

OCTAVE

RE 320

Owner's Manual

English

INTRODUCTION

Congratulations and thank you for choosing OCTAVE!

RE 320


You are now the owner of one of the world's most innovative and reliable amplifiers. Look after it, and it will provide you many years of listening pleasure.

You often hear people claim that tube amplifier design has not progressed for years. The operating principles of tubes have indeed been documented extensively and are well known to amplifier designers. Of course, the same can be said for transistor amplifiers.

However, advances in both technologies are still possible thanks to the development of innovative and improved components, our greater appreciation of the fundamental principles and, of course, deeper and more advanced insights into the interaction of amplifier and loudspeaker. With tube amplifiers in particular, a general reluctance to depart from the classic circuit designs has not done the technology any favors. Although today's loudspeakers and source equipment provide better performance than ever before, they also present greater demands on amplifiers. Modern sound reproduction equipment delivers a level of performance at a price that simply would not have been possible 20 or even 10 years ago.

These advances have been achieved through the application of the latest technological developments as they become available and affordable. OCTAVE has specialized in tube amplification for the past 30 years, during which time we have developed a number of innovative technologies that have earned us a reputation as one of the leaders in the field.

Here's wishing you many happy hours of musical pleasure!



Andreas Hofmann

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1. DESCRIPTION OF THE RE 320

The new **Octave RE 320** stereo power amplifier is designed to deliver 2 x 130 W RMS output power (into 4 ohms loads). Peak Output Power climbs up to 200 W per channel. As with all Octave models, all research and development (R&D) and production has been conducted exclusively in-house, and the amplifier is comprehensively safeguarded against user error and parts wear – including catastrophic power tube failure.

The **RE 320** is based on the stable and reliable SE technology of the MRE220 model, while incorporating the benefits of the recently-developed KT150 power tube.

SE Technology

The SE technology offers great improvements in the fine resolution, the dynamics and the microdistortions- often simplified described as noise

The KT150 allows an output power of more than 150 W with two tubes in push-pull mode, while its current capacity is higher compared to the classic KT88 tube designs. Increased stability with difficult, low impedance speakers is achieved through the increased bandwidth and OCTAVE's specially designed output and mains transformers. The average Output power of the RE 320 is limited to increase the stability and the lifetime of the tubes

The configuration of the output stage of the RE 320:
push pull pentode circuit, class A/B; negative grid voltage adjustable separate for each power tube through ten turn precision regulators. Special wideband output transformers using high efficient PMZ core.

BIAS Measurement

The RE 320 is fixed **BIAS**, and utilizes external precision BIAS trim pots and LED confirmation which allows the user to readily monitor the output tubes and simply correct their BIAS individually at the front panel of the unit without the need of a micrometer let alone any special knowledge or tools – just the supplied 3 mm flat-head screwdriver.

(Super) Black Box Option

The RE 320 is fitted with a connector for the optional Octave "**Black Box**" capacitance modules – available in normal and "Super" versions. The use of the Black Box or Super Black Box significantly increases power supply capacitance to stabilize current delivery and reduce impedance interaction of the load, thus improving dynamic range, separation, depth, soundstage size and articulation. This enables optimizing the RE 320 in respect to the speaker, which is a tremendous benefit if the speaker is difficult to drive.

Input Section

Unlike other designs, the RE 320 offers single ended RCA and true balanced XLR inputs with a very high common mode rejection ratio that eliminates unwanted hum and high frequency distortion induced in the small signal connection to the preamp

1. DESCRIPTION OF THE RE 320

- Power Management** The RE 320 input and output tube heaters as well as its high-voltage rails are logic-controlled to ensure that the conduction of the output tubes as well as the input stage voltages are constantly monitored and controlled by the **Power Management System**, which serves to protect the vital internal parts (tubes, rectifier, electrolytic caps, switches, etc.) against excessive turn-on current. This increases the lifetime of not only the tubes, but all power related components as each derives benefit through this system. The Power Management ensures stable operation even situations where the mains voltage is not stable
- Ecomode** The **Ecomode** serves to reduce heat and unnecessary power consumption when the unit is switched on but not in use. After 10 minutes without receiving signal, the RE 320 Ecomode is activated, turning down the power. In this “sleep” mode, the RE 320 draws only 20 W Idle current. Therefore, the unit produces no heat while it remains switched on. When a music signal is once again detected by the RE 320, the Ecomode circuit will power the unit back on, with a short warm-up/start-up delay (approximately 35 seconds) before the unit will operate.
- The Ecomode also serves to increase the lifetime of the tubes, while providing an added benefit of **increased safety** allowing the RE 320 owner a level of security against any problems when leaving the unit switched on.

2. SAFETY INSTRUCTIONS

2.1. Before you begin

2.1.1. In case of emergency: disconnect the plug from the mains supply

Never use an amplifier that is damaged or faulty. Make sure that it has been labeled as defective and that it cannot be used until it has been repaired by a qualified service engineer. Make sure that there is easy access to the IEC socket and power cable.

2.1.2- Do not open the case



There are dangerously high voltages and hot tubes inside this equipment. To avoid a burn or the risk of electric shock, never allow anyone except qualified personnel to open the case or remove the grill.

2.1.3. Service and maintenance

For reasons of safety, please ensure that servicing, repairs and other modifications to OCTAVE equipment are carried out only by a qualified technician. Defective fuses should also only be replaced by a qualified technician. Always replace fuses with ones of the same type and rating. If your amplifier requires servicing, please ship or take your equipment directly to OCTAVE or to one of our authorized service centers.

2.1.4. Symbols and terms used in warnings

The following warnings, symbols and terms are used in this document in compliance with the American National Standard ANSI Z535.6-2011:

	The general danger symbol, in conjunction with the terms CAUTION, WARNING, or DANGER, warns of the risk of severe injury.
	The triangle symbol with the lightning bolt warns of non-isolated, dangerous voltages inside the case and of hazards posed by electrical shocks. Follow all subsequent instructions to avoid injury or death.
ATTENTION	Indicates a danger that could lead to damage or destruction of the device.
CAUTION	Indicates a danger that represents a low or medium risk of injury.
WARNING	Indicates a danger that could lead to death or severe injury.
DANGER	Indicates a danger that will result in death or severe injury.

Warning format

 WARNING TERM
Type and source of danger
Consequences of ignoring the warning
▶ Action needed to avoid danger

2. SAFETY INSTRUCTIONS

2.1.5. Before connecting

Make sure that the voltage of your amplifier matches your local supply voltage.

2.1.6. Grounding / Earthing

This amplifier is a protection class 1 device, which is the operation with an earth conductor. As a result, a three-pin power cable with a protective ground contact must be used (included in the scope of delivery).

2.2. Placement

2.2.1. Location

- OCTAVE equipment is designed strictly for use in a dry domestic environment. Do not use it in open air or in damp environments!
- Never place plants or liquid-filled containers on your amplifier. Take care that objects do not fall or liquids are not spilled into the enclosure. Should this happen, disconnect the mains plug immediately and have your amplifier checked by a qualified service technician.
- Condensation may form if the amplifier is taken from a cold environment into a warm one. In this case, wait until the amplifier has reached room temperature and is dry before switching it on.
- Avoid installing the amplifier close to sources of heat, such as heaters, or anywhere that it may be in direct sunlight.
- Do not operate your OCTAVE amplifier near flammable materials, gases, or vapors. Avoid areas where there may be heavy accumulations of dust or where the amplifier may be subject to mechanical vibration.
- Place your OCTAVE amplifier on a stable, even surface.

2.2.2. Cover

Never operate the amplifier without the cover.

2.2.3. Ventilation

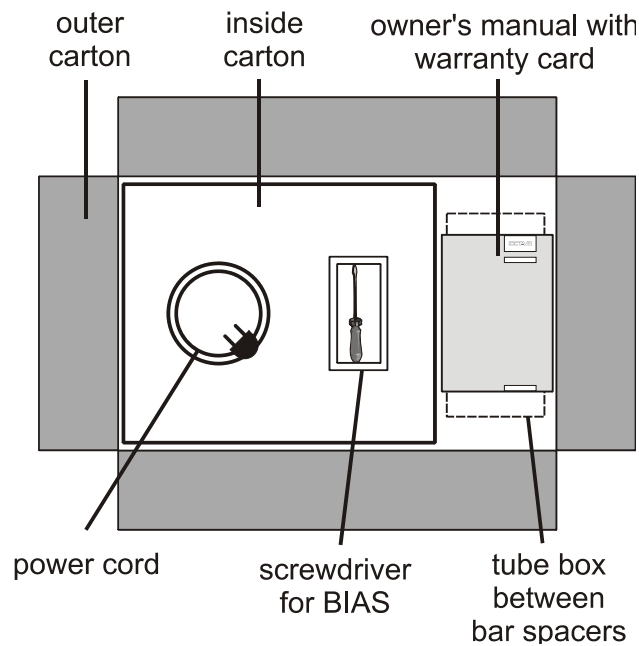
- Ensure sufficient air circulation around your amplifier. If you intend to install your equipment in a cupboard or a shelf unit, ensure that there is at least a 10 centimeter gap between the ventilation slots and the walls all around the amplifier.
- To prevent heat accumulation, the back of the cupboard should have ventilation holes.
- Do not rest the equipment on a soft surface such as carpet or foam sheeting.

