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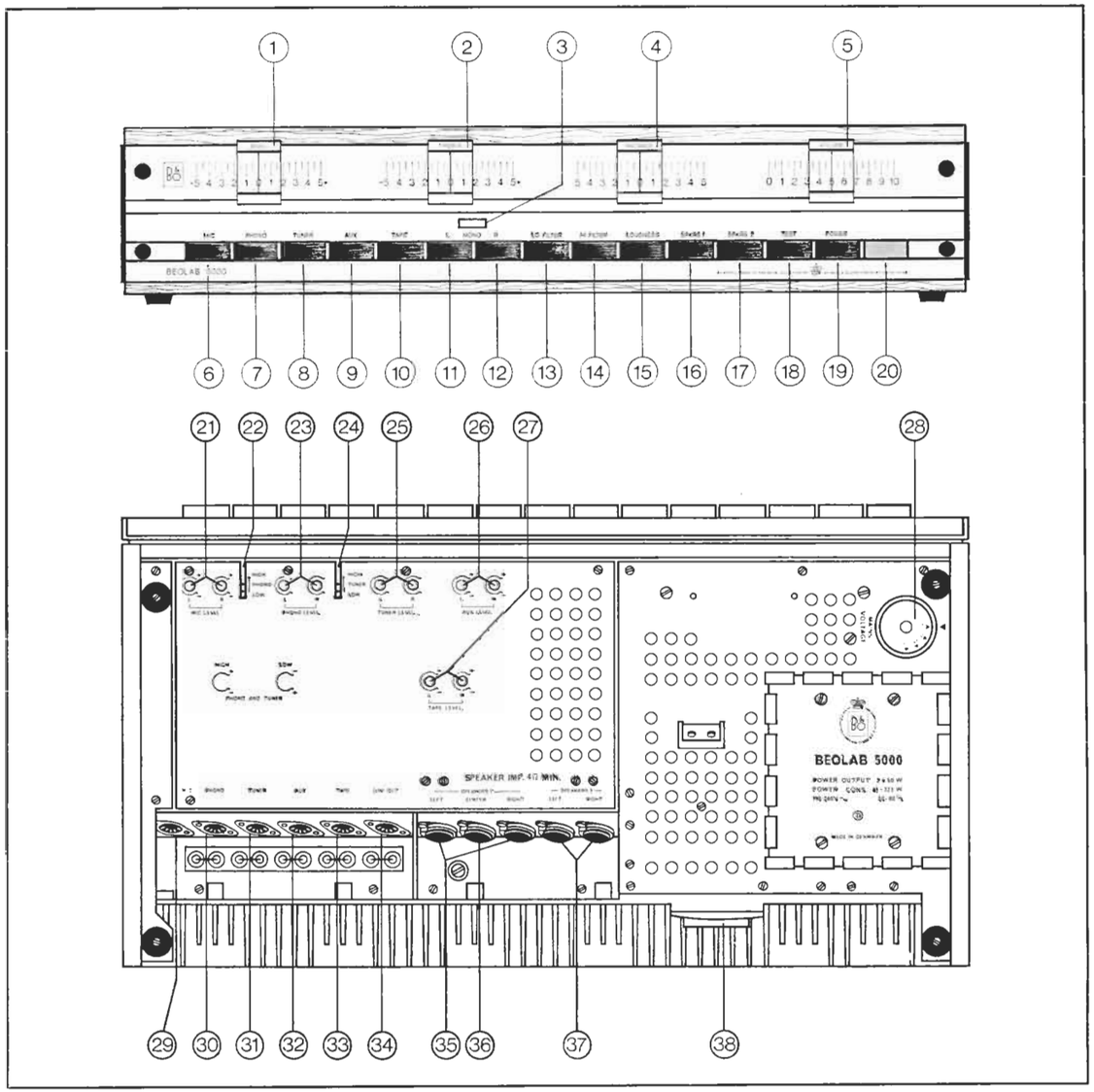
BANG & OLUFSEN A/S · LEVERANDØR TIL DET KONGELIGE DANSKE HOF

BEOLAB 5000

Contents



CONTROLS FRONT:

