUSTICS LTD, 8820 WÄDENSWIL, SWITZERLAND

This folder has been printed to give you an idea of FM ACOUSTICS' philosophy, their products, the differences in standards and the way of manufacturing.

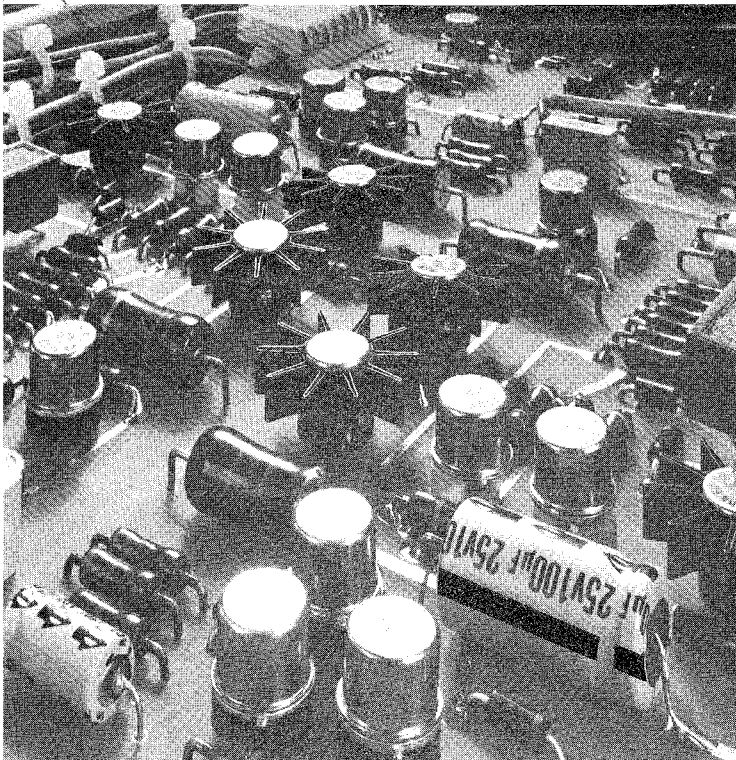
Some steps in the making of an FM 600A power amplifier are shown below.

Selecting power transistors: The reliability of a product stands or falls with the quality of its components. Have a look inside an FM Acoustics and you will immediately realise the difference. Only the best components from the world's leading manufacturers are used despite the higher cost.

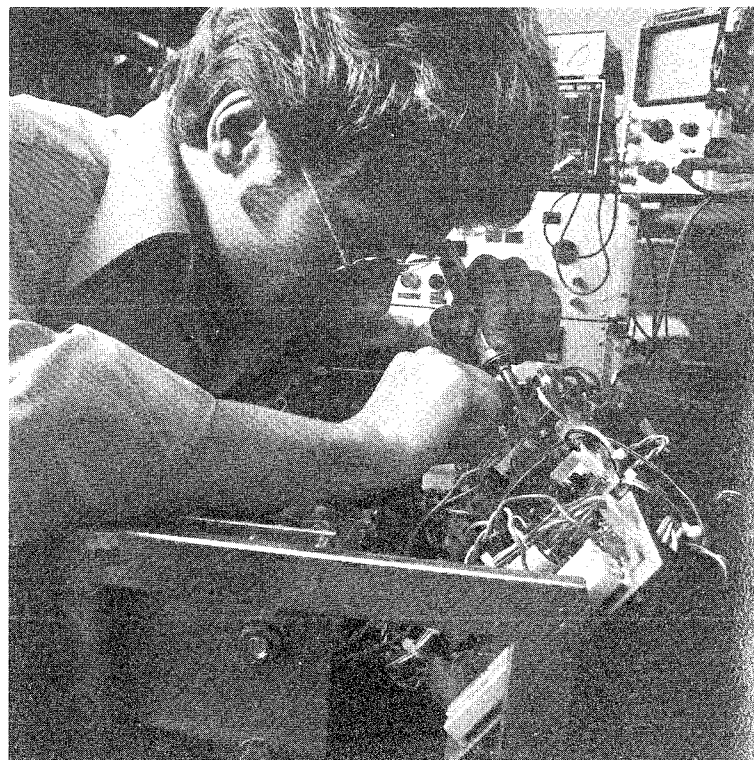
Each and every component is checked at the supplier's factory, then checked again as soon as it arrives at the FM factory. After this all active devices go through a test set where different parameters are measured and the components are matched and colour coded.



