

ULTIMATE HIGH FIDELITY STEREO COMPONENT



CL-32

▶ OWNER'S MANUAL ◀
STEREO CONTROL CENTER

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WARNING: TO PREVENT FIRE OR SHOCK HAZARD
DO NOT EXPOSE THIS APPLIANCE TO
RAIN OR MOISTURE

You are about to begin a new high fidelity experience. The LUXMAN CL32 Preamplifier is unique in the annals of high fidelity equipment. Though built with extremely sophisticated engineering, its concept is quite simple: to produce an amplifier with performance comparable to that available in the finest players, tuners and speaker systems.

The CL32 represents the finest standards of design and craftsmanship, but the proof is in the handling - - - and in the listening. As you proceed to connect the amplifier, may we suggest that you read all the instructions carefully before turning the unit on? A few moments invested now can eliminate doubts or delays later. If you have any question, please do not hesitate to consult your dealer!

Pleasant listening



SWITCHES & CONTROLS

1. Input Selector Switch

This allows you to select desired program source. You may select either of 5 positions (AUX-1, TUNER, PHONO-1, PHONO-2, AUX-2).

2. Tape Monitor Switch

When this is lifted up to the "TAPE-1" position, playback from tape-recorder is feasible from "MONITOR-1" (19), while when this is pressed down to the "TAPE-2" position playback from "MONITOR-2" (17) is possible.

In case of 3-head tape-recorder which has playback head for playback during recording, simultaneous playback monitoring is feasible while recording if the signals are fed to above terminals. In this case this amplifier receives the playback signals while feeding the recording output to the terminals REC. OUT-1 (20) REC. OUT-2 (18).

Note that if this switch is on function no playback from other program sources is feasible, and therefore normally set this switch at the "SOURCE" position.

3. Reprint Switch (Dubbing)

Reprinting (Dubbing) from pre-recorded tape is easily done by this switch when the output terminals (LINE OUT) of one tape-recorder is connected to the "MONITOR-1" terminals (19) and the AUX input terminals (LINE-IN) to the REC. OUT-1 (20), and on the other tape-recorder similarly the output terminals and the AUX input to the "MONITOR-2" terminals (17) and the REC. OUT-2 (18) respectively. This switch must be set at the "SOURCE" position when other program sources are reproduced.

4. Mode Selector Switch

Reproduction mode can be selected by this switch and 3 positions (REVERSE, STEREO, MONO) are provided. For further details refer to "Mode Selection".

5. Linear Equalizer

This is a new tone control which provides tonal compensation specially intended for subtly augmenting regular tone controls. With the control in its mid-position, flat frequency response is achieved. When switched to either of the 2 "up-tilt" positions, the entire response curve is rotated so as to linearly increase treble response while simultaneously decreasing bass response.

Conversely, selection of a "down-tilt" position rotates the response curve in a clockwise direction and provides a gradual decrease of treble and a simultaneous increase of bass. This equalizer is incorporated in the flat-amp circuit, therefore it is effective on all input sources.

6. Filter Switch

Set the switch at the "LOWCUT" position, and low frequencies below 20Hz will be cut off. At the "SUBSONIC" position, low frequencies below 10Hz will be cut off. At the center "DEFEAT" position, the filter circuits are completely bypassed to obtain a flat frequency response. For further details, refer to "Operation of Filter Switch".

7. Balance Control (BALANCE)

The volume balance between right and left channels can be adjusted by this control. Turn it clockwise and the sound volume of left channel will decrease and finally disappear, while counter-clockwise will gradually cut off the right channel. When proper balance of volume between right and left channels is obtained, monaural reproduction sound comes from the center of both right and left speakers, which is usually obtained at the center position of the control.

8. Audio Attenuator

This switch in its "-20dB" position reduces volume by 20dB. At the "SIGNAL OFF" position, signals are blocked and no output is available. Instantaneous attenuation of volume may be desirable for such occasions as answering the phone during music listening.