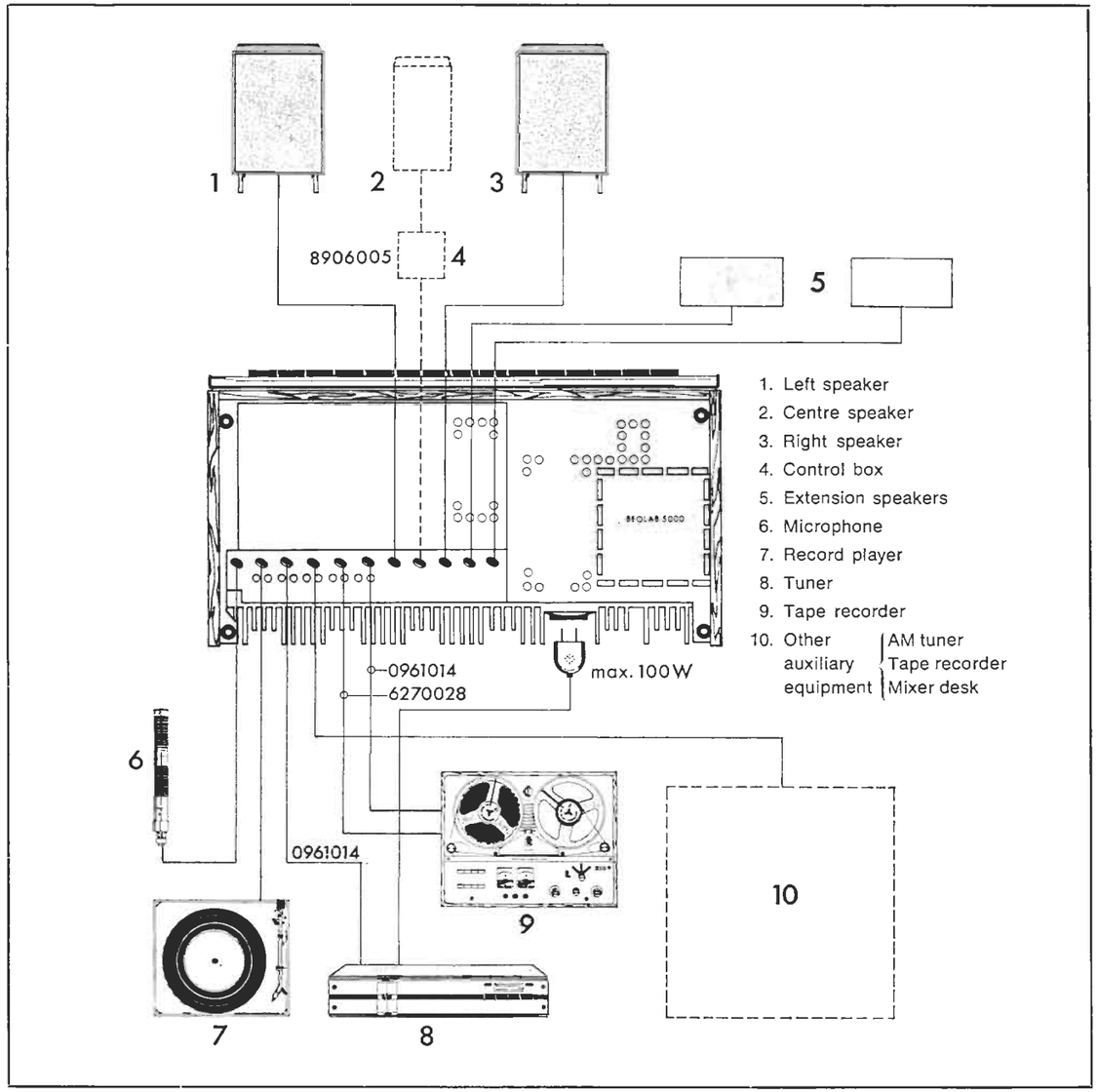
① **BASS:**	
② **TREBLE:**	
③ **STEREO:**	Stereo indicator
④ **BALANCE:**	
⑤ **VOLUME:**	
⑥ **MIC.:**	Microphone input
⑦ **PHONO:**	
⑧ **TUNER:**	
⑨ **AUX:**	Auxiliary input
⑩ **TAPE:**	
⑪ **L** / **MONO:** / ⑫ **R**	Stereo/mono switch
⑬ **LO FILTER:**	Rumble filter
⑭ **HI FILTER:**	Scratch filter
⑮ **LOUDNESS:**	Loudness compensated volume control
⑯ **SPKRS 1:**	Speaker set No. 1
⑰ **SPKRS 2:**	Speaker set No. 2
⑱ **TEST:**	Balance control for level adjustment
⑲ **POWER:**	Power on/off switch
⑳ **ON:**	Power-on indicator

CONTROLS, BOTTOM:

㉑ **MIC. LEVEL:**	Sensitivity adjustment, microphone input
㉒ **PHONO HIGH-LOW:**	Impedance switch, gramophone input
㉓ **PHONO LEVEL:**	Sensitivity adjustment, gramophone input
㉔ **TUNER HIGH-LOW:**	Impedance switch, tuner input
㉕ **TUNER LEVEL:**	Sensitivity adjustment, tuner input
㉖ **AUX. LEVEL:**	Sensitivity adjustment, all-purpose input
㉗ **TAPE LEVEL:**	Sensitivity adjustment, tape recorder input
㉘ **LINE VOLTAGE SWITCH:**	Selects between 110, 130, 220, and 240 volts AC.

EXTERNAL CONNECTIONS:

㉙ **MIC.:**	Microphone input. DIN jack. 200 ohms, balanced.
㉚ **PHONO:**	Record player. DIN jack and RCA sockets. PHONO HIGH-LOW switch selects between high and low impedance (1 megohm and 47 k ohms).
㉛ **TUNER:**	FM or other tuner. DIN jack and RCA sockets. TUNER HIGH-LOW switch selects between high and low sensitivity (7 mV and 250 mV).
㉜ **AUX:**	Auxiliary input. DIN jack and RCA sockets. Sensitivity 250 mV.
㉝ **TAPE:**	Tape recorder input and output: DIN jack: Input and output RCA sockets: Input
㉞ **LINE OUT:**	Line output: DIN jack: Output voltage 30 mV RCA sockets: Output voltage 350 mV
㉟ **SPEAKERS 1:**	Speaker set No. 1. Speakers are cut in and out by pressing SPKRS 1.
㊱ **CENTER:**	Centre speaker for use with speaker set No. 1.
㊲ **SPEAKERS 2:**	Speaker set No. 2. Speakers are cut in and out by pressing SPKRS 2.
㊳ **AUXILIARY AC OUTLET:**	Max. power handling capacity 100 watts. To switched by POWER button.



Set-up.

LINE VOLTAGE SWITCH:

Before plugging in your BEOLAB 5000, make sure that it is switched for the correct mains voltage – that is, your local mains voltage.