2.3. Warranty

OCTAVE can only guarantee the safety, reliability and performance of this unit if modifications and repairs are carried out by specialized personnel and if the amplifier is operated in accordance with the instructions contained in this manual.

3. SETTING UP

3.1. Unpacking, package contents.



Scope of delivery

- RE 320 tube stereo power amplifier
- 1 set power tubes packed separately
- Tube layout diagram
- Power cord
- 4.0 x 100 flat-bladed screwdriver for adjusting the bias
- Owner's manual with warranty card

3.2. Removing the grille

Operating the amplifier without its protective grille is dangerous and not recommended!

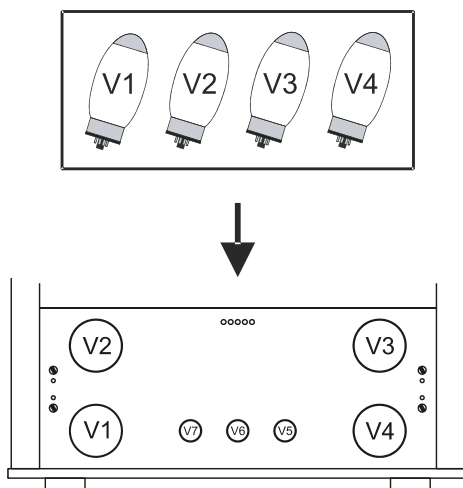
To remove the grille:

1. For your own safety, switch the amplifier off using the on/off switch or disconnect the power cord.
2. Pull the grille upward to remove.

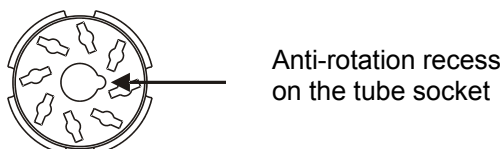
3. SETTING UP

3.3. Installing the power tubes

The power tubes are packed in a separate box in the tube compartment



Insert the power tubes into their sockets as shown on the tube layout. Ensure that you correctly locate the anti-rotation lug on each of the tubes.



3.4. Switching on for the first time – the Soft-Start feature

The RE 320 is equipped with a multi-stage Soft-Start-Turn-On protection circuit which extends component as well as tube life considerably by protecting against stress caused by typical high inrush currents during switch on.

- 1) Connect the RE 320 to the mains.
- 2) Switch on the RE 320 using the amplifier's mains power on/off switch (see chap. 4 front panel ①). The Power-LED ③ will illuminate.
Turn the Input Rotary Selector ② to Muting – the Muting LED ④ goes out
Turn the Function Rotary Selector ⑤ to Eco off – the Ecomode LED on the top side goes out. (see chap. 6.6 Ecomode)
- 3) After approx 30 seconds you hear a relay click noise. The soft start phase is finished and the power tubes start to work.

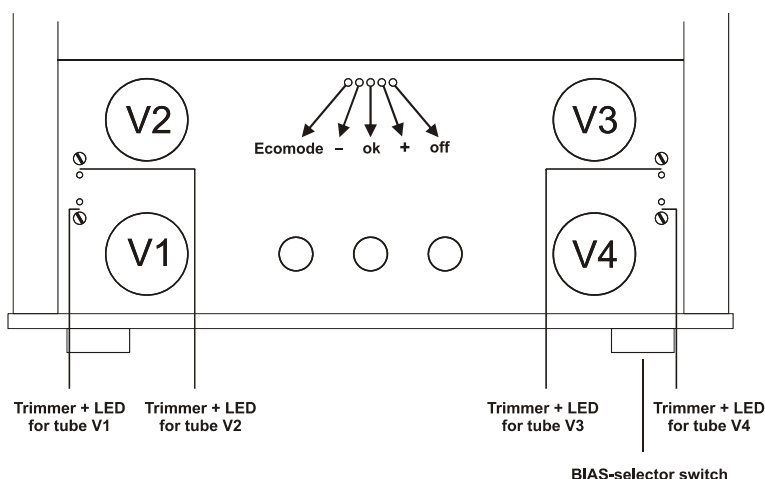
3. SETTING UP

3.5. Checking the power tubes – setting the BIAS

For the first function check you don't have to connect the loudspeakers or the preamp. The trim pots are located next to their respective tubes. Next to each trim pot you will see a pilot lamp, which shows which tubes have been selected with the bias selector switch. A row of LEDs in front of the transformer cover assists you in setting the bias correctly. It shows three conditions: bias too low, correct, and too high.

Before checking the BIAS please wait five to ten minutes. Because the tubes are still cold you would adjust the wrong BIAS

Turn the BIAS-selector switch clockwise to position V1 = BIAS setting for the tube V1. The LED next to the tube will illuminate, and one of the three BIAS LEDs will illuminate, normally first the Minus LED, than the OK-LED.



The LED display:

Ecomode LED	Indicating the status of the Ecomode (see chapter 6.6)
Yellow "-" LED	BIAS setting of the selected output tube is too low
Green "OK" LED	BIAS setting of the selected output tube is correct
Yellow "+" LED	BIAS setting of the selected output tube is too high
Red "off" LED	Indicates that the electronic protection has switched off the amplifier (see chapter 6.3)

After an additional 5 to 10 minutes, the BIAS control LEDs will change from yellow to green in case the BIAS Measurement Electronic is switched to tube 1 for example. This indicates the correct BIAS. Check all four tubes and switch OFF the BIAS electronic during listening.

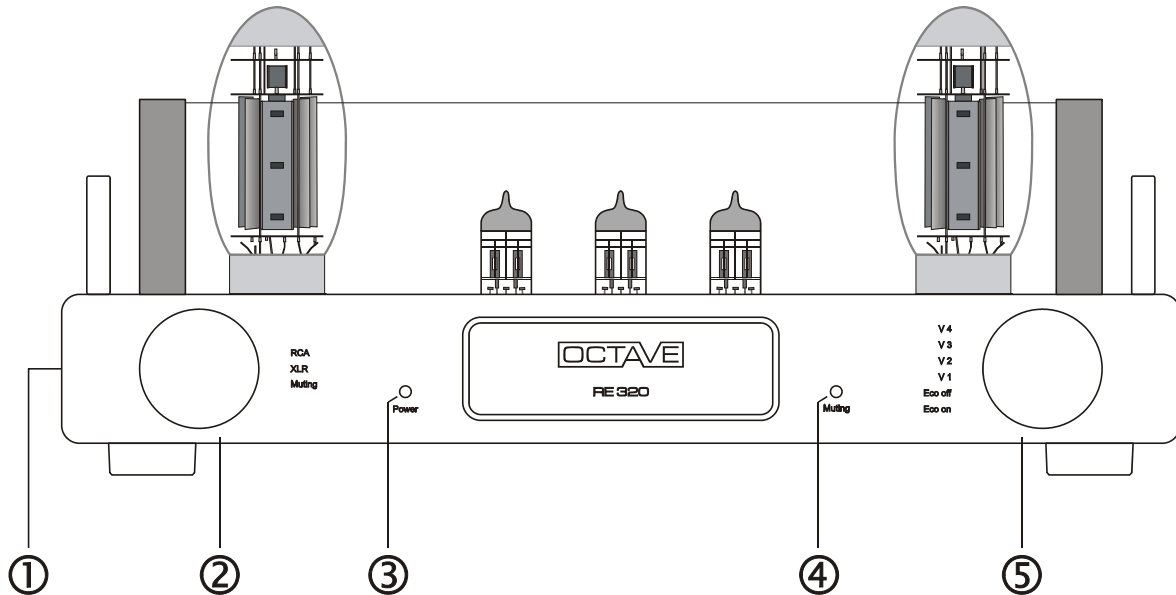
If you notice any irregularity ("+" = High BIAS) in the display please refer to chapter 7.3.

3.6. Connecting the unit

- 1) Make sure that the RE 320 is switched off!
- 2) Connect the other components in your system to the appropriate sockets on the rear of the RE 320. (See chapter 5 "RE 320 rear panel").
- 3) Check that the Input switch (2) on the front is in the right position (RCA or XLR).
- 4) Switch on the RE 320 using the on/off switch and wait a few minutes until the unit is powered. Now you can listen to music.