9. Output Selector Switch

This amplifier is provided with dual pairs of preamp-out terminals. 2 power amplifiers can be selected by this selector switch. At the "A" or "B" position, output is available at the "A OUTPUT" or "B OUTPUT" terminals respectively, while at the "A+B" position, output is available both at "A" and "B" output terminals at the same time.

10. Pilot Lamp

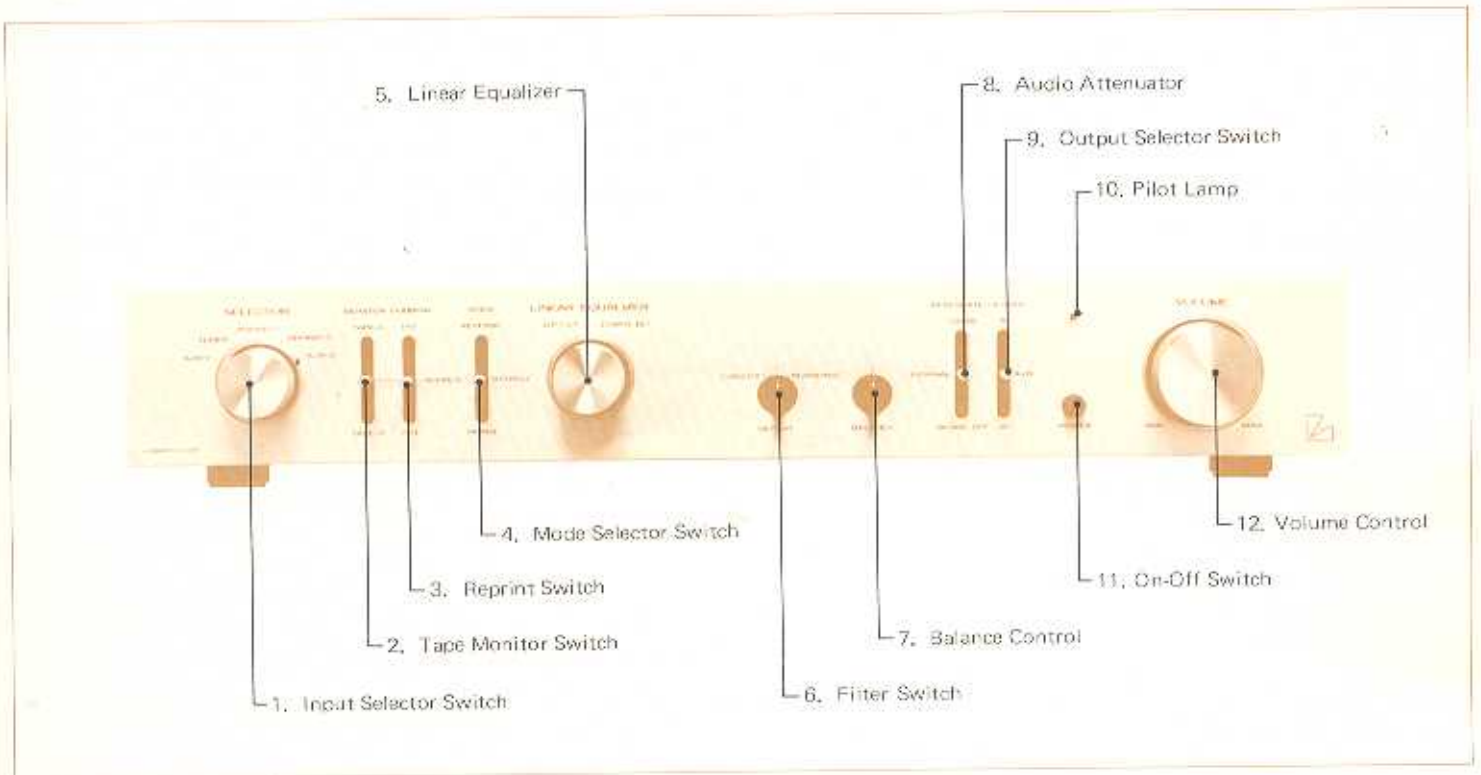
Pressing the On-OFF switch (11) causes this lamp to light, which shows that AC power is on.