Mounting power transistors on cooling fins: Power transistors are specially manufactured for FM Acoustics as there is no «standard» transistor available that handles the extreme requirements of voltage, current, linearity and speed. All power transistors are additionally checked on a curve tracer at low and high temperature and different voltage and current levels. After this and other selections the transistors are carefully mounted by hand on the custom extruded cooling fins with torque-sensitive tools. Later the transistors as well as the insulation between each transistor and the cooling fin are measured with a specially built testing machine.



Hand-soldered audio circuit: The individual parts are assembled and each section like control print, peak reading led display, power supply, audio stages etc. undergoes a function test. Then the different sections are mounted together and the product goes to a first calibration test.

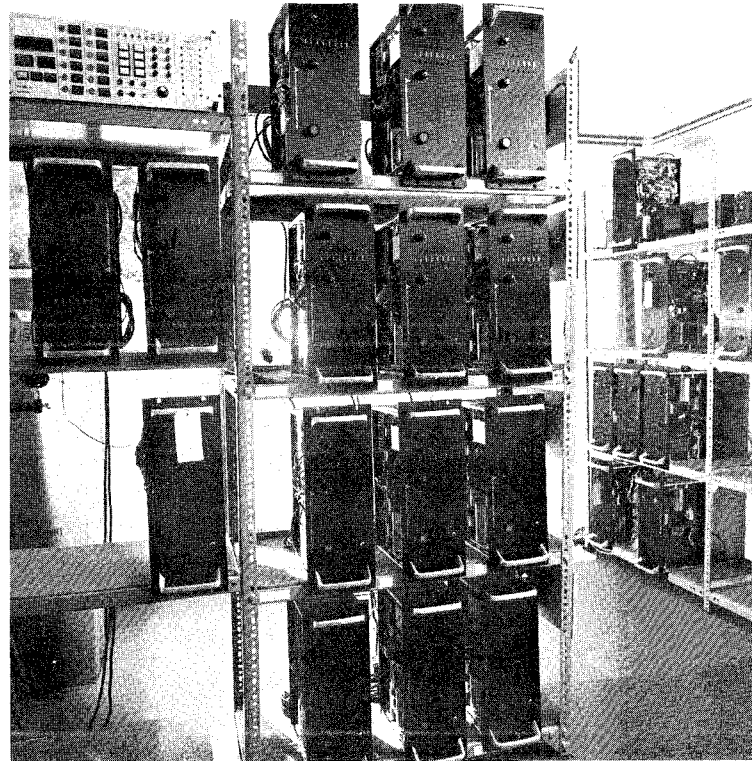


Calibrating an FM 600A: The assembled amplifier is then transferred to the test bench where each amplifier is individually calibrated and compensated. Dozens of different parameters have to be measured by means of the most advanced testing facilities and specially built testing machines. The typical final testing time of a power amplifier amounts to five hours. After everything is o.k. the amplifier is moved into the specially built burn-in room.

Amplifiers in the fully automated burn-in room: A specially built burn-in machine controls up to 12 amplifiers at the same time. The amplifiers are thermally cycled by varying power levels, cycle times etc. Temperature in the burn-in room is usually around 40°C, so that the amplifiers are strained harder than in any practical application. Every 5, 10 or 20 minutes the amplifiers are allowed to run on their quiescent current for a few minutes so that there are continuous temperature differences in all components.