4. OPERATION

4.1. RE 320 front panel



Legend

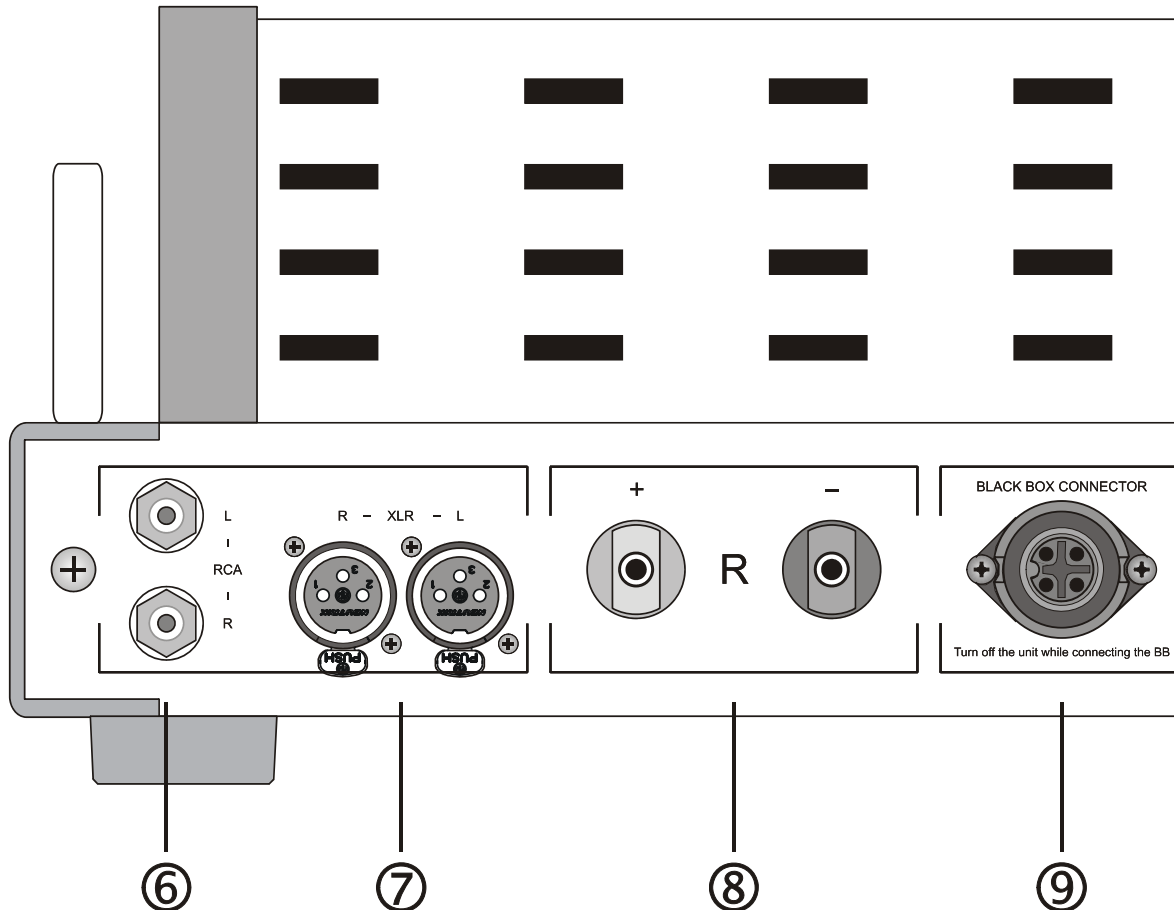
① Power switch	0 = off; 1 = on. The Power LED ③ illuminates that the unit is ON
② Input selector	This is used to select the desired input signal.
	RCA: RCA Input
	XLR: Balanced XLR Input, see Chap. 6.5
	Muting: Muting Function of the Input's, see Chap. 6.4
③ Power LED	lights up when the Power Switch ① is on 1
④ Muting LED	goes out when the Input Selector Switch ② is in position "Muting"
⑤ Ecomode Selector	Eco On: The Ecomode electronic is activated, the Ecomode LED lights up in green
and	Eco Off: The Ecomode electronic is disabled, and simultaneously the BIAS measuring electronic is Off
Bias Measurement	Position V1 - V4: The BIAS measuring electronic is connected to the relevant tubes. To ensure the accuracy of any adjustment, switch On the Muting function

NOTE:

The RE 320 is equipped with a Soft-Start circuit and a Power-Up delay timer. The amplifier is ready for use after a delay of approximately 2 minutes. Because there are no relays in the signal path, a low-level, slightly distorted signal from your source equipment may be heard through your loudspeakers during warm-up. This circuitry extends tube service life and also protects the power section from voltage spikes and excessive inrush currents.

5. CONNECTIONS

5.1. RE 320 rear panel

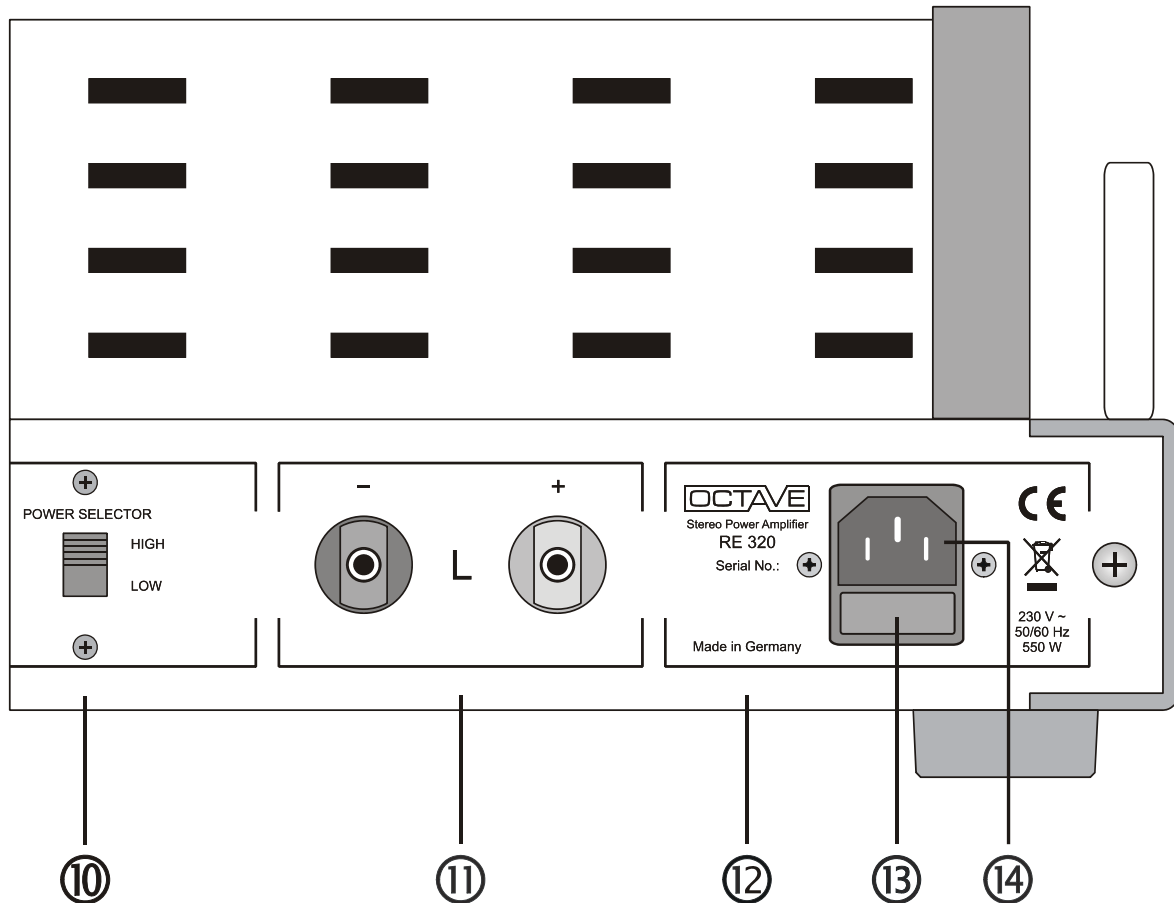


⑥	XLR Input	Balanced Input: Pin 1: Ground, Pin 2: +, Pin 3 –
⑦	RCA Input	Unbalanced Input
⑧	Loudspeaker Terminal	Right channel loudspeaker output Binding posts to connect the speaker cable. Red = positive terminal, Black = negative terminal. You can connect either 4 mm Banana connectors or spades. The negative speaker terminal is internally connected to ground.
⑨	Black-Box-Connector	The (Super) Black Box is an outboard power supply capacitance upgrade for the power amplifier section (see chapter 8). You have to switch off the RE 320 using the power switch before connecting and disconnecting the Black Box!



5. CONNECTIONS

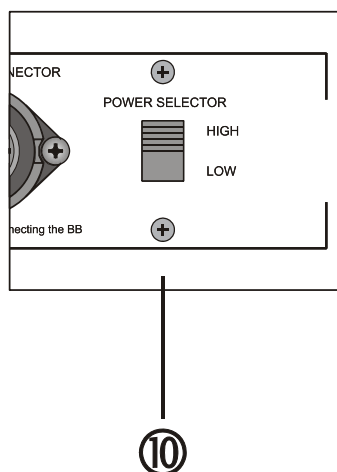
5.1. RE 320 rear panel



<p>⑩ Power Selector</p>	<p>Sliding switch to adjust the output power of the RE 320 depending on the Output Tubes. (see Chapter 6.1)</p>
<p>⑪ Loudspeaker Terminal</p>	<p>Left channel loudspeaker output Binding posts to connect the speaker cable. Red = positive terminal, Black = negative terminal. You can connect either 4 mm Banana connectors or spades. The negative speaker terminal is connected to ground.</p>
<p>⑫ Model identification plate</p>	<p>Model and Serial Number</p>
<p>⑬ Fuse holder</p>	<p>Fuse for 230/240V: 4 H slow-blow IEC Type (5 x 20 mm). Fuse for 115/120V: 6.3 H slow-blow IEC Type (5 x 20 mm) Fuse for 100V: 8 H slow-blow IEC Type (5 x 20 mm).</p>
<p>⑭ Mains supply receptacle</p>	<p>IEC socket with integrated fuse holder. The fuse is located in a pullout compartment above the socket. You can open the fuse compartment after removing the mains plug</p>

6. ADVANCED FUNCTIONS

6.1. Power Selector, alternative output tubes



Position „HIGH“:
KT150, KT120

Position „LOW“:
KT88, 6550, KT90, KT100
(EL34 with Restrictions)

The Power Selector allows adjusting the RE 320 in accordance to the output tubes. Position HIGH is reserved for the standard KT 150 or KT 120 tubes. In the HIGH Position the RE 320 is able to deliver up to 200 W RMS Output Power. The slightly weaker tubes type KT 88 or 6550 can be used in the position LOW. In this position the maximum output power is limited to 75 W to avoid overloading these tubes. The rather rare tubes of type KT 90 and KT 100 can be used also in the LOW position.