IMPORTANT: The BEOLAB 5000 is for AC mains operation only!

The voltage switch is located on the bottom plate – No. 28 in the key plan on page 2. Be sure to switch off your BEOLAB 5000 before you operate the voltage switch.

VENTILATION:

The BEOLAB 5000, like any other high-performance amplifier, generates considerable heat. It must not be placed inside a cupboard or cabinet, nor directly below a shelf or with some other equipment, such as an FM tuner, on top of it. In short, the BEOLAB 5000 should be given every chance of dissipating its heat. Also, never put books, magazines etc. on top of it.

THERMAL CUT-OUT:

Failure to observe the above directions will not result in damage to the amplifier, but the built-in thermal cut-out will operate and switch off the power supply.
Cut-in occurs automatically when the temperature in the amplifier has dropped – in other words, when the cause of the thermal overload has been removed.

VOLUME CONTROL:

Set the VOLUME control to zero before proceeding further.

PLUGGING IN CABLES:

In order to be able to make the various connections through the bottom plate, place the BEOLAB 5000 on one end with the bottom facing forwards.

SPEAKERS:

Speakers should be plugged into the jacks designated SPEAKER 1, L and R (left and right, respectively).

For instructions concerning the CENTER jack, see section CENTER SPEAKER on page 12.

NOTE:

If you want to clean the dial, do not use alcohol or strong detergents. Use a cloth wrung in lukewarm water.

Detailed Description of Controls and External Connections.

BASS AND TREBLE:

The bass and treble controls are of the slide type, as are also the balance and volume controls.
These controls permit accentuating and attenuating the bass and treble ranges so that the tonal balance can be made to match the acoustics of the room, the position of the speakers, and your personal taste. With both slides at zero (mid-scale), the amplifier has linear frequency response.

BALANCE:

This slide controls the relative strengths of the two channels. With it, you can compensate for differences between the signal strengths of the two channels of which programme sources are composed, or for one-sided placement of the listening position with respect to the speakers.

VOLUME:

This slide controls the output level.

LOUDNESS:

Pressing the LOUDNESS button introduces "physiological volume control" or compensation for the decreasing sensitivity of the human ear in the bass and treble ranges at low volume levels.

MIC.:
PHONO:
TUNER:
AUX:

Input selectors.

TAPE:

Tape recorder. For details see section CONNECTING A TAPE RECORDER on page 8.

L MONO R:

Stereo/mono switch. You have stereo when both buttons are released. The green indicator shows light for stereo. With the L button depressed, the left channel will be heard over both speakers. With the R button depressed, the right channel will be heard over both speakers. With both buttons depressed, the two channels are combined into one mono channel.

LO FILTER:

The rumble or bass filter provides heavy cut-off of the lowest frequencies (below 100 c/s). You will find this feature especially useful for gramophone playback as certain record players and records sometimes produce a very deep and objectionable type of noise (rumble) that can ruin reproduction.

HI FILTER:

The scratch or treble filter provides heavy high-note cut-off (of frequencies above 5 kc/s). You may use this filter for old noisy 78 r.p.m. records with poor high-note response.

SPKRS 1 - SPKRS 2:

Selects between two stereo speaker systems which are connected at the same time.

TEST:

This function is described in detail in the section ADJUSTMENT OF INPUT LEVELS on page 9.

POWER:

The POWER button is the on/off switch. Press to apply power; the red indicator will show light.

RCA SOCKETS AND DIN JACKS:

Except for the MIC. input, all inputs and the LINE OUT output have both DIN jacks and RCA sockets. Note for the RCA sockets that the left-hand one – the one nearest to the microphone input – is the left channel.

The microphone jack is for a 200-ohm microphone, balanced. Pins 1 and 3 are the left channel. Pins 4 and 5 are the right channel. Pin 2 is chassis.

PHONO:

Tape recorder input. If your record player has a crystal pickup, or a magnetic pickup with pre-amplifier, set this switch at HIGH.

If you use a magnetic pickup without a pre-amplifier, the same switch should be in the LOW position. Note that this switch is a double-push switch. Always push forwards, in the direction towards the front panel. You can use a coin etc.

TUNER:

The TUNER input is intended for an FM tuner or a radio receiver with diode output. The mains plug of the tuner or radio receiver may be inserted in the AC outlet on the rear of the amplifier. The power supply of the tuner will then be controlled by the POWER switch of the BEOLAB 5000. The power consumption of equipment operated from this outlet must not exceed 100 watts.
You can alter the impedance (and hence also the sensitivity) of the tuner input by means of the TUNER HIGH-LOW switch.
The continuously variable sensitivity controls designated TUNER LEVEL permit you to adjust the tuner input level to match any tuner.
The TUNER HIGH-LOW switch should be at HIGH for the BEOMASTER 5000.

AUX:

An additional record player, tape recorder, tuner, or mixer may be connected at the AUX jack. Sensitivity at this input is 250 mV across 500 k ohms.

LINE OUT:

The LINE OUT output may be used as tape recorder output; see section CONNECTING A TAPE RECORDER below.
You can also use this output if you wish to feed programmes to an amplifier elsewhere in the house.