The amplifiers are burnt-in for at least 50 hours continuously with a minimum of 200 thermal cycles. After this the amplifiers are placed on a vibration table for 2 hours, so that all mechanical and electronic parts are also stressed to levels far above any normal operation mode.

These are some of the reasons that the failure rate of FM products is between 3 and 10 times lower than those of the world's other leading manufacturers,



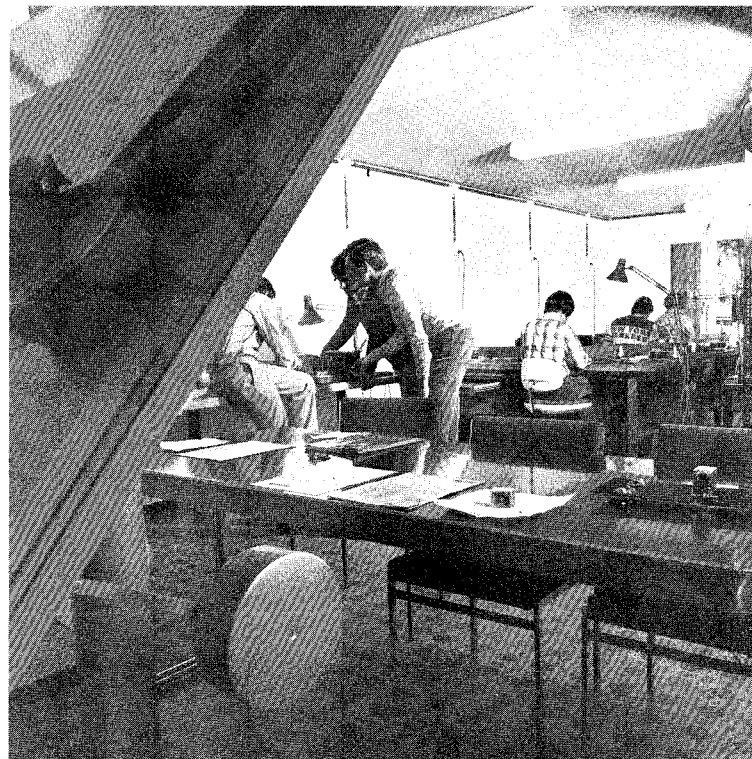
Final Test: The amplifiers are moved back to the test bench where the final test is performed. All parameters that have been measured at the calibration test are checked again and hand-entered in the instruction manual that is delivered with each product. After this final test the amplifiers are again inspected mechanically and then carefully packed.

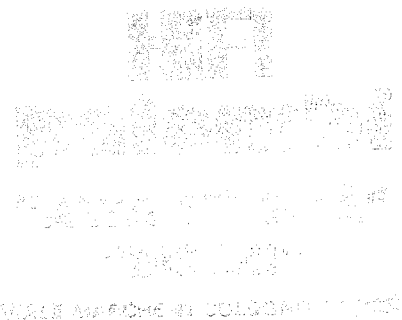
Because every product is fully handmade the quantities that can be built are extremely limited (e.g. the maximum quantity of FM 800's that can be manufactured in one year is 400 pieces!). This of course is another reinsurance that quality is unmatched, as other manufacturers have to divide their care to ten-thousands and hundred-thousands of units. The difference can be seen, felt and heard.

New product development: There are different ways of planning and introducing a new product. Most of today's consumer and commercial products are 3-month developments, the reasons for this being time-pressure and a fashion that is constantly changing.

A new FM Acoustics product does take a long time (most customers say it's much too long) until it is introduced. However this philosophy guarantees that the product provides a top performance right from the beginning. Furthermore such a product remains on top over many years (the FM 800A introduced in 1976 has not yet been rivalled by any other power amplifier) and should be regarded more as a long term investment (the average lifetime expectancy is over 20 years) than a typical consumer product. This philosophy is also manifested by the people who possess an FM Acoustics product, people who do not need fancy knobs and frontpanels, people who work professionally with the product or have a serious dedication, people who believe in the old tradition of hand craftsmanship rather than «fast and efficient» assembly lines.