The EL 34 can be used in the LOW Position in cases of speakers with an impedance higher than 6 ohms.



Tubes of Type 6L6, KT 66, 5881 are not recommended for the RE 320
EL 519 and EL 156 are not suitable for the RE 320.
Before switching the Power Selector turn OFF the mains rocker switch

After switching from power LOW to HIGH and vice versa the BIAS should be corrected in case of using the same output tubes. Normally there is only a slight correction necessary.
When using different tubes the BIAS has to adjust according to chapter 7.3

6.2. Soft-Start, Inrush current limitation

The RE 320 input and output tube heaters as well as its high-voltage rails are logic controlled to ensure that the conduction of the output tubes as well as input stage voltages are constantly monitored and controlled by the **Power Management system** to protect the vital internal parts (tubes, rectifier, electrolytic caps, switches, etc.) against excessive turn-on current. This increases the lifetime not only of the tubes, but also the caps, while all power related components derive benefit through this system.

The Soft-Start is always activated within the first 60 seconds after the unit is switched on. During this time you cannot listen.



During the Soft-Start-phase, adjusting the BIAS is not possible.

6. ADVANCED FUNCTIONS

6.3. Electronic Protection System

The RE 320 features a comprehensive electronic monitoring and protection system. This system will automatically switch off the RE 320 in case of a fault occurring in the power section.

The protection system has been designed to keep the unit safe from the consequences of overloads of any kind and to protect the output tubes from current surges.

The RED "Protection" LED lights up to indicate that the protection system has tripped.



The amplifier will not play music once the protection system has tripped and you will not be able to check or adjust the BIAS setting.

The BIAS LEDs will show "yellow" for each of the four output tubes.

If a Black Box or a Super Black Box is connected to the RE 320, the front panel (operate) LED of the Black Box / Super Black Box will go out. If the Super Black Box is connected, tripping the protection system will automatically activate the discharge circuit of the Super Black Box (see chapter 8.2).

The following conditions can cause the protection system to trip:

- Overdriving the RE 320 to excessive levels or with excessive levels of low frequency.
- A speaker cable short circuit while the speakers are being driven at high listening levels.
- A fault in one or more of the output tubes.
- A fault in one of the preamp tubes which overloads the output stage.

Once the protection system has cut in, the only way you can turn the RE 320 back on,- is to turn the on/off switch off and then on again. Allow the unit two minutes to cool down before switching it back on. If possible, identify and eliminate the cause of the problem (see chapter 9 "Troubleshooting").

If it is not clear what has caused the protection system to trip, we recommend that you check the BIAS before attempting to use the amplifier again. Tube faults can often result in widely varying BIAS settings. When these settings exceed a particular value they can cause the protection system to trip.

6.4 Muting Function

The Muting Function is switching Off the RCA and the XLR Inputs of the unit. In this way you can connect or change the cables without the need of switching Off the unit. You can connect or disconnect the signal or speaker cables in this mode.

6.5 Electronic Balanced Input Circuit

As standard the Balanced Input is equipped with a precision low noise electronic balanced input receiver. The Gain of this converter is -6dB, which means that in case of the usual +6dB of the balanced signal of an electronic balanced preamplifier you will have the same Output level in respect to the RCA connection.

6. ADVANCED FUNCTIONS

6.6. Ecomode (power saving mode)

The **Ecomode** serves to reduce heat and unnecessary power consumption when the unit is switched on but not in use. After 10 minutes without receiving signal, the RE 320 Ecomode is activated, turning down the power. In this “sleep” mode, the RE 320 draws less than 20 W Idle current. Therefore the running unit produces no heat, because the heater voltage and the high voltage for the power amplifier section are switched off. When the music signal is once again sensed by the RE 320, the Ecomode circuit will turn the unit back on, with a warm-up/start-up delay of approximately 30 seconds before the unit will operate.

The Ecomode also serves to increase the lifetime of the tubes, while having an added benefit of **improved safety** allowing the RE 320 owner a level of security against any problems when leaving the unit powered on. The Ecomode is a safety and energy-saving feature that automatically switches off the amplifier's tube circuitry during breaks of more than 10 minutes.

Ecomode reduces the overall power consumption of the amplifier to under 20W, compared with 180W in normal operation. When detecting a signal, the RE 320 reactivates automatically and is ready for use again within 30 seconds.

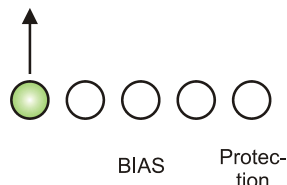
Eco off:

The Ecomode function is off, the Ecomode LED on the top doesn't burn

Eco on:

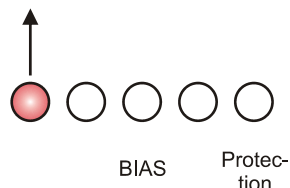
LED display on the top side:

Ecomode on: LED lights **GREEN**



The Ecomode function is activated. The Ecomode LED lights up in GREEN.

Ecomode on: LED lights **RED**



After a 10-minute silence, Ecomode turn the Unit down. The Ecomode LED changes to RED indicating that the Ecomode circuit is powering down the unit.

Note:

If you switch the RE 320 on with Ecomode active, it will go through the start procedure. If it fails to detect a music signal, it will shut down after 10 minutes. Ecomode is not the same as standby, however, because certain sections of the amplifier remain on.

Important!

You cannot adjust the BIAS in Ecomode once the amplifier has powered down!

The signal switching level of 0.6mV results in approx. 40µW output power of the RE 320. In case of a speaker with a high efficiency an adjusted listening level can be lower than this value. The Ecomode would drive the unit down. In such cases the Ecomode should be switched off

7. TUBES

7.1. Removing the grille

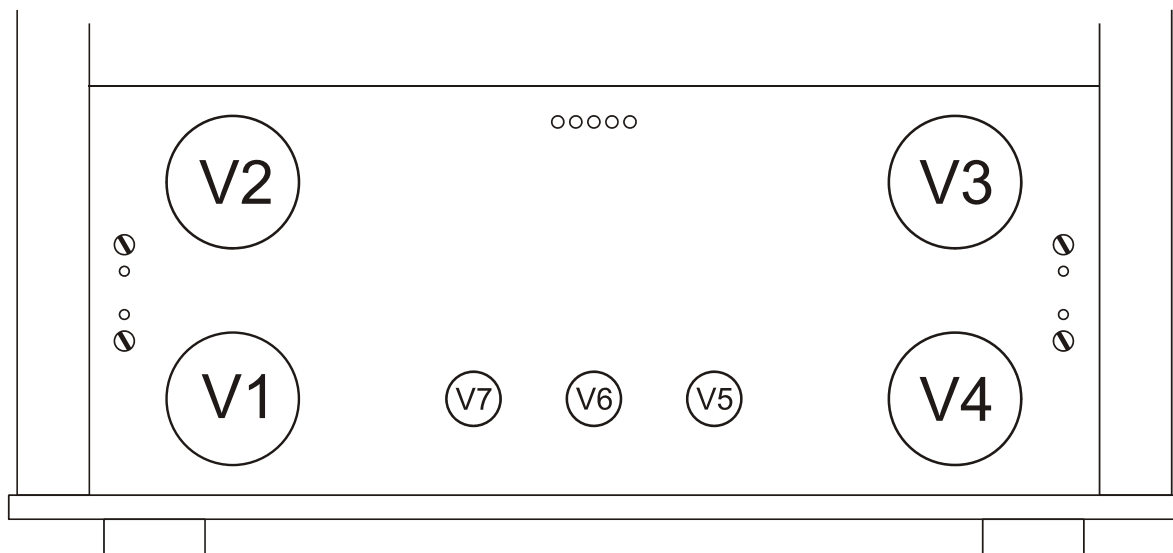
Operating the amplifier without its protective grille is dangerous and not recommended.

To remove the grille:

1. For your own safety, switch the amplifier off using the on/off switch or disconnect the power cord.
2. Pull the grille upward to remove.

See chapter 3.2.

