

THÖRESS

300B Single-Ended Triode Mono Power Amplifier

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"SE300B Mono"



INSTRUCTION MANUAL

Thank you for purchasing the THÖRESS SE300B Mono Power Amplifier!

Our SE300B Monoblock has been tailored around the highly regarded 300B power triode in single-ended zero-feedback operation mode for an output of up to 10 watts into a 4, 8 or 16 ohm load. The amplifier is built with meticulous hand construction using our proven point-to-point hard wiring techniques. Much care has been taken in arranging each aspect of the internal construction to ensure low noise performance, ease of service and the highest reliability for many years to come. Please read the following explanations and instructions carefully to get the most out of your SE300B amplifiers.

CATHODE POINT BALANCE

The 300B power triode is a filamentary tube (FT) with a weakly glowing 5V/1.2A filament developed by the Western Electric corporation in the early times of vacuum technology. Its filament consists of a coated thoriated tungsten wire mounted with spring suspensions to mica plates pressed into the glass envelope. The electrons which constitute the anode current are emitted by the glowing wire itself (directly) and not by a dedicate cathode emission pipe insulated from the filament as in case of the much more widely used indirectly heated vacuum tubes. So the anode current flows through the filament wire concomitantly with the heater current!

FTs require a specific cathode point implementation outside the vacuum envelope in order to separate the signal current from the subsidiary heater current!

In the inception of vacuum technology (when semiconductor rectifiers were not in existence) FTs were AC heated with the aid of dedicated winding on the associated mains transformer whereas a M/IDLE T/AP of the heater winding served as a cathode point of the tube (**ACMT cathode point implementation**). In our monoblock the 300B is DC heated whereas the cathode point is implemented as junction of a two-resistor (R+R) voltage divider connected in parallel with the filament, bypassed with a balance potentiometer (BALPOT) mounted on the rear panel of the amplifier. We call this arrangement **DCRR cathode point implementation**. The BALPOT allows

to balance the cathode point with respect to the filament of each individual 300B power tube. Once the cathode point balance has been tuned-in with the BALPOT, the signal current is distributed evenly over the filament wire and residual hum due to heater voltage ripple vanishes (reaches a minimum). Notably, a filamentary tube can develop optimal performance only when it is operated in the context of an accurately balanced cathode point!

Thoroughly balance the cathode point of the L+R amplifier with respect to the filament of the individual 300B power tube with the BALPOT in the way described in the SETUP section of this manual!

Check the L+R amplifier for optimal cathode point balance from time to time and finely tune the balance if necessary!

Re-balance the cathode points of the L+R amplifier after changing the 300B power tube!

The grid bias voltage $U_g(\text{DCRR})$ for a given 300B tube under DCRR cathode point implementation is 2.5V lower (approximately half the heater voltage) than the bias voltage $U_g(\text{ACMT})$ of the same tube under ACMT conditions when the tube is exposed to an arbitrary pair (U_a , I_a) of anode voltage U_a and anode current I_a ,

$$U_g(\text{DCRR}) = U_g(\text{ACMT}) (-) 2.5\text{V}.$$

$U_g(\text{DCRR})$ is the actual voltage between the control grid terminal of the 300B tube and the tuned cathode point, including the small offset voltage developed over the grid leak resistor due to residual grid current flow. It is important to take this **bias shift** into account when making reference to the characteristics of the ideal/average 300B tube as given by the original Western Electric data sheets!

300B OPERATION CONDITIONS

According to the Western Electric data sheets (January 1950) the ideal/average 300B is supposed to draw an anode current of $I_a=65\text{mA}=0.065\text{A}$ when it is exposed to a grid-bias voltage of $U_g(\text{ACMT})=(-)93\text{V}$ and an anode voltage of $U_a=425\text{V}$, subject to ACMT cathode point implementation. This is an excellent operation point for single-ended class-A operation which we have chosen for the 300B tube in our amplifier! Corresponding to a plate dissipation $P_a=28$ watts, $28\text{W}=425\text{V}\times 0.065\text{A}$ well below the permissible design maximum of 35W,

$$(U_g(\text{ACMT}), U_a, I_a, P_a) = ((-)93\text{V}, 425\text{V}, 65\text{mA}, 28\text{W}).$$