CONNECTING A TAPE RECORDER:

The TAPE jack (DIN-type) permits you to record and play back from the tape recorder.
The RCA sockets designated TAPE are for tape input only – thas is, for tape playback. However, you can record from the amplifier via the LINE OUT sockets. Note that output voltage at the RCA sockets at LINE OUT is 350 mV (only 30 mV at the DIN jack). Consequently, if you use the RCA sockets for making a recording on a B&O BEOCORD 2000 de Luxe, you must set the switch in the radio input circuit of the BEOCORD at HIGH. See operating instructions for the BEOCORD for details.
Many tape recorders with separate record and playback heads can provide off-the-tape monitoring via their built-in or external speakers and via their line outputs. This means that you can monitor your recording from the playback head while you are actually making it. There will be a slight delay, however, equal to the time it takes for the tape to travel from the record head to the playback head. You can use your BEOLAB 5000 for off-the-tape monitoring and so utilize its excellent frequency response and the high-performance speakers connected to it. This is the best possible way of monitoring a tape recording. If you wish to record from the record player through your BEOLAB 5000 you should first of all press the PHONO button. You will then hear, through the speakers, a "direct" reproduction of the record you are playing. If you also press the TAPE button, you will hear the record "via the tape" if your tape recorder is switched for off-the-tape monitoring. If you use the BEOCORD 1500 de Luxe or the BEOCORD 2000 de Luxe, the MONITOR button should be released (up).
Interconnections between the BEOLAB 5000 and the tape recorder require a cable from LINE OUT to the radio input of the tape recorder. If your tape recorder is a BEOCORD 1500 or a BEOCORD 2000 de Luxe, you should set the radio input selector of the BEOCORD at LOW. Also connect a cable between the tape recorder line output and the TAPE input of the BEOLAB 5000. If you use the DIN jack of the BEOLAB 5000 you should use a so-called inverted cable, for example a B&O No. 6270028 cable.

You may also use a No. 6270019 cable. One plug goes into the TAPE input of the BEOLAB 5000; the other two should be plugged into the ⅄ and LINE OUT jacks of the tape recorder.

Adjustment of Input Levels.

The inputs of your BEOLAB 5000 are factory preadjusted for the B&O BEOMASTER 5000 FM Tuner, B&O pickups, B&O microphones, and the B&O BEOCORD 1500 de Luxe and BEOCORD 2000 de Luxe tape recorders.
You can use other record players, tuners, or tape recorders with your BEOLAB 5000; but if you do, you may find it necessary to readjust the inputs in order to avoid differences in sound levels when switching from one programme source to another, and also in order to realize the full benefit of the physiologically compensated volume control. The procedure is described below, and is based on a room 30 – 40 sq. metres in size. If your BEOLAB 5000 is to be used in a rather larger room, "convenient volume level" will mean a volume level that provides good listening without being unduly loud. It should be possible to carry on a conversation "across the music" by raising one's voice – without shouting, however.

To make these adjustments, proceed as follows:

(1) Place your BEOLAB 5000 on one end, with the bottom facing forwards.

(2) Press the POWER button.

(3) Set the BASS, TREBLE, and BALANCE controls at zero – that is, at mid-scale.

(4) Also set the VOLUME control at zero – all the way to the left.

(5) All pushbuttons except POWER, SPKRS 1 (or SPKRS 2) and PHONO should be released (out).

RECORD PLAYER:

(6) Put a mono record – NOT a stereo record – on the record player. Place the pickup on the record.

(7) Push the VOLUME control to the right until a convenient volume level is obtained.
The slide should then be somewhere between 4 and 5. If this is not the case, you should readjust the input level.

To do this, proceed as follows:

(8) Set VOLUME at 4½ on the scale.

(9) Using a screwdriver, turn the PHONO LEVEL alignment controls – both L and R – on the bottom plate for minimum volume. If the PHONO HIGH-LOW switch is at HIGH, the controls should be turned anticlockwise. If the switch is at LOW, turn clockwise.

(10) Push BALANCE all the way to the left.

(11) Using the screwdriver, advance the PHONO LEVEL L alignment control until a convenient volume level is obtained.

(12) Return BALANCE to zero (mid-scale).

(13) With the TEST button depressed, advance, by means of the screwdriver, the PHONO LEVEL R alignment control to the point where minimum volume level is obtained.

(14) The PHONO input is now adjusted for correct balance and input levels.

TUNER:

(15) Press the TUNER button and tune in a powerful local station, with the tuner switched for mono.

(16) Since this adjustment is based on comparison with the PHONO input you should now play the same record again.

(17) Set VOLUME for the same volume level as before (4½).

(18) Push BALANCE all the way to the left.

(19) Back off the TUNER LEVEL alignment controls (L and R) to the point where minimum volume is obtained.

(20) Advance the TUNER LEVEL L alignment control until a convenient volume level is obtained.

(21) By alternatingly pressing the PHONO and TUNER buttons, compare the volume levels of the two inputs. Adjust the TUNER LEVEL L alignment control to the point where you have equal volume from both inputs. The TUNER button should be depressed on completion of the comparison.

(22) Set BALANCE at zero (mid-scale).

(23) With the TEST button depressed, turn the TUNER LEVEL alignment control with the screwdriver to bring the output down to the lowest possible level.

(24) The TUNER input is now correctly adjusted for volume and balance, and its volume level now matches that of the PHONO input.

AUX:
TAPE:

(25) Adjust the AUX and TAPE inputs in the same way as described for TUNER under items (15) to (24) above.

MICROPHONE:

(26) Adjustment procedure for the MIC input follows the same basic lines. If you use a mono microphone only, you may find it practical to interconnect pins 1 and 4 and pins 3 and 5 of the microphone plug. The advantage of this arrangement is that the microphone works into both channels, and you will not have to switch to mono on the amplifier.

If you wish to use the microphone in the same room as the speakers, proceed as follows:

(27) Press the MIC button.