7.2. Tube layout



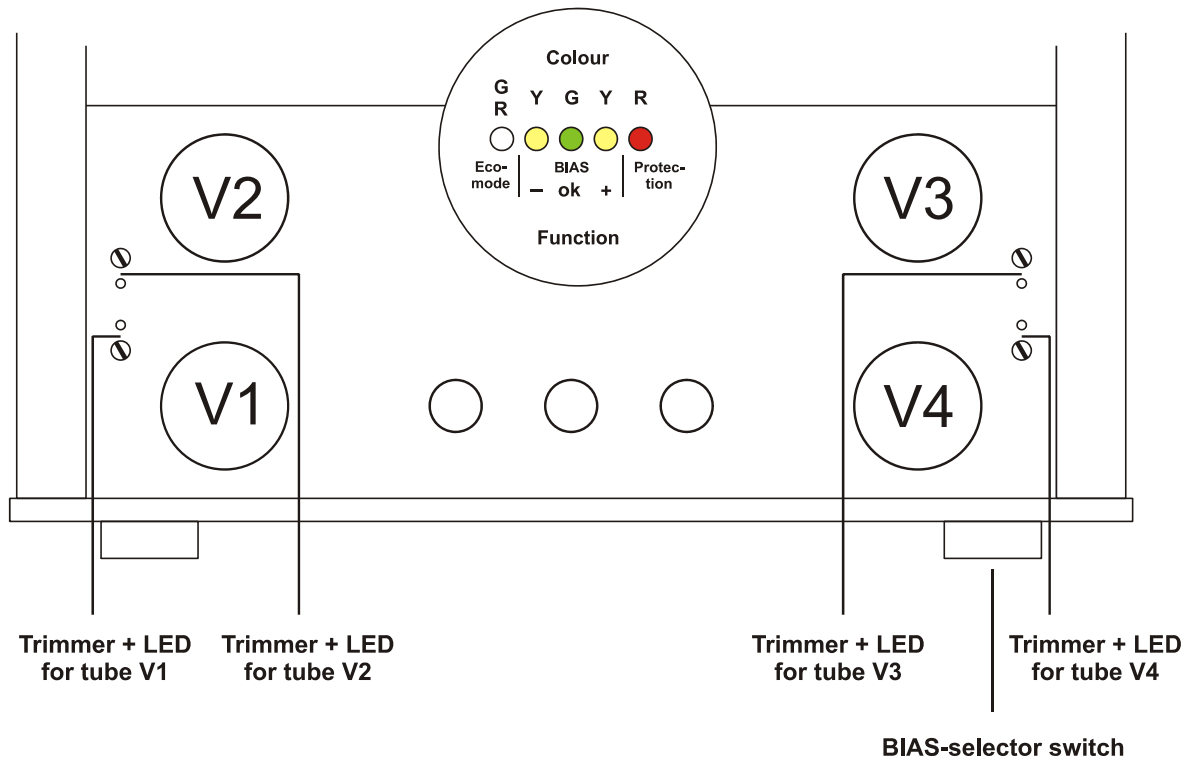
Output tubes: V1 - V4: KT 150 TS standard
 V1 + V2 left channel
 V3 + V4 right channel

Driver tubes: V5, V6, V7 ECC802 (= ECC 82,12 AU 7, 5814, 6189)

All driver tubes should have a system Gain match close to 0.2dB

7. TUBES

7.3. BIAS measurement electronic



The BIAS measurement electronic makes it easy for you to check and adjust the idle current of the output tubes. Getting the BIAS setting right for all four tubes is critical for both the sound of the power amplifier section and for the service life of the tubes. This feature guarantees consistent sound quality over the entire lifetime of the output tubes.

That is why we have built this BIAS measurement electronic into the RE 320 – to allow you, the user, to carry out the adjustment yourself without the need for test equipment. The use of precision op amps makes it possible for you to set the BIAS to accuracy within 0.2%, making it superior to any other method.

Using selected output tubes only makes sense if the idle current is adjusted accurately, as is clearly shown in Fig. 1 Technical Data.

The LED display:

Ecomode LED	indicates the status of the Ecomode Electronic
Yellow - LED	indicates that the BIAS is Low
Green OK LED	indicates that the BIAS has the correct value
Yellow + LED	indicates that the BIAS is too high
Red OFF LED	indicates that the Protection Electronic has turned off the Power supply of the Tube section

7. TUBES

7.3.1 How to set the BIAS

Make sure that no signal is playing through the amplifier when you are adjusting the BIAS. It is sufficient to turn your preamp volume control to 0, or you switch on the Muting; there is no need to disconnect the speakers.

The tubes should have reached operating temperature. The unit should run at least 15 minutes before you adjust the BIAS. If you notice high BIAS at one or more of the output tubes in cold state you should reduce the BIAS in any case.

Procedure:

Procedure	
1.	Turn the volume control of your preamp to 0
2.	Set the bias selector switch to V1. The green LED next to the trim pot for tube V1 will light up to show that you have chosen to adjust the bias for tube V1
3.	The bias setting for this tube is correct when the green OK LED on the display illuminates <ul style="list-style-type: none"> ■ If the yellow + LED illuminates, the bias is set too high. <ul style="list-style-type: none"> ➔ Turn the trim pot counter-clockwise until the OK LED illuminates. ■ If the yellow - LED illuminates, the bias is set too low. <ul style="list-style-type: none"> ➔ Turn the trimmer clockwise until the OK LED illuminates. Repeat this procedure with the other three tubes
4.	Switch the bias selector back to its "off" position.

If there is no change in the BIAS of a tube while turning the BIAS regulator, the corresponding output tube is faulty.

Note:



It is not possible to adjust the bias if the amplifier's electronic protection has cut in (as indicated by the red "off" LED in the display), or if the Ecomode has powered down the unit. When you activate the measuring facility under these circumstances, the LEDs will illuminate for all tubes. You must fix the fault or switch off the Ecomode before using the measuring facility. If a defective tube is causing the problem, you should locate and replace it. (See Troubleshooting Chapter 9)

7. TUBES

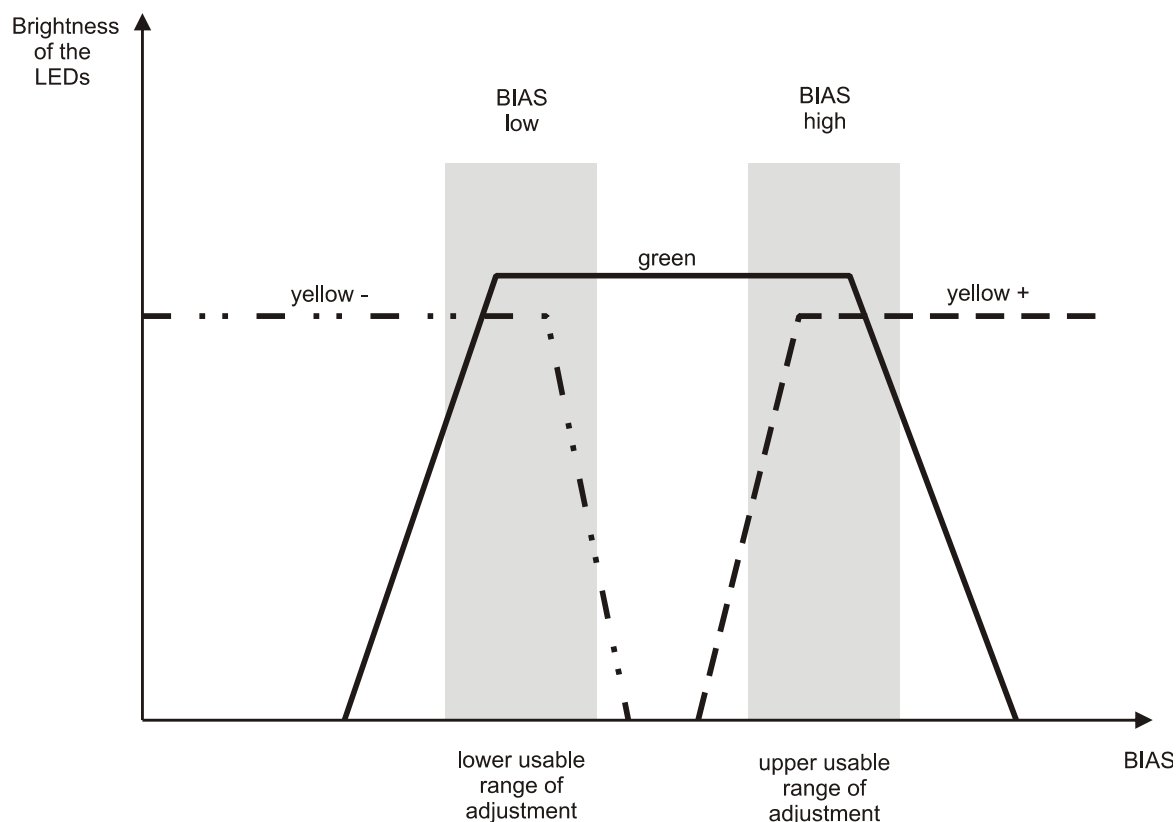
7.3.2 LED graphs, advanced adjustments of the BIAS setting

There is an upper adjustment limit to the "high" BIAS setting, which is indicated by the green and red LEDs lighting up at the same time, and a lower limit to the "low setting, where the yellow and green LEDs light up. The lower limit should be used with "smaller" output tubes such as the KT 88, KT100, 6550, KT 90, EL 34 and similar. The upper value, which provides a higher BIAS current for the output tubes, can be used with the KT 120 in both positions of the power selector.

Exception: The BIAS high setting can also be used with the KT 88 in the power LOW position.

Certain loudspeakers may benefit from the higher BIAS current, as it will increase the damping factor and provide slightly better control of the speakers.

LED graphs



The BIAS LOW setting corresponds to the plate current of 33mA

The BIAS HIGH setting corresponds to the plate current of 40mA

The crossover setting yellow / green or green / red is an adjustment with a very high precision. Small changes in the brightness of the LEDs are normal due to the long time drift of the tubes or the mains voltage.