Taking into account the bias shift due to different cathode point scenarios $U_g(\text{DCRR})=U_g(\text{ACMT})-2.5\text{V}=(-)(93\text{V}-2.5\text{V})=(-)90.5\text{V}$, the equivalent quiescent point under DCRR cathode point conditions is given by

$$\underline{(U_g(\text{DCRR}), U_a, I_a, P_a) = ((-)90.5\text{V}, 425\text{V}, 65\text{mA}, 28\text{W}).}$$

The grid, bias voltage of the 300B tube is factory preset to (-)90.5V and is not meant to get trimmed by the user in order to adjust the idle current!

This design choice makes it important to use 300B tubes with characteristics out of a specific tolerance window with respect to the ideal/average 300B tube. Allowing for a 10% tolerance, only 300B samples which draw an anode current

$I_a=59mA=65mA-6mA$ (Pa=28.5W) to $I_a=71mA=65mA+6mA$ (Pa=30W)

under DCRR conditions, subject to a $(U_g, U_a)=((-)90.5V, 425V)$ periphery are suitable for service in our SE300B Mono Amplifier! Therefore it is strongly advisable to exclusively use matched pairs of 300B tubes carefully selected to meet the above specs supplied by the manufacturer or a reliable vacuum tube supplier.

The use of 300B tubes with inadequate characteristics will lead to inferior sound quality (too low idle current!) or to a reduced lifespan of the 300B tube due to overheating (too high idle current!)

A carefully selected good quality 300B tube of current production is likely a better choice than a rare and expensive NOS part with questionable characteristics!

If there is any doubt that a given 300B tube fulfills the above requirements, the actual idle current I_a can be determined on the living object (indirectly, by ohms law) by measuring the voltage-drop U_d over the (known) winding resistance R_w of the output transformer primary winding, $I_a=U_d/R_w$ (after the cathode point of the amplifier has been accurately tuned).

Measurements within the SE300B amplifier circuitry should be carried out by an experienced technician only!

POWER TUBE MICROPHONY

Mechanical vibrations of the inner life of a vacuum tube modulate the anode current and are converted into signal, which may become audible under unfortunate condition. This effect, called tube microphony, is particularly pronounced with FTs because the freely suspended filament wire is able to swing rather easily. Therefore amplifiers employing FTs need more considerate placement than amplifiers featuring the more commonly used indirectly heated tubes in order to keep the wanted signal free of microphony artifacts. Tube microphony is especially critical when highly efficient loudspeakers are involved, for obvious reasons.

Place the Amplifier on a rigid rack, shelf or platform carefully decoupled from the floor in order to keep the signal free of noise artifacts due to tube microphony!

DRIVER TUBES

The SE300B mono amplifier employs a pair of EL822/CV2382 power tubes operated in triode mode at high idle current in the driver stage. The amplifier comes with a matched set of tubes which have been carefully selected to meet tight specifications with respect to the chosen quiescent operation conditions. When operated in triode mode (screen grid tied to the anode), the ideal/average EL822 tube is supposed to

primary versus secondary turns-ratio of the OPT is higher than the nominal index value. This reduces the voltage gain but also the harmonic distortion and the output resistance of the amplifier, at the sacrifice of a somewhat reduced maximum power output.

It can be beneficial to use a 16-ohm loudspeaker with OPT load pattern configured for 8-ohm or even 4-ohm, especially when the loudspeaker is highly efficient!

It is possible to use a 8-ohm loudspeaker with OPT load pattern configured for a 4-ohm load, especially when the loudspeaker is highly efficient!

On the other hand, a compromised performance is likely to be expected (from a single-ended triode amplifier) when the OPT is configured for a higher load impedance than the rated loudspeaker impedance!

It is not advisable to use a 4-ohm rated loudspeaker with OPT load pattern configured for a 8-ohm or even a 16-ohm load!

It is not advisable to use a 8-ohm rated loudspeaker with OPT load pattern configured for a 16-ohm load!