(28) Turn the MIC. LEVEL (L and R) alignment controls to minimum.

(29) Set VOLUME at the level at which you normally wish to operate your BEOLAB 5000.

(30) Push BALANCE all the way to the left.

(31) Advance the MIC. LEVEL L alignment control to just before the point where the system begins to howl (feedback). Push BALANCE all the way to the right and also advance the MIC. LEVEL R alignment control to just before the "howling point".

(32) Set BALANCE at zero (mid-scale). Should the system begin to howl now, you should further decrease the settings of the MIC. LEVEL alignment controls (L and R).

(33) If the microphone is not in the same room as the speakers, the adjustment procedure described under items (15) to (24) above should be followed. The speaker of a radio receiver or tape recorder may be used as a source of sound. If your microphone is a stereo microphone you should set it up so that microphones face in the same direction.

Speakers.

Your BEOLAB 5000 will operate with speakers of impedances between 4 and 16 ohms. Maximum volume will be obtained with 4-ohm speakers.
If you use speakers of lower impedance you will get proportionately lower volume – see the curve in Fig. 6.

IMPEDANCE:

The rated output impedance of the BEOLAB 5000 is 4 ohms, but 3.2 ohms is acceptable for normal volume. The speaker output of the BEOLAB 5000 incorporates an electronic circuit to protect the amplifier against overloading as a result of short circuits or too-low speaker impedance (a short circuit represents

zero impedance). The electronic circuit operates if the impedance is lower than a certain critical level. The STEREO and ON indicator lamps will flash off and on when the electronic protective circuit operates, and it will not be possible to obtain very high volume levels.
If you connect speakers at both SPKRS 1 and SPKRS 2, and if you use both sets together at the same time, you should keep in mind that the load on the amplifier equals that represented by the parallel connection of the speakers connected to each channel. An example will illustrate this:
4-ohm speakers are connected at SPEAKERS 1 and at SPEAKERS 2. On pressing both speaker buttons (SPKRS 1 and SPKRS 2), the speakers will be connected in parallel, and the overall impedance will be 2 ohms, which is too low. If you use one speaker output for extension speakers in the kitchen or the bedroom, or in some other room, you will no doubt prefer speakers with built-in volume controls. Speakers of this type have so high impedance that they have negligible effect on the total load. If you wish to use identical speakers on both outputs you must use speakers of higher impedance, for instance 8 ohms.

CAUTION:

The speakers connected to your BEOLAB 5000 must be capable of handling its large power output (50-watt speakers).
If you use speakers of lower power handling capacity you should not operate them at volume levels above their distortion limit. Also, you should not operate speaker switches and filter buttons until 20 seconds after power has been applied.

The formula for calculating the total impedance for speakers connected in parallel is

$$\frac{\text{ohms}_1 \times \text{ohms}_2}{\text{ohms}_1 + \text{ohms}_2}$$

where ohms_1 refers to one speaker and ohms_2 to the other.

CENTER SPEAKER:

Your BEOLAB 5000 has provision for connection of a centre speaker, which should be plugged into the CENTER jack. Use of a centre speaker normally requires a B & O Type 6005. Stereo Width Control Box.
The adjustable centre speaker makes it possible to increase or reduce the width of the »stereo picture«. With it, you can vary the reproduction to match the acoustics of the room, the placement of the point of listening with respect to the speakers, the programme material, and your personal taste.
For further details see the operating instructions supplied with the control box.

BEOLAB 5000, Technical Specifications.

The data listed here are minimum values. For exact values for your BEOLAB 5000 see enclosed individual test certificate.

POWER OUTPUT:	120 watts (2 × 60 watts). This amount of output can be delivered as a 1 kc/s sine-wave tone for 10 min. with both channels driven simultaneously. DIN 45500, 6. 2. 6.
SPEAKER IMPEDANCE:	4 ohms (see Fig. 6 for higher impedance values).
DAMPING FACTOR:	16.
DISTORTION:	0.2 % at 1000 c/s. 0.6 % at all frequencies from 20 to 20000 c/s and 60 watts output from both channels simultaneously, with the volume control backed 20 dB off from max. setting.
INTERMODULATION:	1 % when driven to 2 × 60 watts at frequencies of 250 and 8000 c/s and 4 : 1 amplitude ratio. DIN 45403, 4.
FREQUENCY RESPONSE:	20 – 20000 c/s ± 1.5 dB (for microphone: 40 – 16000 c/s ± 1.5 dB).
SIGNAL/NOISE RATIO:	Min. – 90 dB below 60 watts with volume control at minimum. Min. – 58 dB below 50 mW at nominal input voltage and volume control backed off for 50 mW. DIN 45500, 6. 2. 5. (for microphone: min. – 54 dB below 50 mW).
CHANNEL SEPARATION:	45 dB at 1000 c/s; 30 dB between 250 c/s and 10000 c/s. DIN 45500, 6. 2. 4. 1.
INPUT SEPARATION:	60 dB at 1000 c/s; 45 dB between 250 and 10000 c/s. DIN 45500, 6.
	Signal/noise ratio and input separation measured at the input loads specified below:
	MIC.: 200 ohms PHONO HIGH: 1.5 nF PHONO LOW: Magnetic pickup 1200 ohms at 1000 c/s. TUNER HIGH: 50 k ohms TUNER LOW: 100 k ohms AUX: 50 k ohms TAPE: 50 k ohms
	Alignment controls at nominal input sensitivities, tone controls at linear response, LOUDNESS off.
BASS CONTROL RANGE:	± 17 dB at 50 c/s.
TREBLE CONTROL RANGE:	± 14 dB at 10000 c/s.
BALANCE CONTROL RANGE:	Min. 60 dB.
RUMBLE FILTER:	70 c/s, 15 dB per octave.
TREBLE FILTER:	6000 c/s, 18 dB per octave.
CHANNEL DIFFERENCE:	< 3 dB from max. output to 40 dB below max. output.

