



*KORA*  
HIGH FIDELITY

TECHNICAL INFORMATION

Here are some technical information about the Kora amplifiers using our patented SQUARE TUBE innovation. Reading them will allow you to make the most out of your device.

Kora high fidelity devices are designed and built by electronics technology professionals. Kora's teams are also involved in the high-precision instrumentation field for civil, aeronautical and military measurement laboratories. The criteria for choosing specific schematics and components meet the same requirements.

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# I. SQUARE TUBE

The Square Tube device is a new way of assembling electronic tubes to amplify an audio signal. Square Tube is a registered trademark.

The **SQUARE TUBE** is the result of a long process of R&D. Tubes – old technology – are used in a totally modern way. <sup>(1)</sup>

Four tubes are used to make a single amplification stage, hence the name! The **SQUARE TUBE** «outputs» a symmetrical signal with respect to the reference (earth). In other words, the signal goes alternately in the field of positive voltages (to push the diaphragm of the loudspeaker) and in the field of negative voltages (to pull the diaphragm). This unique capacity with vacuum tubes makes it particularly suitable for the design of audio amplifiers.

In your Kora amplifier, the **SQUARE TUBE** provides all the functions of amplification and control of the audio signal. At the output stage of the **SQUARE TUBE**, the signal is identical to the one which is input to the speakers. Complementary power transistors, audio and hyper-linear <sup>(2)</sup> will give the current required by the speakers, but without interfering in the amplification of the signal. <sup>(3)</sup>

We are definitely talking about a tube amplifier here!

1. The circuitry is organized around a differential stage, inherently symmetrical, and an output stage which could be related to an OTL push-pull. The set constitutes a complete operational amp, «passing» the direct current. «Passing the DC» is not interesting acoustically. On the other hand, this characteristic allows the assembly **SQUARE TUBE** to be self-stable, and to keep the perfect polarization of the lamps independent of the external elements, the temperature and the effects of time. And this guarantees you always the same operation, with constant quality listening.

2. Linear from 10mA to 10A, exceptional thanks to ON Semiconductors™!

3. They are mounted in a “voltage follower mode”, so with a gain slightly lower than 1.

The operation of the **SQUARE TUBE** is very sophisticated.

The point of operation of the tubes are imposed to them. For input triodes, the current flowing through them is determined by a “quasi current source”.<sup>(1)</sup>

In the same way, the currents in the «output» tubes are fixed by reference voltages. The currents in the tubes are much lower than their rated current. This is a will of its design engineer. This guarantees an exceptional lifetime for these components.

The **SQUARE TUBE** is powered by two high regulated voltages. One positive and the other negative.

Regarding the heating and to scrupulously respect the specifications of the tubes, the filaments are powered by a «floating» mode through small modules called «DC-DC». All tubes are heated in direct current (except for TB140 output tubes).

1. Two mA are injected in the two cathodes, an than each input tube must work with one milli amps, regardless of its brand or specifications!



## > Why does Square Tube present this set of usually incompatible auditory qualities ?

> The **SQUARE TUBE** is a tube amplifier. Tubes have a small amount of amplification, but they do it very well. They are generally more linear than transistors. To compensate for their low gain, the **SQUARE TUBE** uses 4 of them for each single stage.

> The **SQUARE TUBE** is powered between 400 and 500Volts depending on the model. This supply voltage corresponds to an amplifier of 2500Watts or more, under  $8\Omega$  (do not forget that the output voltage of the **SQUARE TUBE** is the one applied to the loudspeaker outputs!). On this tension of 400 or 500V, we use 20% when the amplifier is at its maximum. Regarding the capacity of 2500W, we exploit a few percent... In other words: the amplifier is always in «its comfort zone» and never operates near its limits.

**Last remark:** the **SQUARE TUBE** is not a transistor amplifier preceded by tubes, it is a tube amplifier assisted by transistors.

This structure makes it possible to preserve the sound qualities of the tubes and to avoid current limitations of the power tubes. It also avoids the use of an output transformer, with its phase rotations problematics...

Without current limitation, your amplifier can drive more “tightly” the loudspeakers, which explains the very good performance of the low frequency – but always without emphasis – and the limitless dynamics!<sup>(1)</sup>

1. Another advantage of the technology is also very visible on the ability of the amplifier to drive capacitive loads. Square signal's behavior on a test load made up with a capacitor of  $2.2\mu\text{F}$  placed in parallel with a resistance of  $8\text{Ohms}$  is simply remarkable. This also explains the good performance of the amplifier with speakers equipped with so said «demanding» filters!

## II. LISTENING

The Square Tube is characterized by some striking effects:

> **A great precision** on the localization of the instruments, with the greatest respect of the tone colors.

> **An enlargement** of the sound stage, in width, but also in depth. We also often notice a feeling of gain of the sound image in height.

> The sound image is **absolutely stable**.

> **An excellent dynamic**, which has nothing to envy to the best transistor amplifiers.

> **A great softness** providing a natural listening, absolutely not tiring, even at high level and which has nothing to envy to the best tube amplifiers.

> **The signal is rich** and detailed, precisely shaped. The cymbals find a purely analog sound (you should discover a lot of unsuspected details in your music collection).

> With unrestricted current capacity, the bass speakers are firmly driven, giving **an ample bass**, always controlled, and free of disastrous harmonics (the “boom-boom”). You will have the feeling of gaining an octave down the spectrum.