11. On-Off Switch (POWER)

Depressing this switch permits the flow of AC power to the amplifier and the pilot lamp will light up, and some 35 seconds later the time-delay muting circuit is operated to make the entire circuitry operational.

12. Volume Control

A clockwise turn increases volume, while a counter-clockwise turn decreases and finally cuts off volume. A high grade attenuator type detent volume is used which enables accurate adjustment of attenuation between right and left channels.



INPUT & OUTPUT TERMINALS

13. AC Cord

The plug at the end of the AC cord should be connected to the AC power supply socket in your listening room.

14. 15. Extra AC Outlets

Convenient for supply of AC power to other equipment such as AM/FM tuner and record player. The terminal (14) (UNSWITCHED) is independent of the on/off switch (11) of this amplifier, while the other 2 outlets (15) (SWITCHED) are coupled with the on/off switch and the supply of AC power depends on the on/off switch. The maximum capacity for the UNSWITCHED receptacle is 200W, and the total capacity for the SWITCHED is 400W.

16. Output Terminals (OUTPUT)

The output is taken out from these terminals. 2 channels are provided to allow simultaneous or individual command of 2 main amplifiers. 3 positions (A, A+B, B) are selectable by the Output Selector Switch.

17. TAPE-2 Monitor Terminal

Line output signals of tape-recorder can be reproduced through this terminal. For this purpose the tape monitor switch (2) should be set at the "TAPE-2" position. In the case of a 3-head tape-recorder, tape-monitoring is feasible e.g. simultaneous recording and playback.

18. TAPE-2 REC. OUT Terminal

Signal for recording is taken out from this terminal. When input signal is supplied to either of the input terminals, the recording output signal is always available from this terminal. However when the reprint switch is set at the "1 to 2" position the inside connection is changed and the recording signals can be taken out from the "TAPE-1 REC. OUT" terminals.

19. TAPE-1 Monitor Terminal

Same as with the TAPE-2 terminals (17) in function. Playback from tape is possible when the tape monitor switch (2) is set at the "TAPE-1" position.

20. TAPE-1 REC. OUT Terminal

Same as with (18), and when the reprint switch (3) is set at the "2 to 1" position output of recording signal is changed to TAPE-2. When the switch is at "SOURCE", the signal is fed to both channels (18, 20) for recording on 2 tape-recorders.

21. TUNER Terminal

For connection of an AM/FM tuner. Input sensitivity can be adjusted by the Level Set Control for TUNER (22). Maximum sensitivity is 160mV. Input Impedance, 100K ohms.

22. Level Set Control for TUNER

This control permits adjustment of the input sensitivity of TUNER terminals (21). Also useful for adjustment of volume difference of input sources.

23. AUX-2 Terminal

This is an auxiliary input terminal for playback of such program sources as AM/FM stereo tuner, line output of tape-

recorder and audio output of TV receiver. Input sensitivity can be adjusted by the level set control (24) on rear panel.

24. Level Set Control for AUX-2

This control permits an adjustment of the input sensitivity of AUX-2 terminals (23). Useful for adjustment of volume difference of input sources.

25. AUX-1 Terminal

This has also the same function as AUX-2. Input sensitivity; 160mV. Input impedance; 200K ohms.

26. PHONO-2 Terminal

This is for reproduction through magnetic cartridges (MM, IM, MC) and the input sensitivity is 2mV for a 1V output voltage. The input impedance is fixed at 50K ohms.