Input	Application	Curve	Input Impedance 1000 c/s	Nominal [1] Input Voltage	Alignment Control Ranges	Max. Input Voltage	Jack
MIC	Balanced Input for Microphone	Linear	200 ohms max.	200 µV	150 µV 15 mV [2]	3.5 mV 15 mV	DIN
PHONO HIGH	Crystal Pickup and Line	Linear	1 megohm	250 mV	200 mV 4 V	5 V 5 V	DIN and RCA
PHONO LOW	Magnetic Pickup	IEC fine groove	47 k ohms	4 mV	1.3 mV 14 mV	35 mV 120 mV	
TUNER HIGH	Radio Line	Linear	470 k ohms	250 mV	200 mV 4 V	5 V 5 V	DIN and RCA
TUNER LOW	Radio	Linear	47 k ohms	7 mV	6 mV 200 mV	180 mV 5 V	
AUX	Line	Linear	470 k ohms	250 mV	200 mV 4 V	5 V 5 V	DIN and RCA
TAPE	Tape Recorder	Linear	470 k ohms	250 mV	200 mV 7 V [2]	7 V 7 V	DIN and RCA

[1] Nominal input voltage is the voltage providing full power output with the volume control at max. Technical data are for alignment controls set for nominal input voltages.

[2] May be set for higher voltages, but max. input voltage must not exceed the values listed.

Outputs	Output Impedance	Output Voltage at Nominal Input Voltage	Max. Output Voltage	Jack
TAPE	4 k ohms	30 mV	0.9 V	DIN
LINE OUT	4 k ohms	30 mV	0.9 V	DIN
LINE OUT	2 k ohms	350 mV	7 V	RCA

Speakers at Outputs	Speaker Impedance [1]	Power Output
SPKRS 1 - 2	4 ohms	2 × 60 watts
SPKRS 1 - 2	8 ohms	2 × 40 watts
SPKRS 1 - 2	16 ohms	2 × 20 watts
CENTER only	8 ohms	120 watts

[1] Speaker impedance is represented by the parallel connection of the speakers connected at SPKRS 1 and SPKRS 2 (the load imposed on both channels by the centre speaker alone is one-half (4 ohms) of the centre-speaker impedance (8 ohms). At speaker impedances lower than 3 ohms, power output decreases in direct proportion to the decrease in impedance (electronic protective circuit).

NUMBER OF TRANSISTORS: 47

PILOT LAMPS: Two 60-volt 5-watt dial lamps.

SUPPLY VOLTAGE: 110, 130, 220, and 240 volts AC.

FREQUENCY: 50 - 60 c/s.

POWER CONSUMPTION: 45 - 325 watts.

OVERLOAD PROTECTION: Primary: Two 5 × 20 mm 2000-mA 250-volt slow-acting fuses. Government approved.
Secondary: Electronic circuit to protect against overloading and short-circuiting of speaker outputs.

WEIGHT: 10.4 kg (22.88 lbs).

DIMENSIONS: Length: 47 cm (18½ in.)
Depth: 25 cm (9⅞ in.)
Height: 9.6 cm (3¾ in.)

Subject to change without notice.

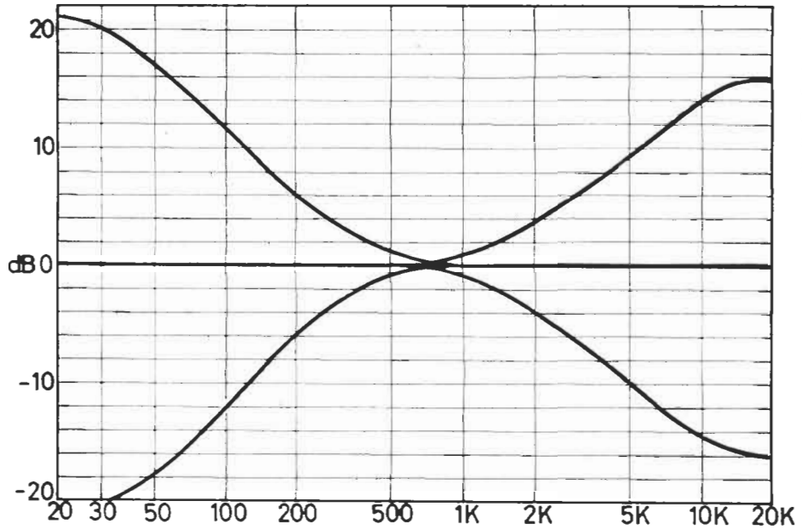


Fig. 1
Tone control. – The centre line, O dB, shows flat frequency response obtained with bass and treble controls at zero. – Curves show tone control for maximum and minimum bass and for maximum and minimum treble.