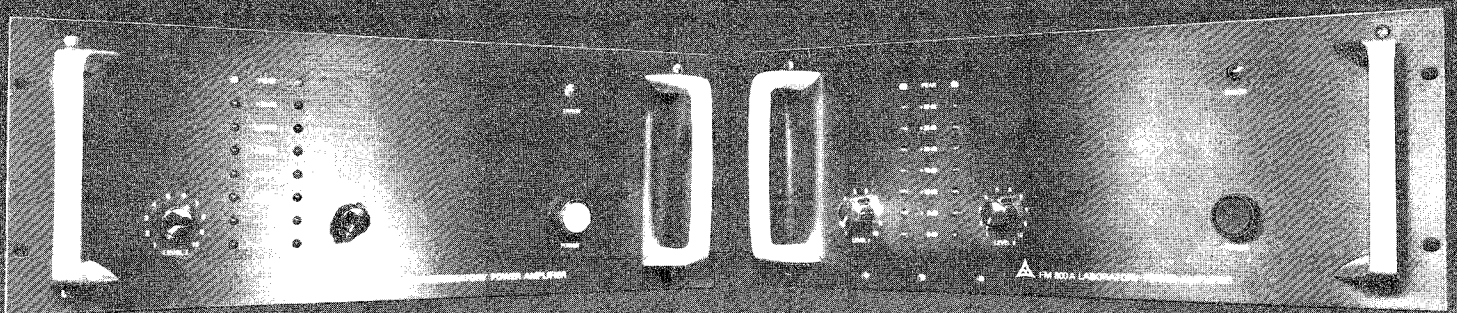
There is no need to explain that such a way of production must be considerably more expensive than usual ways and this is the reason that an FM Acoustics will cost more at the initial stage than products with similar specification. But nothing can be compared to the enthusiasm, pride and involvement that go into each product that carries the name FM Acoustics.





FM ACOUSTICS LTD, 8820 WÄDENSWIL, SWITZERLAND

# FM 600A & FM 800A POWER AMPLIFIERS SERIES II



- SUPERB SOUND QUALITY
- UTMOST STABILITY WITH REAL-WORLD LOADS
- TEN PROTECTION SYSTEMS FOR LOAD AND AMPLIFIER
- HIGH-SPEED LED LEVEL INDICATORS
- MADE OUT OF SELECTED MIL AND COMPUTER GRADE COMPONENTS ONLY
- UNMATCHED LONG TERM RELIABILITY
- COMPLETELY HAND ASSEMBLED IN LIMITED QUANTITIES

**FM ACOUSTICS LTD, 8820 WÄDENSWIL, SWITZERLAND**

Today there are many high-power amplifiers available that have certain advantages and certain drawbacks. Almost all are designed for a price or for certain specifications but the engineers at FM ACOUSTICS did not have such pressures and took great care that in the design of the FM 600A and FM 800A power amplifiers no detail was overlooked nor were compromises accepted. The amplifiers advantages lie not just in superb specifications but in the way they reproduce sound with an unmatched naturalness, the exclusive components that are used, the extreme care during assembly tuning and final test, the rugged mechanical design and their long-term stability. They have been in production since 1976 with little modification and when used with appropriate high-quality equipment have outperformed any other known power amplifier in the most critical applications providing superb natural sound and unmatched reliability.

## FEATURES:

Both amplifiers have the same features, same printed circuit boards and components. The only difference is that the FM 800A has a larger power transformer, more output devices and a low-noise dual-speed fan.

### FM 600A: Sophisticated convection cooling:

The FM 600A uses large black anodized aluminium extrusions as heat-sinks that are directly mounted on the rear-panel and tightly connected to the whole chassis cover and front-panel which altogether radiate heat very efficiently. This guarantees that the power amplifier stands up well to continuous long-term use in heavy-duty professional applications.