27. PHONO-1 Terminal

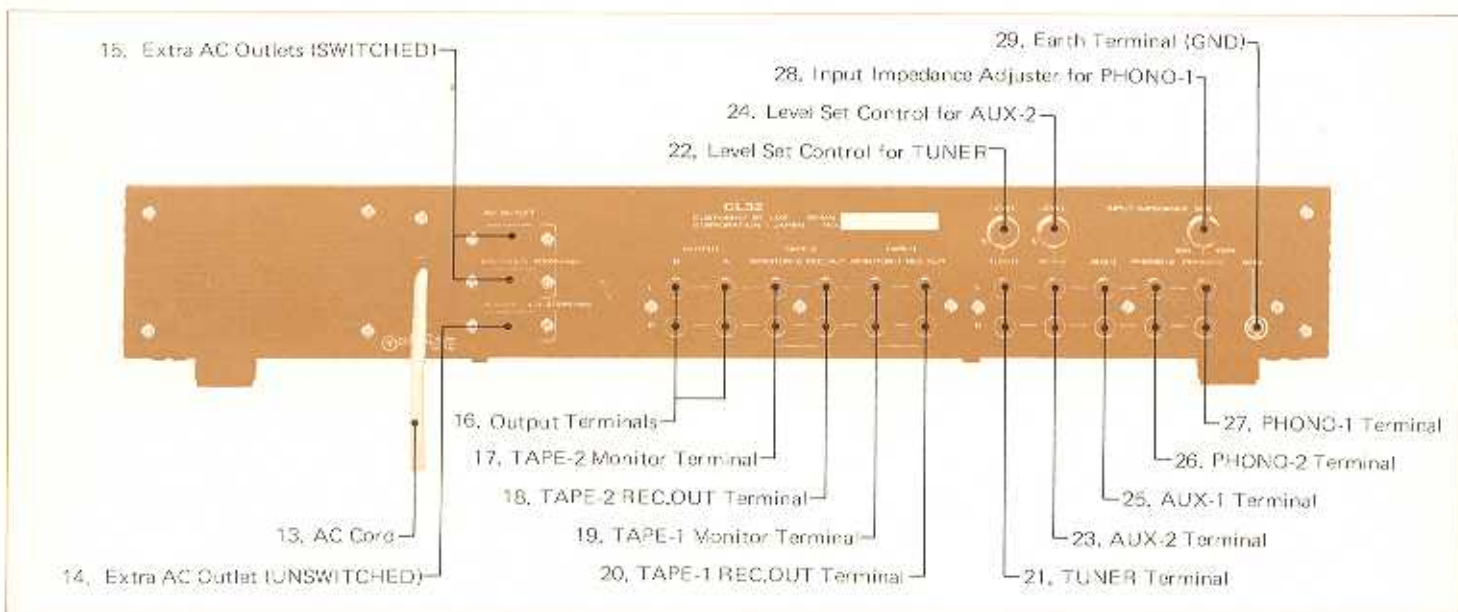
The function is the same as that for PHONO-2. The input impedance can be adjusted by the Input Impedance Adjuster (28).

28. Input Impedance Adjuster for PHONO-1

Desired impedance can be adjusted by this switch between 30K ohms and 100K ohms. This is provided for the purpose of correct reproduction through MM type cartridge under an appropriate load since these MM cartridges tend to vary in frequency response under different load resistance conditions.