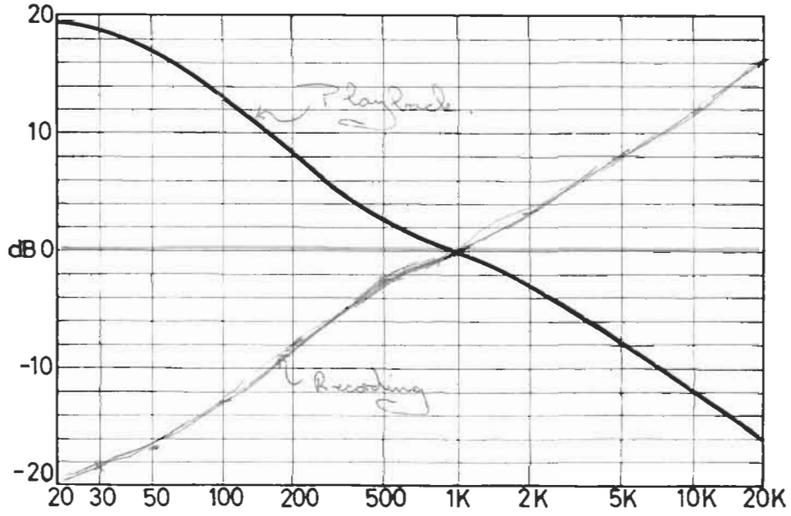


Fig. 2
This curve shows de-emphasis applied to the magnetic-pickup input (PHONO LOW).

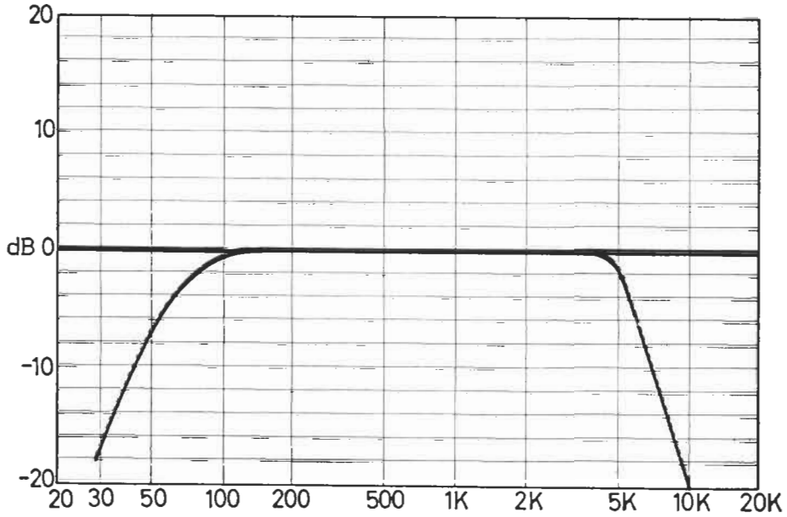


Fig. 3
Curve showing treble and bass cut-off resulting from use of HI FILTER and LO FILTER, respectively (scratch and rumble filters).

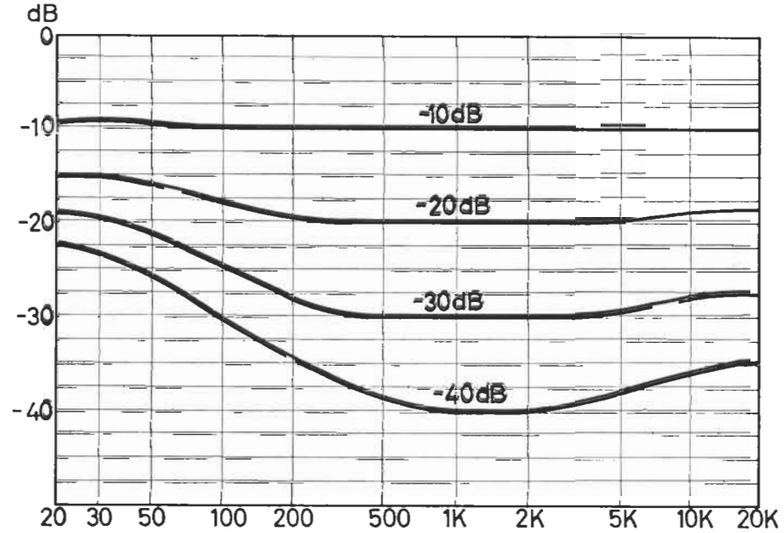


Fig. 4
Frequency response of the BEOLAB 5000 with LOUDNESS button depressed, at different volume control settings. The topmost line (O dB) indicates full volume (volume control all the way to the right).

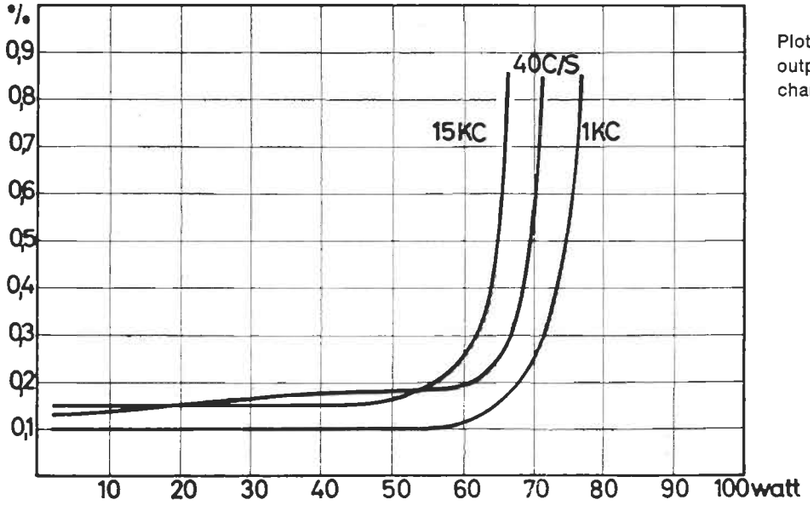


Fig. 5

Plot of distortion percentage versus output, at different frequencies, for one channel loaded by 4 ohms.

