THÖRESS

845 Single-Ended Triode . Mono . Power Amplifier

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"SE845 Mono"

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I N S T R U C T I O N   M A N U A L

Thank you for purchasing the THÖRES SE845 Mono Power Amplifiers!

Our SE845 Monoblock has been tailored around the famous 845 filamentary power triode in single-ended (class-A) operation mode for an output of 20 watts into a 4, 8 or 16 ohm load. The amplifier is built with meticulous hand construction using our proven point-to-point 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 SE845 amplifier!

CATHODE POINT BALANCE

The 845 power triode is a filamentary tube (FT) with a brightly glowing 10V/3.25A filament which has been developed in the early times of vacuum technology. It consumes a considerable amount of heating power, 32.5W=10Vx3.25A. The filament of a FT consists of a thin thoriated tungsten wire mounted with spring suspensions to mica supports pressed into the glass envelope. The electrons which constitute the anode (cathode-to-plate) 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. 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**.IDDLE **T**.AP of the winding served as cathode point (**ACMT** cathode point implementation). In our mono block the 845 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 845 power tube in order to ensure equal current flow through both ends of the tube filament. Optimal cathode point balance is attained when the hum 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 845 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 845 power tubes!

For a given setting of anode voltage and current, the grid bias voltage Ug(DCRR) of a given 845 tube under DCRR cathode point implementation is about 5V (half the heater supply voltage, 5V=10V/2) lower than the grid bias voltage Ug(ACMT) of the same tube under ACMT cathode point conditions,

Ug(DCRR) <---> Ug(ACMT)-5V.

Notably, Ug(DCRR) is the actual voltage between the 845 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) 845 tube as given by the original Amperex or RCA data sheets.

845 OPERATION CONDITIONS

Under ACMT cathode point implementation the ideal (average) 845 tube draws an anode current of Ia=0.070A=70mA when it is exposed to an anode voltage of Ua=950V and a grid-bias voltage of Ug(ACMT)=(-)145V according to the original AMPEREX data sheets. This represents an excellent operation point for single-ended operation which we have chosen for the 845 tube in our amplifier. Corresponding to a plate dissipation Pa=67W=950Vx0.07A well below the permissible design maximum of 75W,

(Ug(ACMT), Ua, Ia, Pa) = ((-)145V, 950V, 70mA, 67W).

The corresponding quiescent operation point under DCRR cathode point implementation is

(Ug1(DCRR), Ua, Ia/Pa) = ((-)140V, 950V, 70mA, 67W),

Ug(DCRR)=(-)140V=(-)(145V-5V).

The grid bias voltage for the 845 tube is factory preset to (-)140V and is not meant to get

trimmed by the user in order to adjust the idle current of the power tube!

This design choice makes it especially important to use 845 tubes with characteristics out of a specific tolerance window. Allowing for a 10% tolerance in anode current with respect to the ideal 845 tube, only tubes with an anode current

63mA=70mA-7mA (Pa=60W) … 77mA=70mA+7mA (Pa=73W)

(under the given DCRR voltage conditions (950V, (-)140V)) are suitable for service in the amplifier. Thus, it is advisable to use only matched pairs of 845 tubes tested for the above specs supplied by the manufacturer or a reliable tube supplier.

The use of 845 tubes with inadequate characteristics will lead to inferior sound quality (idle current too low) or to a reduced lifespan of the 845 tube (idle current too high) due to overheating!

A carefully selected good quality 845 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 845 tube fulfills the above requirements, the actual idle current Ia can be determined indirectly (with the aid of 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 845 cathode point has been accurately balanced with respect to the filament), Ia=Ud/Rw.

Measurements within the SE845 amplifier circuitry should be carried out by an experienced technician only!

TUBE MICROPHONY

Mechanical vibrations of the inner life of a vacuum tube modulate the anode current and such are to a small degree converted into noise artifacts 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 SE845 Mono 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 SE845 amplifier employs matched pairs of CV2382 (EL822) power pentodes operated in triode mode (g2 tied to the anode, g3 connected to the cathode) at high idle current in the driver stage. The amplifier comes with a set of 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=290V and a control grid bias voltage of Ug1=(-)8.5V. Allowing for a 10% tolerance in anode current only tubes with

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

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

It is strongly advisable to use only carefully tested matched pairs of EL822 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!

POWER AMPLIFIER GAIN

The SE845 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 SE845 mono amplifiers are used to drive loudspeakers with moderate to low efficiency it will be necessary to set the volume control (on the line device) to a somewhat higher than usual angle of rotation to achieve a saturated listening loudness.