### FM 800A: Dual-speed forced-air cooling system:

The higher output capacity of the FM 800A requires increased air-flow. The heart of the FM 800A is its rubber-suspended direct-blowing dual-speed forced-air cooling system. This exclusive design achieves superb thermal stability and extremely low thermal stress, which results in a tremendous increase in long-term reliability. At continuous full power operation into 8 Ohms for 24 hours the FM 800A reaches 39°C only. (All other designs will either not stand this or operate at around 100°C.)

### Temperature Stability:

Sensors on power transistors, forced-air cooling system and power transformer individually measure temperature and automatically control the dual-speed fan on the FM 800A. The highest temperature before the sensors activate is a conservative 80°C and not 100°C or 120°C which other manufacturers allow. Therefore the transistors work in a safe area with plenty of reserve. Unlike amplifiers using power Mosfets the transistors in the FM 600A and FM 800A do not reduce the current capability with increasing temperature. They deliver the same output current at all temperatures from -25°C to +80°C which guarantees that no dynamic compression and power limiting occur at high temperatures, a weakness of many other designs.

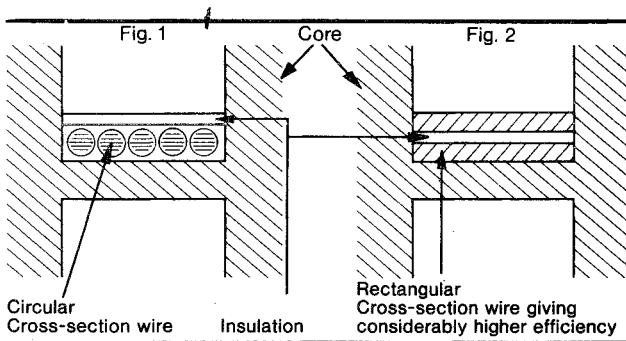
### Delayed turn-on:

A special delayed turn-on circuit is used to protect the load from thumps and transients. Within 5 seconds after switch-on the amplifier has completely stabilised and the speakers are connected without transients.

### Overdesigned Power supply:

Extremely powerful mains transformers with a continuous rating of 1000 W (FM 600A) and 2500 W (FM 800A) made of special high-efficiency steel are used to reduce the weight of the amplifiers and to guarantee continuous full power capacity with extremely low distortion. Three (3) individual bridge rectifiers with a current rating of 50 A are used for absolute accuracy and dependability. Furthermore the transformers are designed to work noiseless on 50 Hz and 60 Hz supplies. Instead of one smaller standard power transformer per channel (which would be cheaper) FM ACOUSTICS are using one over-designed power transformer for both channels while crosstalk is minimised by special techniques. This results in better dynamics with music material.

To further reduce the size and weight of the transformer FM ACOUSTICS are using a new type of transformer winding. Figure 1 shows a cross-section of a conventionally wound transformer. Figure 2 shows the special rectangular foil which is used to decrease space requirements and increase stability at high current levels. Because of this transformer stability, the amplifiers will provide much higher output levels under music conditions than their rated power might suggest and, in fact, the amplifiers have considerably more dynamics and sound tighter than competing amplifiers with similar and even higher power ratings.



### Protection:

The amplifiers contain ten (10) different protection systems per channel, six of which are electronic and four of which are by fuses. These protect the amplifier and the load against all possible damages:

1. Delayed turn-on circuit to protect loudspeakers.
2. Short-time and continuous open-circuit protection (this protection will not shut down amplifier).
3. Short-time and continuous short-circuit protection (this protection will not shut down amplifier).
4. Special first stage circuit acts as input protection (this protection will not shut down amplifier).
5. Protection against thermal overload and failure of forced-air cooling system (protection will shut down amplifier temporarily and reset automatically).
6. Protection of loudspeakers and amplifier against DC-offset with separate systems for + and - DC-offset (protection will shut down amplifier. Manual resetting required.)
7. Special superfast acting fuses against extreme high-frequency overloads and/or instability of preceding equipment (protection will shut down amplifier. Fuse must be replaced before resetting.)
8. Separate fuse for fan on FM 800A. (Fuse must be replaced before resetting.)
9. Separate fuse for electronic protection systems. (Fuse must be replaced before resetting.)
10. Primary side mains power fuse. (Fuse will shut down amplifier completely. Return amplifier for service.)