POWER AMPLIFIER GAIN

The SE300B mono amplifier has been specifically designed to have a moderate voltage gain (low input sensitivity). This design choice helps to avoid idle noise issues (and ensures conveniently fine volume adjustment) in a wide variety of setup scenarios.

Low voltage gain is a desirable feature of power amplifiers, particularly when the amplifiers are used to drive highly efficient loudspeakers!

As a matter of consequence it will be necessary to set the volume control knob (on the line device) to a somewhat higher than usual angle of rotation to achieve a saturated listening loudness, particularly when the amplifier is used to drive a loudspeaker with moderate to low efficiency.

FUSE

The SE300B Mono Amplifier draws a current of 0.325A/0.75A from the 230Vac/120Vac mains line corresponding to a power consumption of 75W. It is protected with a

1A/2A slow blowing 5x25mm fuse

locked in a drawer of the power inlet module. Very occasionally, the fuse may blow at the moment the amplifier is powered on due to the pronounced current spike drawn by the mains transformer of the amplifier in this instant. If this condition arises regularly it may be advisable to use a fuse with slightly higher current rating.

SETUP

To set up a pair of SE300B Mono Amplifiers power off all devices of the setup and proceed as follows.

Do not connect the amplifiers to mains power until steps 1 to 5 of the setup procedure have been taken. Do not connect the amplifiers to the preamplifier until steps 1 to 7 have been taken either.

1. Make sure that the power switch on the power inlet module is in OFF position on both mono blocks.
2. Bring the BALPOT into about the middle position on both units.
3. Install the all tubes carefully.

Filamentary tubes (FT) such as the 300B are fragile devices and must be handled with exceptional care!

Never switch on the amplifier until all tubes have been installed!

Never pull out a tube of the socket while the amplifier is powered on!

Never move or even transport a 300B power tube as long as it is still hot!

Always de-install all tubes and wrap them in their original protection case before shipping or transporting the amplifier!

4. Bring the amplifiers into their final position. Hereby take into account the notes made in the paragraph TUBE MICROPHONY of this manual. Make sure that there is sufficient clearance around the tubes to allow for adequate ventilation.

5. Connect the L+R amplifier to the L+R loudspeaker. Ascertain that the load jumper pattern for load matching installed on the OPT suits the nominal loudspeaker impedance. Take notice of the explanations given in this regard in the paragraph LOUDSPEAKER LOAD MATCHING of this manual.

6. Connect the L+R amplifier to mains power.

7. Balance the cathode point of the amplifiers with respect to the filament of the installed 300B tubes in the way described below.

Attentatively read the paragraph CATHODE POINT BALANCE of this manual. Power on the L-amplifier with input running at idle while the R-amplifier remains switched off. Wait for about one minute until the warm-up process has come to an end. Use the BALPOT located on the rear panel above the power inlet module to minimize the residual hum (caused by heater voltage ripple) re-given by the L-loudspeaker. Hereby it is important to observe the noise close to the woofer rather than at the listening position, with regard to room modes (specific areas in the auditory where the sound power distribution peaks or dips thanks to standing waves between pairs of room boundaries). Optimal cathode point balance has been attained when the humming noise vanishes (reaches a minimum). Power off the L-amplifier after the balancing procedure has been accomplished. Tune-in the cathode point balance on the R-monoblock in a similar manner, while the L-amplifier remains powered off. Power off the R-amplifier.

Check the amplifiers for correct cathode point balance from time to time and finely tune the balance if necessary!

Always re-balance the L+R amplifier after changing the 300B power tube!

8. Connect the L+R amplifier to the preamplifier.
9. Make sure that the volume control knob rests in zero position.
10. Power on the preamplifier and the program source(s) while the R+L power amplifier is still powered off. Wait until the warm-up process on these components has come to an end.
11. Complete the setup by powering on the L+R power amplifier.

Always power on the program sources and the preamplifier first and then switch on the power amplifiers, observing a delay of at least 30 seconds!

When powering off the system, always switch off the power amplifiers first, then switch off the other components of the system, observing a delay of at least 30 seconds!

Keep the original crates and tube protection cases for later use. They have been specifically designed for safe transport under rough conditions!

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THÖRESS...

**A Tribute to Professional Audio Components
from the Golden Age of the Vacuum Tube !**