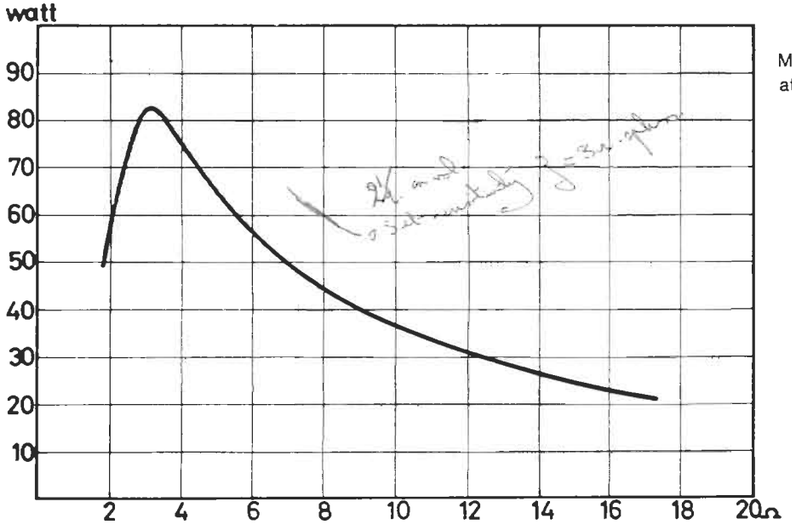


Fig. 6

Maximum obtainable output per channel at different speaker impedances.

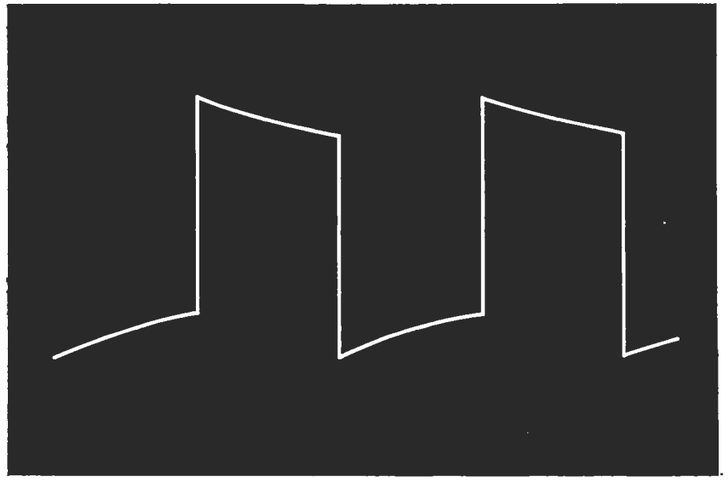


Fig. 7

Square-wave signal at output amplifier, R_{load} = 4 ohms, 100 c/s.

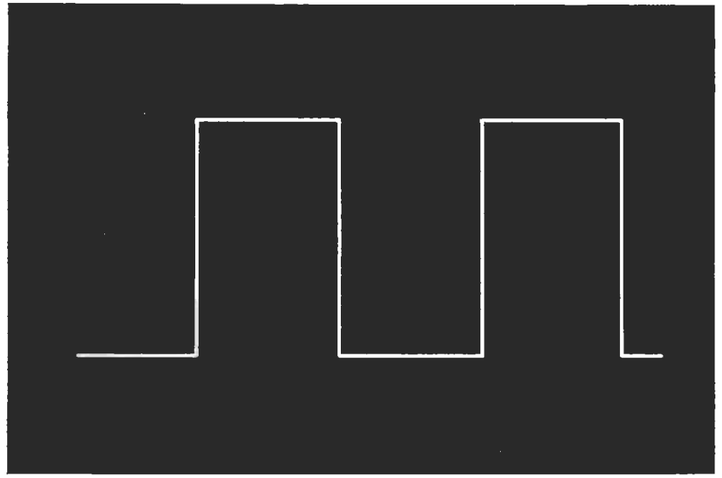


Fig. 8

Square-wave signal at output amplifier, R_{load} = 4 ohms, 1000 c/s.

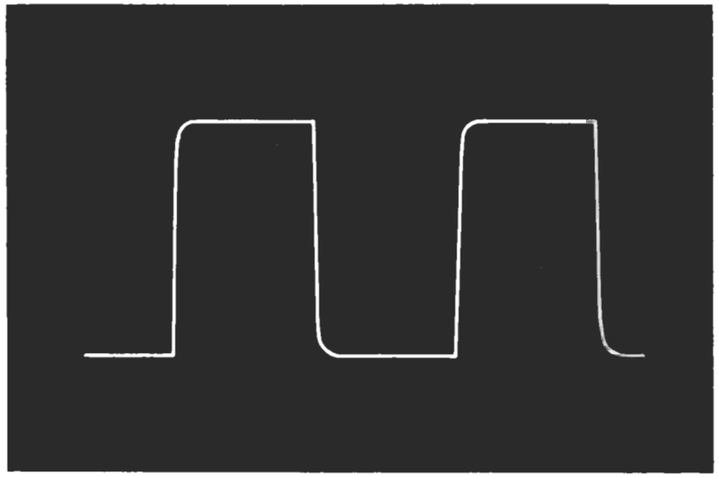


Fig. 9
Square-wave signal at output amplifier, R_{load} = 4 ohms, 10000 c/s.

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