These protection systems guarantee that in real-world fault situations the amplifier will not be damaged by misuse and that it will protect the loudspeakers from dangerous DC voltages and HF oscillations that could damage them within seconds. The protection systems are not just simple crowbar circuits that short-circuit the power supply as this results in greatly reduced capacitor and rectifier life and always requires manual resetting. They are either complex individual circuits or easy to replace fuses and each one of them is designed specifically for its special application.

**Error Indicator:**

The Error indicator on the frontpanel will light should the temperature rise above 80° C and the amplifier will reset automatically after about 1 minute. The Error indicator will also light if a DC voltage appears on the output or if any of the fuses of other protection circuits blew. If the Error indicator lights the loudspeakers are immediately disconnected from the amplifier for protection.

**Stereo or mono operation:**

A stereo-mono switch on the rear-panel of the FM 800A converts the amplifier instantly from a two-channel stereo amplifier to two mono amplifiers which are ideally suited to drive large arrays of loudspeakers. The amplifiers cannot be connected in bridge mode as – despite the contrary claims of many other manufacturers – neither these nor any other amplifiers can be made absolutely stable in a bridged mode when working into real-world impedances. Bridging an amplifier always results in a degrading of sound quality and this is not acceptable for FM ACOUSTICS.

**Led level indicators:**

Studio-type high speed led-arrays are used as level indicators instead of fragile VU meters which are much too easily damaged. Every led has its own precision comparator for accurate peak level indication. Unlike other led-arrays the leds in the FM ACOUSTICS are undamped and have an extremely fast attack and decay time. This allows one to see system difficulties like instabilities, oscillations, excessive tonearm resonances etc. that cannot be seen on other led indicators.

**Stability:**

The amplifiers are able to drive all currently available loudspeakers, even highly reactive electrostatic systems while remaining stable. They are also capable of driving inductive loads such as servo motors, shake tables etc. They are designed for 4–100 Ohm systems, but can drive down to 2 Ohms and above 100 Ohms without difficulties. For lower impedances than 2 Ohms there are special versions available. It is extremely important that the preceding equipment has an output impedance according to the studio standard (600 Ohms or lower) as otherwise it is not possible to realise best performance. The same applies to stability of preceding equipment. Before working with a system always check the complete set-up with an oscilloscope for any instabilities or anomalies.

**Sound quality:**

When auditioning the FM ACOUSTICS 600A & 800A you should always compare to the original natural sound (attend some concerts then ask your dealer to lend you an FM ACOUSTICS for a few days to use at home in your set-up). To achieve optimal results it is absolutely necessary to use the most natural sounding components available. The best performance will be achieved when using the FM 240 reference preamplifier and if necessary the FM 212A MC prepreamplifier. They have absolute compatibility with all existing cartridges and can drive any number of power amplifiers with absolute stability and naturalness. Do not just make your decisions upon a few hours listening and comparing in a dealers showroom as the reference is live sound and not any other component. While realising that words cannot describe sound quality satisfactorily and while realising that the FM 600A's and the FM 800A's advantages vary in strenght depending on the associated components there are still some remarkable differences when comparing to other power amplifiers. One immediately realises the accurate depth reproduction while transients have superb dynamic range and detail but lack the forward projection that many transistor amplifiers produce. The FM ACOUSTICS are devoid of another weakness of currently available amplifiers, the loss in imaging and depth on quiet or loud passages. Middle frequency reproduction is without equal and outperforms even today's tube designs without having their inherent colouration. Low bass is considerably extended and tightened up. A similar frequency-range extension can be found in the top octaves. The reason for these improvements lie partly in the circuitry (the amplifiers work in class A most of the time) but one of the most important reasons is that each transistor is tested and

selected for four different parameters into many colour-coded groups and that only transistors with the same codes are used in each stage. Furthermore each amplification stage is tuned to optimum performance during the calibration test. This care is very time consuming and expensive (sometimes 70–80% of the expensive high-voltage transistors must be rejected) but it is the only way to guarantee this kind of sound quality, no unit to unit variability and utmost reliability.

