THÖRESS

300B Single-Ended Triode . Mono . Power Amplifier

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"SE300B Mono"

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INSTRUCTION MANUAL

Thank you for purchasing the THÖRESS SE300B Mono Power Amplifiers!

Our SE300B Monoblock has been tailored around the highly regarded 300B filamentary 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 Western Electric in the early times of vacuum technology. The filament of a 300B tube consists of a thin coated thoriated tungsten wire mounted with spring suspensions to mica supports pressed into the glass envelope. The electrons which constitute the anode current are emitted by the glowing wire itself (directly) and not by a cathode pipe insulated from the filament as in case of the more widely used indirectly heated tubes. Thus the anode current flows through the filament along 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 windings on the mains transformer whereas a M/IDLE T/AP of the winding served as cathode point (ACMT cathode point implementation). In our mono block the 300B tube is DC heated whereas the cathode point is given by the junction of a two-resistor (RR) voltage divider, bypassed with a balance potentiometer (BALPOT, mounted on the rear panel) connected in parallel with the filament. We call this arrangement DCRR cathode point implementation. The BALPOT allows to balance the cathode point of

the amplifier with respect to the filament of each individual 300B power tube in order to ensure equal current flow through both ends of the power tube filament. Optimal cathode point balance is attained when the hum disturbance induced in the wanted signal via residual ripple of the heater voltage vanishes (reaches a minimum).

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 tubes!

For a given setting of anode voltage and current, the grid bias voltage Ug(DCRR) of a given 300B tube under DCRR cathode point implementation is about 2.5V (that is half the heater supply voltage, 2.5V=5V/2) lower than the bias voltage Ug(ACMT) of the same tube under ACMT cathode point conditions,

Ug(DCRR) <-----> Ug(ACMT)-2.5V,

Notably, Ug(DCRR) is the actual voltage between the 300B control grid terminal and the DCRR cathode point under balanced conditions in the sense above (including the effects caused by residual grid current). 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 tube draws an anode current of Ia=65mA=0.065A when it is exposed to an anode voltage of Ua=425V and a grid-bias voltage of Ug(ACMT)=(-)93V 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 pa=28 watts, 28W=425VXx0.065A well below the permissible design maximum of 35W,

(Ug(ACMT), Ua, Ia, Pa) = ((-)93V, 425V, 65mA, 28W).

Taking into account the bias shift Ug(DCRR)=Ug(ACMT)-2.5V=(-)(93V-2.5V)(-)90.5V between the two different catode point scenarios the corresponding quiescent operation point under DCRR cathode point conditions is

(Ug(DCRR), Ua, Ia, Pa) = ((-)90.5V, 425V, 65mA, 28W)

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 300B tube. Allowing for a 10% tolerance, only tubes with an anode current

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

(under the given DCRR voltage conditions Ua=425V, Ug=(-)90.5V) are suitable for service in our amplifier. Accordingly, it is advisable to use only hand picked matched pairs of 300B tubes tested for the above specs supplied by the manufacturer or a reliable 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 doubt that a given 300B tube fulfills the above requirements, the actual idle current Ia can be determined indirectly (by ohms law) by measuring the voltage-drop Ud over the winding resistance Rw of the output transformer primary winding on the living object (after the 300B cathode point has been accurately balanced with respect to the filament), Ia=Ud/Rw.

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 modulate the anode current and such are to a small degree converted into noise artefacts which blur the wanted signal. This effect, called tube microphony, is particularly pronounced with FTs because the freely suspended filament wire is able to swing rather easily. Therefor amplifiers employing FTs need more considerate placement than amplifiers featuring 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 matched pair of EL822/CV2382 power pentodes operated in triode mode (screen grid tied to the anode) at high idle current in the driver stage. The amplifier comes with a set of 2x2 tubes which have been carefully hand-picked to meet tight specifications. When operated in triode

mode, the ideal /average CV2382 tube draws an anode current of Ia=40mA when it is exposed to an anode voltage of Ua=290Vdc and a control grid bias voltage of Ug1=(-)8.5Vdc,

(Ua, Ia, Ug1) = (290V, 40mA, (-)8.5V).