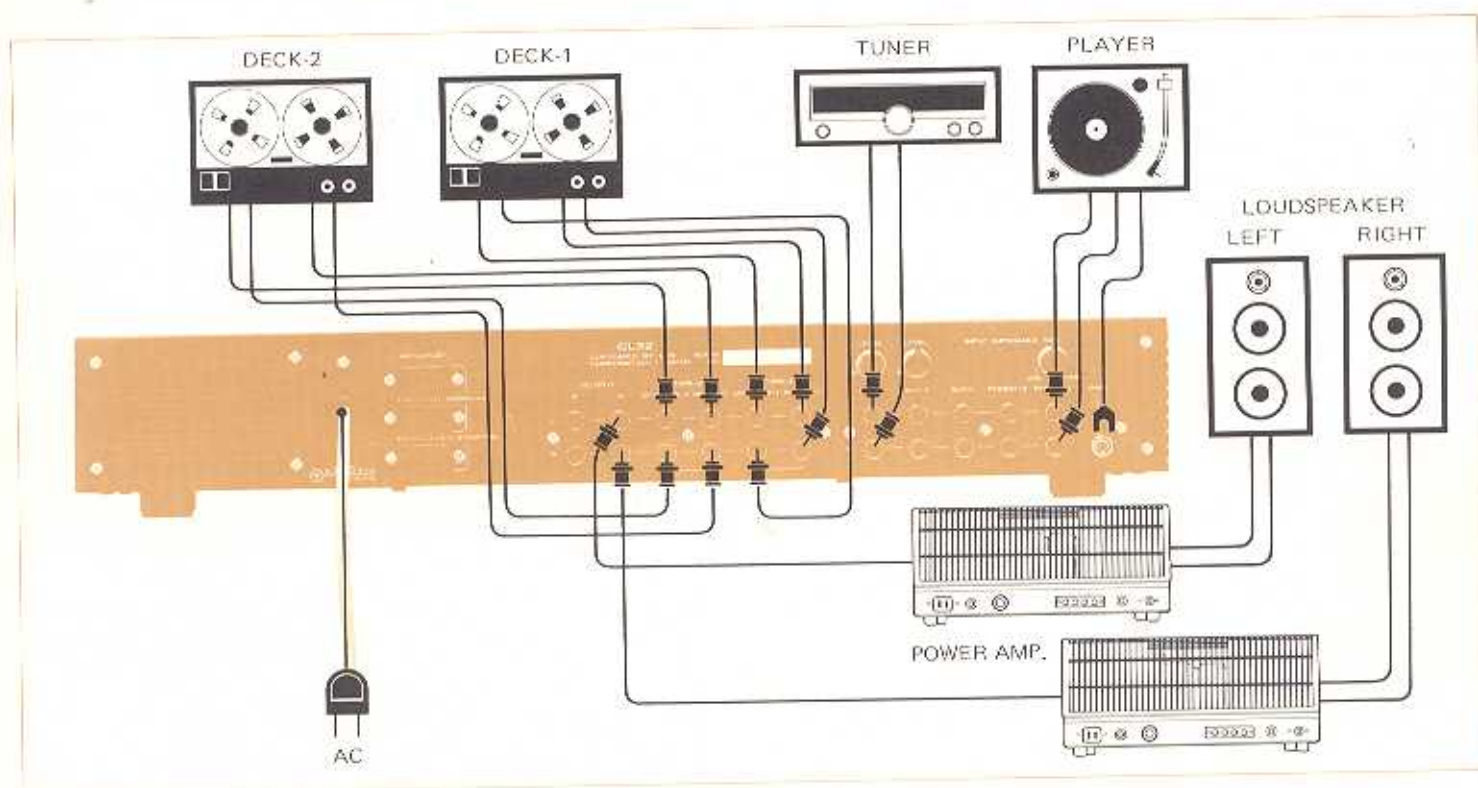
29. Earth Terminal (GND)

Connect an earth (ground) lead wire of record player (from motor or pick-up arm). This terminal can be used for grounding of this amplifier should it be necessary.





CONNECTION PROCEDURE



Basic Connections

This preamplifier controls all the other equipment in a Hi-Fi stereo reproduction system. However, it has no power section to drive speaker systems and it is necessary to combine it with an appropriate power amplifier. A stereophonic reproduction system is completed only when such program sources as record-player, tape-recorder and tuner are connected to the input side of this pre-amplifier, and a main amplifier with speaker systems is connected to the output side.

Connection to Input Terminals

Connect the relevant input terminals of this preamplifier to the outputs of tuner, record-player, or tape-recorder etc. As to the details see the items of playback of Disc, Tuner, Tape-Recorder.

Connection of Power Amplifier

Connection should be made by pin-jack cord (shielded wire) between input terminals of the power amplifier and one or two output terminals of this preamplifier. Be sure that correct phase matching is maintained between RIGHT and LEFT channels.

Connection of Speaker to Power Amplifier

Stereophonic playback is made with a pair of speaker systems for right channel and left channel. Right hand speaker system (viewed from the listener's position) should be connected to the right speaker terminals of power amplifier, while left speaker

system to the left terminals.