7. TUBES

7.4. Replacing the tubes


- **Driver tubes**
Replacement driver tubes require no adjustment.
- **Output tubes:**

General procedure

1. Switch off the amplifier and allow it to cool down for 10 minutes. Remove the old tubes and fit the new ones.

2.  Before you switch the amplifier back on, turn all BIAS adjustment screws (see chapter 7) counter clockwise (this greatly reduces the anode current). These screws are ten-turn potentiometers, i.e. it takes ten revolutions to go from the maximum to the minimum setting.

3. Switch on the amplifier and turn the BIAS selector switch to the BIAS position. Following the Soft-Start phase, the "minus" LED (yellow) will illuminate at every of the four Output tubes. If from this point of time any of the LEDs are green or red, this indicates a faulty tube that must be replaced. After a 10-minute warm-up period, set the BIAS as explained in chapter 7.

3.1  Original Octave tubes.
There is no need to break in original Octave replacement tubes, as they are factory tested and passed a 24-hour endurance test. Allow the tubes 10 minutes to warm up and adjust them to the appropriate setting for the tube type.

3.2 New, untested output tubes should be allowed a longer warm up period. You should adjust these tubes after about 20 minutes and control the setting in the first days of operation

7.5. Running in

All OCTAVE equipment is subject to a 48-hour performance test at the factory to break in the tubes. The tubes are preselected for use in each particular model.

New tubes can take up to three months to run in and start sounding their best.

Daily use is beneficial in speeding up this process but is not mandatory. Continuous operation does very little to help reduce the running-in time and is therefore **not** recommended.

7.6. Tube service life

- Thanks to the protection circuits and soft-start electronics, the output tubes in your amplifier can achieve a service life of up to 3 - 5 years.
- Driver tubes can be used for 10 years or even longer.
- Because tubes have different service lives, you will never have to renew the entire tube complement at the same time. The facility for setting the BIAS for each output tube individually makes it unnecessary to use matched sets of output tubes. You can replace output tubes individually if you wish.
- Some tubes require a long time (up to 300 hours) to achieve their optimum sound quality. Depending on how long the tubes have been stored, it may be necessary to adjust the BIAS several times in the first two to three weeks after installing them.

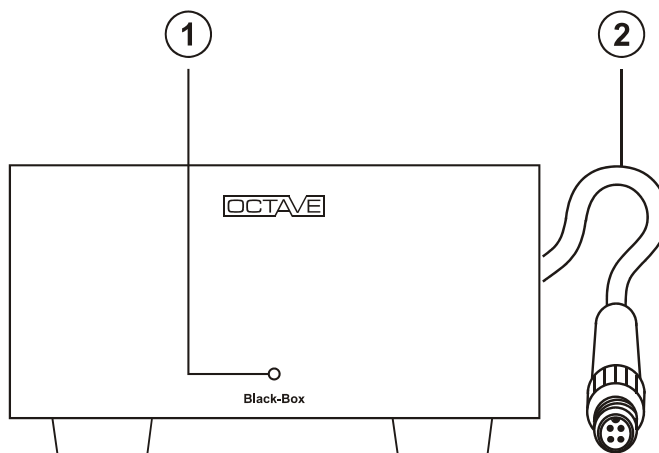
8. OPTION BLACK BOX AND SUPER BLACK BOX

Description

With the Black Box technology OCTAVE offers an instrument for optimizing the OCTAVE amplifier in respect to the speaker. This flexibility is a unique feature of the OCTAVE brand.

The dynamic and tonal stability of an amplifier is strongly dependent upon the stability and capacity of the power supply, therefore the Black Box and Super Black Box were developed as external upgrades to the OCTAVE amplifiers' power supply storage capacitors by increasing their capacitance by a factor of 4 (Black Box) or 10 (Super Black Box), respectively. This is a tremendous benefit if the speaker is difficult to drive. Loudspeaker efficiency is made less critical, while the amplifier is enabled to handle speakers with minimum impedances as low as 2 ohms. The power supply capacitance increase realized via use of the Black Box or Super Black Box stabilizes current delivery and reduces the impedance interaction of the load. This improves dynamic range, separation, depth, soundstage size and articulation, rendering the musical reproduction clearer throughout the entire frequency range. The amplifier remains unaffected by mains variations and interferences due to the noise filtering characteristics of the capacitors

8.1. The Black Box option



Legend

- | | | |
|-----|-------------------|---|
| (1) | Indicator LED | The LED illuminates continuously when the power amplifier is on. The LED goes out when the protection circuitry trips. This is normal, as the protection circuitry cuts the power to the amplifier. |
| (2) | High-current plug | |

8.2 Connecting to the amplifier



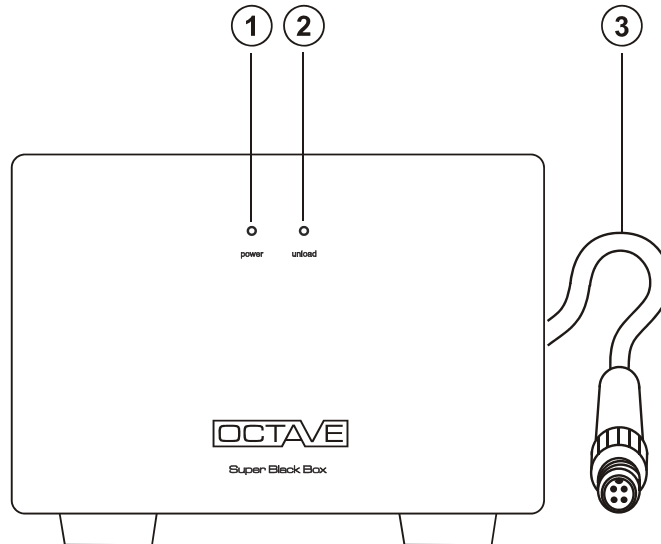
- Important! Before connecting the Black Box, switch **off** the unit using the **power switch and wait for 1 minute.**



- When inserting the connector, guide the anti-rotation lug carefully into the mating recess in the socket.
- When you switch on the amplifier, the LED on the front panel of the Black Box will illuminate.
Note: The LED on the Black Box goes off when the amplifier's electronic protection circuitry is activated or the Ecomode has turned the unit down.
- Should you wish to disconnect the Black Box, switch off the amplifier first and **wait until the LED on the Black Box has gone out.**

8. OPTION (SUPER) BLACK BOX

8.3. Super Black Box option



Legend

(1) Blue power LED	The blue “power” LED illuminates when the power amplifier is switched on via the amplifier’s power on/off switch.
(2) Yellow unload LED	The yellow “unload” LED (discharge control circuit) lights up for approximately two seconds after switch-off, in case the electronic protection is activated and if the RE 320 is powered down through the Eco-mode. The Super Black Box is equipped with a rapid discharge circuit, which discharges the unit’s electrolytics. The yellow LED indicates that that this procedure is taking place. The discharge circuit also activates if the SBB connecting cable is accidentally removed. This is to prevent the SBB maintaining its charge when it has not been properly disconnected
(3) High-current plug	(Connection see 8.2.)

8.4 Technical Data

8.4.1 Black Box

Specifications

Dimensions	178 x 98 x 300 mm (W x H x D)
Weight	3.2 kg
Connection cable	Length: 90 cm (with plug). Longer lengths are available upon request

8.4.2. Super Black Box

Specifications

Dimensions	203 x 149 x 360 mm (W x H x D)
Weight	5.6 kg
Connection cable	Length: 90 cm (with plug). Longer lengths are available upon request

9. TROUBLESHOOTING

9.1. Faults caused by external issues

9.1.1. Buzzing and hum in the speakers

■ **Possible cause: multiple grounds**

Hum in an audio system is often caused by several system components having their own separate grounds. It is particularly common in systems containing tuners, VCRs or satellite receivers, as these components are connected to an aerial. Because aerials and cables are always grounded, ground loops can form between the aerial connection and other grounded equipment. Other equipment that is normally grounded may include PCs with sound cards, and some CD/DVD players and DACs.

Although the RE 320 is grounded, its signal ground is a "floating" ground, which means that the RE 320 cannot create ground loops itself. Hum can only be caused when the RE320 is connected to other earthed units of the equipment.

To fix the problem

Before trying to fix the problem, find out which of your system components is responsible for generating the hum.

Procedure:

- Unplug all source equipment, including any equalizer if used, from the RE 320, leaving only the loudspeakers connected.
- Reconnect the components back to the RE 320 one at a time. As soon as the hum reappears, you have two grounded components connected to the RE 320. You must now unplug your components in reverse order to find out which of them is grounded.

Usually, the hum will still appear even when the problem components are switched off. The ground causing the problem is always connected, since it is not broken when the power switch is operated.

Now that you know which components are grounded, you can discuss the problem with your dealer.

One option might be to use a signal-isolating filter on the aerials or cable networks. This devices do not normally have any adverse effect on the sound or picture quality of tuners or TVs. Other possible solutions could include using an isolating transformer or an isolating device offering complete galvanic isolation. Please seek the advice of a specialist.

Power strips with built-in filters, mains filters or replacement mains cables are not appropriate solutions.

Note

Switching power supplies are quite common nowadays. These are often fitted with a protective earth terminal (PET) and an RFI filter. When using these devices, the protective earth terminal **must** be connected to the wall socket. You must never remove this protective terminal, as doing so could cause high levels of radio frequency interference to enter your system, which could affect the operation of other digital equipment, including remote controls.