> Ability to transcribe the musical message, whichever its complexity is. Instruments and voices are reproduced with aeration. They seem cut out, without halo. They benefit from a **great readability**.

### III. TECHNOLOGIES

Some precisions...

#### > Sector

Your device is designed to operate at a rated main voltage in the range of +7 and -10%. In order to get the best out of the disturbances present on the sector, your Kora is equipped with a double filter input.

A first filter processes the so-called «common mode» noise (between the earth and the two neutral and phase wires), a second circuit filters the so-called «differential mode» disturbances (between neutral and phase). Always use a good quality power cord, plugged into a proper installation!

The output power available on the speaker terminals is directly dependent on the mains voltage. We draw your attention to the fact that an increase of the sector of 10% leads to an available power of more than 20% at the output. Your Kora amplifier has a huge current capacity: it will not falter! Therefore, always be very careful if you use low-power speakers. The natural sound is that with your Kora amplifier, you will listen at a higher level than usual...



## > Speaker output protection

For the power section, the Kora amplifier has a generously dimensioned “double mono” power supply, with – depending on the model – one or two toroidal transformer(s).

The output transistors are powered by as many fuses as transistors.<sup>(1)</sup> The fuses used are far below the limits of the transistors, so as to actually provide protection against mishandling.

A resettable circuit “disconnects” the output transistor which would end up without a fuse. The DC output voltage is thus kept close to zero, to protect the speakers. As a result, the amplifier continues to operate, but with reduced current capacity. Distortions can appear on strong signals.

This is a degraded mode to avoid the risk of failures in series. In this case it is necessary to bring your amplifier to a professional for control.

1. The fuses are placed in the collectors of the transistors, a so-called «high impedance» zone, so the non-linearities of fuses have no effect on the signal.

## > Pre-charge of power supplies

The Kora range is equipped with generously sized power supplies. Positive thermal coefficient power resistors work as limiter to inrush current at power on. This avoids overloading unnecessarily the filtering capacitors which are essential power reservoirs to ensure a good functioning.

These components draw their performance to a thin film of aluminum oxide. To preserve this precious film, Kora power supplies are equipped with a device which will instill very gently, and for a few minutes, a slight current in order to permanently maintain a residual voltage (of the order of 80% the nominal value) at the capacitor's terminals. Once they are pre-loaded, the current is canceled.

First advantage: maintained in this way, the lifetime of the components can be counted in decades, while maintaining their characteristics.

Second advantage: in the starter mode, the capacitors are close to their operation voltage, the inrush current will be indeed reduced.

**We draw your attention to this point: dangerous voltages are present in the device. Do not open it under any circumstances, even after several hours disconnected from the mains power.**

## > Voltage monitoring

A microcontroller constantly monitors the important supply voltage of the amplifier, the tubes outputs and the loudspeakers outputs.

The **SQUARE TUBE** is a tube amplifier. This technology is characterized by “passing DC”. During the warming process, the output voltage is uncontrolled, as a tube warms up always faster than his neighbor. As long as the resulting tension is not stabilized at a corresponding value<sup>(1)</sup>, the **SQUARE TUBE** is disconnected from the output transistors.

| 1. Less than 1 Volt in general

An identical phenomenon occurs while setting Standby. A tube cools faster than the other, the output transistors are, in this case too, disconnected from the tubes.

If the correct voltage is not reached after the normal heating delay, a message reports the problem. No signal is transmitted to the outputs.

If a DC voltage appears on the speaker output terminals, the amplifier is placed in Stand-by mode and an alert message appears.

## > Polarization of output transistors

To avoid sending the speakers a completely useless, even harmful DC current, the output voltage is constantly monitored and held close to 0 by a dedicated circuit. <sup>(1)</sup>This circuit is not involved in the amplification chain and has no effect on the audio signal.

The Kora amplifier works in class A/B. The Zero signal current <sup>(2)</sup> is thermally stabilized in a traditional way. The output transistors being only «Followers» of the **SQUARE TUBE** output stage, the bias circuit is powered by a small floating power supply.

Some floating power supply (tube warming, Zero signal current) are generated by small modules called «DC-DC» operating at a very high frequency, above 100 kHz. Examining the output signal at the oscilloscope can reveal traces of these oscillators. This is far beyond the technical capabilities of the speakers and of our ears, and therefore has no influence on the musical signal.

| 1. Less than 50 mV.

| 2. Approximately 30 mA per transistor.



## IV. DESIGN ON A GENERAL LEVEL

In addition to a very elaborate schematic, the design of your Kora follows simple precepts: to make a quality product, satisfying on the musical level, of course, but also giving this pleasure of listening for many years.

The components are precisely chosen, calculated and selected in the professional ranges. Operating points are determined far from limits, which will ensure the longevity of the device.

All Kora devices are built in a modular way. Each function is provided by an independent electronic board, easy to replace in case of failure. Each card uses easy sourcing components. Service will be always possible, even in a few decades...

Discover our technologies: [www.kora.fr](http://www.kora.fr)  
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KORA HIGH FIDELITY S.A.S.U.  
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Your device was designed and manufactured in France, in the beautiful Occitanie region. Kora thanks her for her key supporting role.



[www.kora.fr](http://www.kora.fr)