Note that perfect sound reproduction cannot be expected if the phase is not matched between both channels. To match the phase, connect the (+) terminal of the right hand speaker to (+) terminal in right channel and the (-) terminal to (-) one, and to do the same with left channel speaker. If mismatched for some reasons (for example mis-connection of speakers) low frequency range may be subject to deterioration.

Connection of AC Power Supply Source

As the final step of preparation, connect the amplifier to the AC power supply source. The plug of the AC cord should be connected to the AC power supply receptacle. Then, press the on/off switch and the pilot lamp lights up. The amplifier will function in some 35 seconds.

Connection Cable (Cord Wire)

For protection from external noise or inductance noise, shielded wire is used for connection. Usually, this shielded wire has a capacitance of approx. 100pF/m, that is to say, the use of connection cable gives the same effect as that of insertion of a capacitor in parallel with input or output circuits. This is a type of high-cut filter circuit which yields an unnecessary attenuation of treble range. The output impedance of recent tuner or tape-recorder etc is designed to be low enough, which offers little problem, but in the case of record players, the typical output impedance of MM-type cartridge is around 10K ohms at 10kHz. Use of the shortest wire is therefore recommended, especially on such high impedance equipment.



PLAYBACK FROM RECORD DISC

Connections

Generally a record player consists of a turntable ensuring constant rotation of the record disc, a pick-up (cartridge) whose stylus (needle) traces the sound groove of the disc converting the physical signal of the recorded sound into an electrical signal, and the arm which holds the cartridge.

The player has 2 cords with pin-plug at their ends for both right and left channels. Connect the pin-connectors to the input terminals [PHONO-1 (27) or PHONO-2 (26)]. A probable earth (ground) lead of player may be connected to the GND terminal (29). The AC cord of the player to drive its motor may be connected to the convenient extra AC outlet (14).

The CL32 is provided with 2 input terminals (PHONO-1 and PHONO-2) to be selected by the input selector switch (1), which is useful for comparison test of 2 pick-ups or using 2 record players.

Signal Path

Put the disc on the turntable, switch on the phono motor, and set the stylus on the groove of disc. Then recorded signals begin to be fed to the amplifier.

First the signals fed to the amplifier through PHONO terminals are brought to the equalizer section, where recorded signals are equalized and restored to the original frequency curve. Incidentally, this equalizer curve has been standardized to the RIAA curve. The equalized signals are then fed to the input selector switch (function switch). If this switch is not set at the correct position of PHONO, the signals are blocked here and no reproduction is possible.

Then the signals are divided into 2 channels. One line to the Reprint Switch, and the other to the Tape Monitor Switch. The signal to the reprint switch reaches to one or both of the two REC.DUT terminals selected by the Reprint Switch. If the Monitor Switch is set at the "SOURCE" position, the signals are sent to the Mode Selector Switch, Balance Control, Audio Attenuator, and Volume Control (former stage), but if at the "TAPE-1" or "TAPE-2" position the Monitor terminals start to function and the signals are stopped at this point. Except when tape playback is desired, the Monitor Switch must be kept at the "SOURCE" position.

Then the signals passed through the Monitor Switch are sent to the Volume Control and Balance Control. If the Audio Attenuator is at the "SIGNAL OFF" position, the signals cannot proceed ahead. Usually, it is necessary to set this attenuator at the "NORMAL" position. Then the signal goes forward to the Volume Control (latter stage) via the flat amp section and filter. Such controls as Filter, or the Linear Equalizer inserted in the flat amp, are for flexible and diversified adjustment of playback sound and do not block the signals completely. The volume control at the latter state is linked with that of the former stage to provide reasonable sound level, and the extreme counter-clockwise turn blocks the signal. The signal passed the latter volume control goes forward to the output terminal via the buffer amp and output selector. And the output selector must be set at the appropriate position.

The above is the feeding path of PHONO signals starting from input terminals to the output terminals. Difficult as it

may sound you can easily understand it from the attached block diagram. For your complete understanding of this amplifier, we recommend that you bear the block diagram in mind.