9. TROUBLESHOOTING

■ Possible cause: induction

Another possible cause of hum could be the stray field of a transformer generating interference in a device or cable. You can easily diagnose this problem by switching off the problem component.

To fix the problem

To reduce this kind of interference, move the transformer/component or the affected component/cable to a different location.

The transformer in the RE 320 will not generate interference, as it is electromagnetically shielded and has a very low stray field.

■ "Phase" does not cause noise and hum

The mains polarity of the components in your system has no impact on noise and hum. That is a common fallacy. Swapping positive and negative in your mains plug will not make any difference to an earth loop. If it does, there is a fault with that component and you should not be using it.

9.1.2. Mains interference

Older fridges and 12V halogen lamps can produce strong radio interference when they turn on and off. Depending on the wiring in your home, this can result in clicks and pops in your loudspeakers.

To fix the problem

Modern domestic mains systems with a separate protective earth (PE) will normally suppress this interference. If you experience this type of switching interference, you either have a poor protective earth connection in your home or else your house does not use a PE system. In the latter case, you may not be able to eliminate switching interference entirely. In any event, the use of mains filters (in front of the device responsible for the problem) is certainly recommended.

9.1.3. Channels are not balanced

Level differences can have a variety of causes, although tubes are unlikely to be one of these.

1. The acoustics of the listening room may be affecting what you hear.
2. One of the drivers in your loudspeakers may be faulty.
3. There may be a faulty cable in your system

To fix the problem

You can trace the cause of this kind of problem by swapping speakers, cables, etc.

9. TROUBLESHOOTING

9.2. Faults caused by tubes, faulty tubes

Like other OCTAVE products, the RE 320 is equipped with a double safety system. This means that the amplifier will be protected from damage if a component (tube) should fail and trip the electronic protection. The protection system protects the amplifier and the tubes from overload. This technology has proven its worth in recent years. *It has enabled us to reduce our overall failure rate (except for output tubes, which we are unable to control 100 percent) to virtually zero. OCTAVE equipment will achieve a service life of 10 to 15 years without needing to be serviced. We feel that this is particularly important aspect of tube equipment design, as many preconceptions still exist about the technology's durability and long-term stability.*

There are a number of reasons why tubes might fail at some point in their lifetime. You can fault-find tubes by examining their behaviour.

9.2.1. Mechanical fault that does not trip the RE 320's protection

- **The tube's heater filament no longer glows**

No matter whether it is a driver tube or an output tube, no tube can work without a properly functioning heater.

Output tube heater fault

When the heater system on an output tube fails, you will be unable to adjust the bias. The particular tube will refuse to move from the minus setting. A loose connection inside the tube could have caused the heater to fail. It may be possible to repair the connection by mechanical means. If the bias was previously badly misadjusted, the bias might "runaway", tripping the electronic protection.

This is why you should never turn the bias screws to the extreme right and leave them there. If you have not been able to adjust the bias satisfactorily, turn the adjuster screw back to its extreme left position.

Driver tube heater fault

When this happens, you will normally lose an entire channel, depending on which driver tube system is affected by the faulty heater. This can only be established by a visual examination. The heater filaments are often difficult to see inside the driver tubes, since they only protrude very slightly from the tube system. We use double triodes exclusively, i.e. there are always two identical tube systems within the glass envelope. Because each of these triode systems has its own heater, you should always be able to see two glowing filaments. If you can only see one, it means that the tube is faulty.

- **A tube has developed an air leak**

The glass envelope of all tubes normally contains a vacuum. In order to maintain the vacuum throughout the service life of the tube, there is a device inside the tube that absorbs the residual gas. It is called the getter pill. It normally takes the form of a small crucible near the top of the tube. It contains a substance known as the getter, which absorbs and permanently retains the residual gas. This device ensures that the tube maintains a high vacuum during its entire service life. Hairline cracks around the base and leaks around the socket pins can cause the tube to take in air. Because the getter is only able to absorb a finite amount of gas, it will soon stop working. The silver coating at the top of the tube will then begin to discolour. If a tube has an air leak, you will not be able to adjust its bias voltage. As soon as a certain amount of air leaks into the tube, it will stop working completely and the heater filament will burn through.

9. TROUBLESHOOTING

9.2.2. Tube faults that trip the protection system

The protection system continuously measures the current flow into the four power tubes. Depending on the problem, this current may exceed a specified limit and cause the protection system to switch the power stage off. The red protection LED will light up to show that this has happened. Once the protection circuit has been tripped, you will no longer be able to measure the bias of the power tubes and your amplifier will not produce any output. Exceeding the specified current limit can have a variety of causes.

■ Faulty output tube

Aging and mechanical stresses from rough handling during transport can create an unwanted connection inside the tube, which can lead to failure of the tube.

How can you recognize a faulty tube? If you do not know what fault caused your amplifier to cut out, it is a good idea to disconnect the speakers and switch the RE 320 off and on again. Before switching it back on, turn the mode selector to the BIAS position. Now check the correct operation of the tubes via the bias display. If the tubes are good, the sequence of events will be as follows:

- Four LEDs illuminate until the soft-start phase is complete.
- After the soft-start phase, the power tubes will begin to heat up and will visibly glow as current flows into the tubes. After approximately one minute, the bias display should read "green".
- A fault in one of the power tubes would result in an uncontrolled rise in current, which would cause the top, red bias LED of the relevant tube to illuminate after a short time. A further rise in current to the tube would then cause the protection system to trip. Should this happen, switch the RE 320 off and replace the problem tube.

■ Faulty driver tube

In very rare cases, a problem with one of the driver tubes can cause the RE 320 to switch off. You can use the bias display to troubleshoot problems in the driver stage. The procedure is the same as the one described earlier, although the display will behave differently after the amplifier has warmed up. If one of these tubes is indeed responsible for the problem, both output tubes in the affected channel will behave erratically. This behaviour may take the form of short, rapid changes in LED colour - from yellow to green and red and back again. If the bias of both output tubes in one channel appears unstable, one of the driver tubes is generally responsible.

■ Tube faults that degrade the sound

These faults are relatively uncommon and usually a result of a fault already described above. Thanks to the controlled soft-start circuitry, the tubes will retain their tone throughout their working life.

The RE 320's sophisticated, low-noise power supply circuits push hum and noise down to negligible levels. Tubes do not inherently produce hum or hiss: these problems are simply side effects of older, classic tube technology.

Noise, crackling or similar undesirable noises can be caused by residual gas or other residues in the tubes. This kind of noise does not often reach a level that could be considered annoying, although the nearer to the "front" the particular tube is, the more it will tend to make itself felt. In the RE 320, this would be tube V 6. As it is rare for both systems in a double triode to be equally affected, the noise levels in each stereo channel will be different. If you experience noise that is louder on one channel than on the other, the first thing to do is to change the V 6 tube (ECC 81/6072).

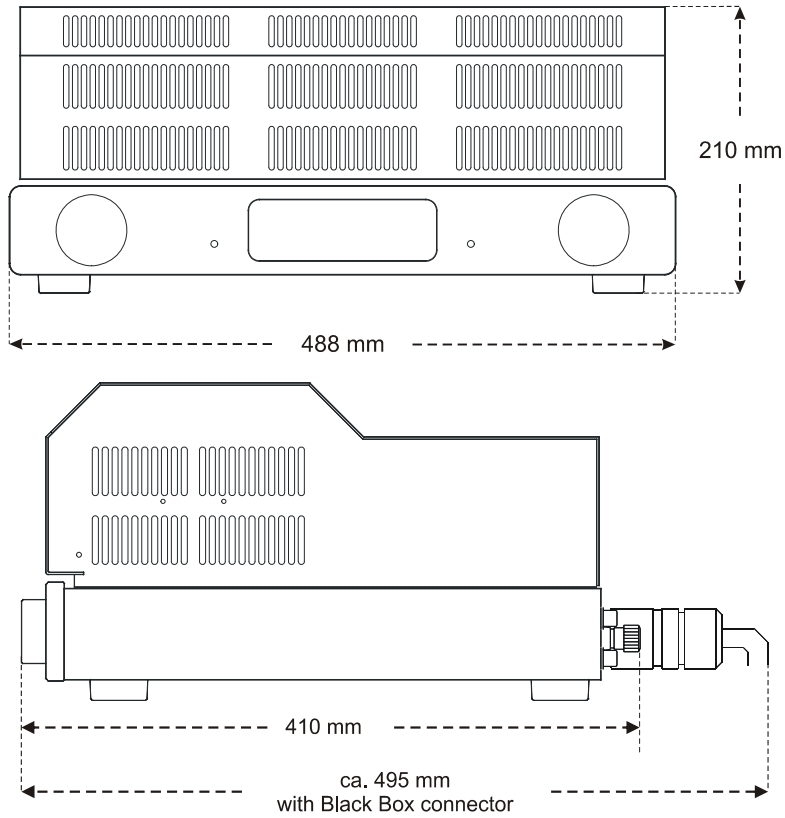
10. TECHNICAL DATA

10.1 Specification

Power Amplifier		
Output Power into 4 ohms:	Power Selector High:	2 x 130 W RMS
	Power Selector Low:	2 x 75 W RMS
Peak Power into 4 ohms:	Power Selector High:	200 W one channel 2 x 150 W both channels
	Power Selector Low:	140 W
	Into 8-Ohms Load the Output Power is reduced by 20 %	
Power Bandwidth:	25 Hz – 85 KHz / - 3dB at Full Power	
	5 Hz – 85 KHz / -3dB at 5 W	
Noise:	< 100 µV 150 Hz – 15KHz, > -110dB	
Input Sensitivity:	0.8V RCA; 1.6 V XLR	
Input Resistance:	220 KOhm RCA; 20 KOhm XLR	
CMRR of the XLR-Input:	> 85dB / 1 kHz	
Minimal Load Impedance:	2 ohms	
Gain:	+28dB - RCA	
Eco Mode Trigger Level:	0.5mV	
In- and Outputs		
Inputs:	1 x RCA, 1 x XLR	
Outputs:	1 x speaker terminal for 4 mm Banana connectors and spades	
General Data		
Power consumption:	< 20 W in Ecomode, 180 W idle, 550 W at full power	
Weight:	27.6 kg	
Mains:	100 V / 120 / 240 VAC available	
Dimensions:	488 x 210 x 410 mm (W x H x D)	