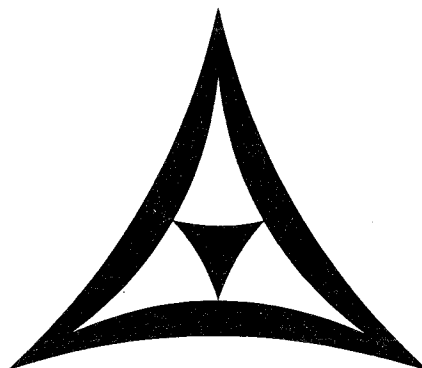
We encourage you to listen carefully under closely controlled conditions for an extended period using the best and most natural sounding components (only very few tube preamplifiers will give satisfactory results). Then you will be able to realise the potential of the FM 600A and FM 800A.

**Reliability:**

For a product used in extreme professional applications reliability is sometimes the most important parameter. Both amplifiers are currently used in very demanding applications from Norway to South Africa all over the world. Therefore the parts used in the FM ACOUSTICS are extremely over-dimensioned to guarantee long-term stability: you will find only 1% tolerance precision metal-film resistors, the capacitors are expensive computer types, the audio circuitry uses only selected special high-voltage, high-speed metal can transistors, the power transistors (300 V, 30 A, 9 MHz) are specially manufactured for FM ACOUSTICS, the long-life precision potentiometers are dust- and waterproof, the frontpanel is not just printed as usual but negatively anodised so that signs and numbers will never peel off etc. There is no other amplifier available that is made out of such superb components. Have a look inside an FM ACOUSTICS and you will immediately realise the difference.

**Superb craftsmanship:**

Before the assembly starts every component is checked. Then all hand-soldered PC boards are checked visually and electronically. After this each FM ACOUSTICS amplifier is completely hand-assembled by experienced Swiss craftsmen. Then each amplifier is tuned to optimum performance, is calibrated and a first final test including all measurements is performed. Led arrays, fan low- and high-speed operation, DC sensor operation, all protection circuitry etc. are tested and power, distortion, noise etc. are measured. Then every amplifier is burnt-in for at least 50 hours under worst-case conditions. Then each amplifier goes onto a shake table for two hours. When it comes back to the test bench all curves and data must be exactly the same as before. If they are the same the data are entered in the instruction manual. If the data changed the amplifier is left on the burn-in until it fails and then the reason for this difference and failure is analysed. This results in an unmatched reliability and long-term stability. Because of this extreme care the FM ACOUSTICS power amplifiers can only be made in small quantities.



# Specifications

Unfortunately specifications have been misused and misunderstood considerably during the last years. From unrealistic power ratings to distortion ratings at 1 KHz only (the ear is more sensitive to distortion at lower frequencies) specifications were mainly used to sell a product. Many trustful customers were disappointed when they realised that specifications were misleading them.

For instance almost all manufacturers quote slew rates either with no measurement details or at the unrealistic level of 1 W into 8 Ohms or so and are therefore able to quote very impressive slew rates. At FM ACOUSTICS we quote slew rate at full power -3 dB into any recommended load which is certainly much harder and honest than the good-looking 1 W rating of other manufacturers. Another example is power rating where you will find differences of up to 300% for similar power am-

plifiers. FM ACOUSTICS have decided to quote honest minimum specifications instead of the much used «typical» specifications. Two power ratings are quoted: one for the output power into a given impedance when both channels are driven by a musical signal or tone bursts (the normal application) and a second extremely conservative 100 hours power rating that will provide data for worst-case operation using any continuous sine-wave frequency in the audio band at low, medium or high ambient temperature and at very low distortion.