LOUDSPEAKER LOAD MATCHING

The SE845 Mono Amplifier allows for precise 4, 8 or 16 ohm loudspeaker load matching by way of jumpers soldered to the secondary terminals of the OPT according to the patterns given below. Each of which pattern corresponds to a specific (primary versus secondary) turns ratio of the OPT.

4 ohm loudspeaker

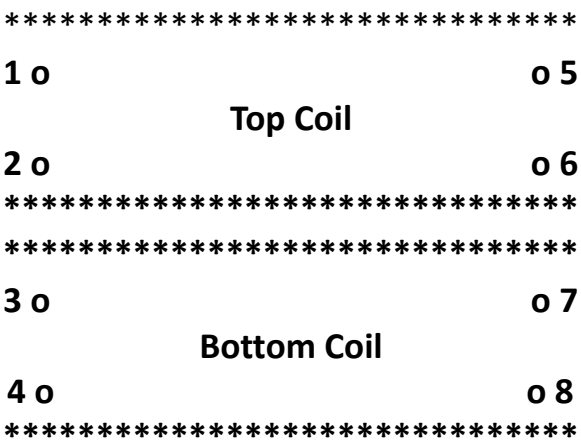
Connect (1 and 2) , (3 and 4) , (5, 6, 7 and 8).

8 ohm loudspeaker

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

16 ohm loudspeaker

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



o=secondary terminal, 2=speaker RED, 3=speaker 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 speaker is highly efficient!

It is possible to use a 8-ohm loudspeaker with the 4-ohm load pattern of the OPT, especially when the speaker 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 speaker on the 8-ohm or 16-ohm load pattern of the OPT!

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

FUSE

The SE845 mono amplifier draws a current of about 0.7/1.4A from the 230Vac/115Vac mains corresponding to a power consumption of 160W. It is protected with a

2A slow-blowing 5x25mm fuse

inside the power inlet module. Occasionally, the fuse may blow at the moment of

switching-on (due to the current spike drawn by the mains transformer in this instant). In case this condition arises more regularly it is advisable to use a fuse with a somewhat higher current rating.

SETUP

To set up a pair of SE845 Mono Amplifiers power off all devices of the setup and proceed as follows.
Do not connect the amplifiers to the mains until steps 1 to 5 have been taken!
Do not connect the amplifiers to the preamplifier until steps 1 to 8 have been taken!
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 middle position on both units.
3. Install the 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 845 are fragile devices and must be handled with exceptional care!

Never move or even transport a 845 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.
5. Connect the L+R amplifier to the L+R loudspeaker. Ascertain that the load matching installed on the output transformer suits the loudspeaker impedance. Take notice of the explanations presented in this regard 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-monoblock with respect to the filament of the installed 845 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. Observe the residual hum radiated by the L-loudspeaker and adjust the BALPOT of the L-amplifier (see paragraph CATHODE POINT BALANCE) until the hum noise vanishes (reaches a minimum). Hereby it is important to observe the noise at about 0.5m distance to the woofer(s) 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 with respect to the filament of the installed 845 tube 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 845 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 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 SE845 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!

FEATURE OVERVIEW

- All-Tube Mono Power Amplifier utilizing the famous filamentary 845 power triode in single-ended (class-A) operation mode.
- 20 watts of output power.
- Minimalist (pure class-A) zero-feedback schematic.
- Powerful single-stage driver utilizing two CV2382 (EL822) power pentodes operated in triode mode at high idle current.
- High grade electrolytic capacitors (made in Germany) in the power supply.
- C-core filter choke made in-house.
- Ultimate tape wound cut core (C-core) output transformer with dual-coil winding manufactured in-house.
- Precise 4, 8 and 16 ohm loudspeaker load matching by soldering jumpers setting to the secondary terminals of the output transformer.
- Low noise low leakage mains transformer produced in-house for 230Vac (115Vac via jumper setting), 100Vac (Japan), 120Vac (USA, Canada), 220Vac (South Korea, China, Thailand, Indonesia), 240Vac (UK) or 245 Vac (Australia).
- Full hand construction, point-to-point wiring throughout.
- Non-magnetic case (aluminium throughout), anodized printing on front and rear panel, powder-coated chassis and lids.

- Dimensions: 150x595xH330 mm,
  330=20/feet+210+150/tube over case,
  595=575+20/speaker terminals, weight 18 Kg (each monoblock).
- Dimensions of the shipping crate: 950x400xH460 mm.

THÖRESS...

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