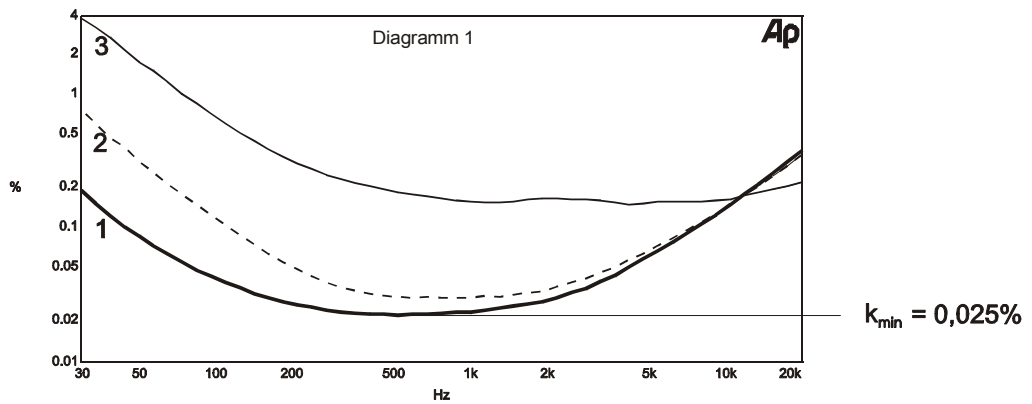
10. TECHNICAL DATA

10.2 Dimensions



10.3 Diagrams

THD at 4V into 4 ohms from 30 Hz to 20 kHz at a variety of BIAS settings

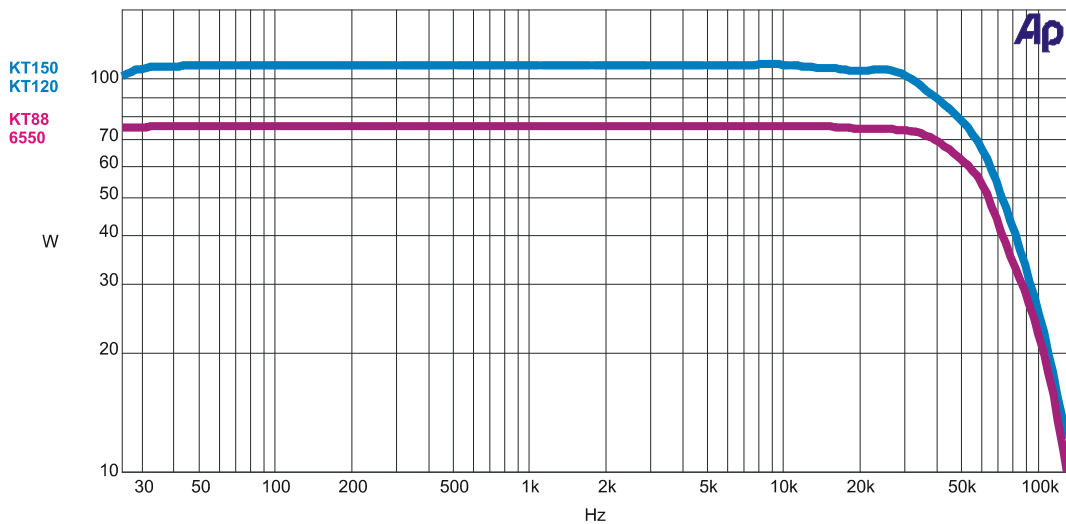


- Curve 1: BIAS adjusted correctly
- Curve 2: BIAS 10% out
- Curve 3: BIAS 30% out

10. TECHNICAL DATA

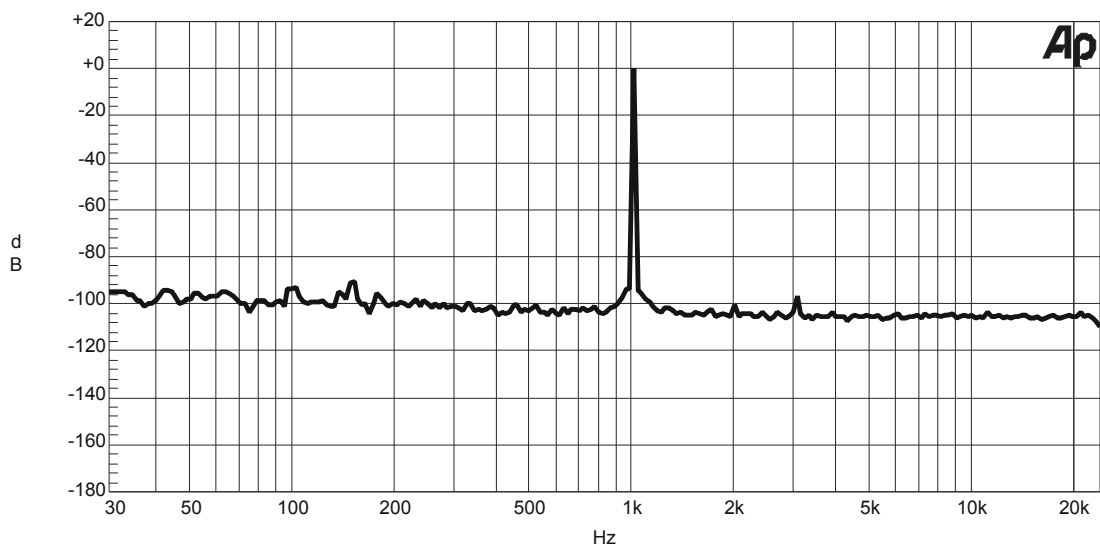
10.3 Diagrams

Graph 2: Power Bandwidth



Power bandwidth of both positions of the power selector. The maximum output power of 130 W in position “high” and 75 W in position “Low” is constant in the range from 25 Hz up to 30 kHz.

Graph 3: Noise spectrum



Noise spectrum at 1 kHz / 5 W into 4 ohms – there is no mains interference to be seen. (50 Hz < 200 μ V, 100 Hz < 70 μ V) The k2, k3, k4 and k5 noise spectrum is extremely low and falls quickly.

11. FAQ

1. Can you operate the RE 320 when no loudspeakers are connected?

Yes. The RE 320, like all OCTAVE amplifiers, is fully protected against open circuit operation, i.e. the amplifier will come to no harm if it is operated without loudspeakers connected.

2. How do you recognize a faulty tube?

See troubleshooting

3. Is there a loss of sound quality as tubes age?

No. Tubes normally sound the same throughout their service life. Our soft-start technology contributes greatly to extending the service life of tubes. You can tell when an output tube has reached the end of its useful life: it becomes impossible to adjust it correctly. Driver tubes cannot be checked, but these will generally last for well over 10 years.

4. Does the RE 320 have to have all of its tubes fitted?

In principle, the RE 320 will also operate without tubes. It is sometimes useful to do this when testing the operation of the switching functions such as the selector switch, remote control, etc. Of course, it is not possible to play music under these circumstances.

For test purposes, or as a temporary measure, one channel may be fitted with just a single power tube, although its power output will - of course - be reduced. The amplifier will come to no harm if it is operated continuously like this.

Operation without driver tubes is also possible for test purposes, although, for obvious reasons, music playback is not possible.

5. What is the significance of loudspeaker impedance and efficiency?

The impedance and efficiency of modern loudspeakers is not an issue for OCTAVE amplifiers. The often-quoted damping factor is not normally a guarantee that an amplifier will exert tight control over the loudspeakers. In practice, speakers of 85 dB efficiency and above are suitable for use with tube amplifiers. The high stability of the OCTAVE power amplifier technology even allows the use of speakers whose impedance dips as low as 2 ohms (except for EL34 with 4 ohms)

6. What cables are suitable for tube power amplifiers?

The cable manufacturers are now offering cables that have supposedly been designed specifically for tube amplifiers. Although such cables may be of good quality, there is no need to use special cables with tube amplifiers. Speaker cable can exhibit high values of capacitance and inductance, and tube power amplifiers deal with such loads better than transistor power amplifiers. The only exception would be if you needed to use a tube pre-to-power amp interconnect cable longer than 5 meters. In that case, a low capacitance cable would be advisable.



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