Please observe such differences if you want to compare to other specification sheets. However specifications alone will not tell you much about the true value for a certain component. They are here to give you some idea of what the product can be expected to do when used with some other component.

		<b>FM 600A</b>	<b>FM 800A</b>
<b>Power output:</b>	with mixed musical signal or tone bursts 4:4 both channels driven, per channel:	250 W RMS into 8 Ohms 350 W RMS into 4 Ohms 400 W RMS into 2 Ohms (2 Ohms with special version)	400 W RMS into 8 Ohms 600 W RMS into 4 Ohms 850 W RMS into 2 Ohms
	100 hours operation using continuous sine waves in the audio band at low distortion both channels driven:	150 W RMS into 8 Ohms 250 W RMS into 4 Ohms	300 W RMS into 8 Ohms 400 W RMS into 4 Ohms
<b>Distortion:</b>	typical distortion in mid-frequency band at rated power:	0,008% THD somewhat higher at very low and very high frequencies	0,007% THD
<b>Slew Rate:</b>	at rated power - 3 dB into rated impedance:	25 V/usec	25 V/usec
<b>Damping factor:</b>	at middle frequencies:	greater than 500	greater than 800
<b>Hum and Noise:</b>	below full power typical:	105 dB	110 dB
	minimal unweighted:	90 dB	95 dB
<b>Frequency response:</b>	at levels up to 50 W RMS:	5 Hz-300 KHz - 3 dB	5 Hz-300 KHz - 3 dB
<b>Input sensitivity:</b>	into 4 Ohms at rated power:	0,9 V RMS	0,8 V RMS
<b>Input Impedance:</b>	at all level settings:	4-5 KOhm depending on level	4-5 KOhm depending on level
<b>Load Impedance:</b>	designed for:	4-100 Ohm systems	2-100 Ohm systems
	can drive down to: special version for low impedance:	2.5 Ohms available down to 1 Ohm	1 Ohm
<b>Stability:</b>	stable with all loads including transformer coupled electrostatic loudspeakers		
<b>Average life expectancy:</b>	at 25° C ambient, medium power, 10 hours per day, 365 days per year:	22 years	28 years
<b>AC Voltage selector:</b>		110/120/220/230 V	110/120/130/220/230/240 V
<b>Max. Overvoltage:</b>	short-term, not on switch-on:	180% V nominal	180% V nominal
	long-term, including switch-on:	135% V nominal	125% V nominal
<b>Power consumption:</b>	at idle:	100 W	250 W
	at 30% power:	700 W	900 W
	at full power:	1200 W	2500 W
<b>Led indicators:</b>	undamped, peak-reading, calibrated in dBV above 0 dB (0,775 V) into 8 Ohms:	200 W RMS	Peak
		70 W RMS	+ 30 dB
		7 W RMS	+ 20 dB
		0,7 W RMS	+ 10 dB
		0,07 W RMS	0 dB
		300 W RMS	
		100 W RMS	
		10 W RMS	
		1 W RMS	
		0,1 W RMS	
<b>Connectors:</b>	Input:	self-locking, 3-pin XLR type, Pin 1 = Ground, Pin 3 = Signal	
	Output:	5-way binding posts	
	AC line:	3-wire (grounded) cable	
<b>Weight:</b>		19 kgs net, 20 kgs packed	29 kgs net, 30 kgs packed
<b>Dimensions:</b>	for standard 19" rack mount	483 mm wide, 177 mm high, 330 mm deep (incl. handles)	483 mm wide, 177 mm high, 360 mm deep (incl. handles)
<b>Application:</b>	recommended for uses such as:	studio monitoring, P.A., laboratory, industrial	studio monitoring, heavy-duty P.A., laboratory, industrial

Continuous research is done by FM ACOUSTICS LTD and they will improve their products if possible. Therefore specifications are subject to be changed from time to time.