Allowing for a 10% tolerance in anode current only tubes with

Ia=36mA=40mA-4mA to Ia=44mA=40mA+4mA

(under the given voltage conditions Ua=290V, Ug1=(-)8.5V) are suitable for service in our the SE300B Mono Amplifier.

It is strongly advisable to use only carefully tested matched pairs of driver tubes as supplied by the manufacturer!

The use of driver tubes with questionable characteristics may lead to inferior sound quality and, in extreme cases, to damage in the driver circuit!

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

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

POWER AMPLIFIER GAIN

The SE300B mono amplifier has been specifically designed to have a moderate voltage gain (low input sensitivity). This design choice has two benefits. At first, the idle noise of the line amplifier remains in-audible even when the amplifier is used to drive a highly efficient loudspeaker, for example our 2CD12 model (or an even more efficient horn arrangement). Secondly, the volume control can be operated at a higher angle of rotation so as to allow for conveniently fine volume adjustment.

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

When the SE300B mono amplifiers are used to drive loudspeakers with moderate to low efficiency 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.

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 L+R amplifier to mains power until steps 1 to 5 have been taken.
Do not connect the L+R amplifier to the preamplifier until steps 1 to 8 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 2x3 tubes carefully.

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!

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

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 section 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 matching installed on the OPT suits the loudspeaker impedance. Take notice of the explanations given in the section LOUDSPEAKER LOAD MATCHING of this manual.
6. Connect the L+R amplifier to the mains.
7. Balance the cathode point of the L-channel monoblock with respect to the filament of the installed 300B tube in the way described below.
Power on the L-amplifier with open input (no cable connection) while the R-amplifier remains switched off. Wait for about one minute until the warm-up process on the amplifier has come to an end. Adjust the BALPOT (see CATHODE POINT BALANCE) while observing the residual hum re-given by the L-loudspeaker until the hum noise vanishes (reaches a minimum). Hereby it is important to monitor the noise at about 0.5m distance 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 (sound reflective) room boundaries, particularly opposite walls). Power off the L-amplifier after the cathode balancing procedure has been accomplished.
8. Balance the cathode point of the R-channel monoblock in a similar manner. Power off the R-amplifier after the balancing procedure has been completed.

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!

9. Connect the L+R amplifier to the preamplifier.
10. Make sure that the volume control knob rests in zero position.
11. 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.
12. 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!

LOUDSPEAKER LOAD MATCHING

The SE300B Mono Amplifier allows for precise 4, 8 and 16 ohm load matching by way of jumpers soldered to the secondary terminals of the output transformer (OPT) according to the patterns indicated below. Each of which pattern corresponds to a specific (primary versus secondary) turns ratio of the OPT.

4 ohm loudspeaker

Connect (1 and 2), (5, 6, 3 and 4), (7 and 8).

8 ohm Loudspeaker

Connect (2, 3 and 5), (4, 6 and 7).

16 ohm loudspeaker

Connect (2 and 5), (3 and 6) and (4 and 7).

Output Transformer Coil

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1 o o 5
2 o o 6
3 o o 7
4 o o 8

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o = secondary terminal, 1 = loudspeaker RED, 8 = loudspeaker BLACK

A single-ended triode amplifier can adequately drive a loudspeaker when the OPT is configured for a lower load impedance than the rated impedance of the loudspeaker, especially when the loudspeaker is highly efficient. In this case the (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 expense of a somewhat lower maximal power output.

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

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

On the other hand, a compromised amplifier performance is definitely to be expected when the OPT is configured for a higher load impedance than the rated loudspeaker impedance. Thus:

It is not advisable to use a 4 ohm rated loudspeaker on the 8 ohm or 16 ohm load pattern of the OPT!

It is not advisable to use a 8 ohm rated loudspeaker on the 16 ohm load pattern of the OPT!

FUSE

The SE300B Amplifier draws a current of 0.325A (0.75A) from the 230Vac (115Vac) mains corresponding to a power consumption of 75W. It is protected with a

1A slow blowing 5x25mm fuse

inside the power inlet module. Very occasionally, the fuse may blow at the moment the amplifier is powered on, (due to the current spikes drawn by the power transformer in this instant) especially when power cords with very low resistance are used with the amplifier. Should this problem arise more regularly it may be advisable to use a fuse with slightly higher current rating (2A/3A).