Playback Performance

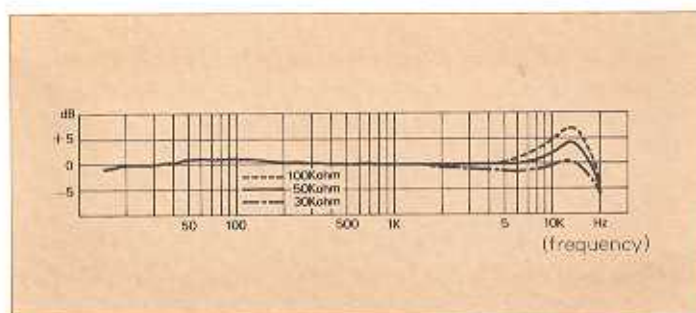
Now put a disc on the turntable for playback performance. As the volume control is turned clockwise from the cut position, playback sound comes out from speakers. As explained in the paragraph of Signal Path the sound playback is possible regardless of the position of Mode Selector etc. so long as these essential controls such as Input Selector Switch (1), Monitor Switch (2) Audio Attenuator (8), and Volume Control (12) are set at the correct position. Now all preparations have been completed.

Check if the volume levels on both right and left speakers are identical. If not, adjust them by means of the Balance Control. For stereophonic playback see to it that the Mode Selector Switch is kept at the "STEREO" position.

Input Impedance Adjuster

On the PHONO-1 terminal the input impedance is adjustable (30k - 100k ohms) by the Input Impedance Adjuster (28) provided on the back panel. Except for some special low impedance type pick-ups, almost all currently marketed pick-ups have recommended load impedances in the range of 30 - 100k ohms.

Among all, 50k ohms pick-ups are predominant. It is known that variation of the load impedance effects frequency response to large extent. The chart given here clearly illustrates an example - with a low load impedance treble output is lowered while with high impedance a peak is triggered at treble range. Degree of such effect is not the same among different pick-ups, but generally speaking the high the internal impedance of the cartridge the more delicately influenced. It is therefore necessary to make proper adjustment of input impedance with this control.





PLAYBACK FROM TAPE

Playback from Tape Monitor Terminal

Connect the output terminals (LINE OUT) of the tape-recorder to the Monitor terminals (17) or (19). Then set the Monitor Switch at the corresponding position to which the tape-recorder is connected, and playback from tape is realized. If 2 tape-recorders are connected to the terminals (17) and (19), selection between 2 tape-recorders is possible by means of the Monitor Switch.

This amplifier can be divided into 2 sections --- one before the Recording Output terminals (REC.OUT) and the other after the Tape Monitor terminals, and 3-head tape-recorder makes it feasible to make recording with the former section and simultaneously to listen to playback with the latter section.

Playback from TUNER/AUX Terminals

Connect the line output of tape-recorder or tape-deck to the TUNER/AUX terminals of this amplifier by use of pin-jack leads. Set the Input Selector Switch to the corresponding position to the TUNER/AUX terminals. All operations in this case are same with those for Playback of Tuner.

Note that when tape playback is made through AUX terminals the line input or AUX input terminals of tape-recorder should be kept free. If connected to the Recording Output terminals (REC.OUT) of the amplifier there will be possible oscillation by feedback of signals.

Recording on Tape

Recording

In case of playback of various program sources through input terminals of this amplifier, the same signals as those reproduced in speakers are always available at the Recording Output terminals (18, 20) if the Reprint Switch is at the "SOURCE" position.

By connection of these terminals to the input terminals (LINE-IN) of a tape-recorder you can enjoy simultaneous recording and playback. These recording signals are taken out before the Monitor Switch and there is no influence of such controls as Mode Switch, Balance Control, Volume Control, Audio Attenuator, Linear Equalizer, Filter and Output Selector.

Reprinting (DUBBING)

Connect the output terminals (LINE OUT) and the input terminals (AUX or LINE IN) of one tape-recorder to MONITOR-1 terminals and REC.OUT-1 terminals respectively, while the output and input of the other tape-recorder are connected to MONITOR-2 and REC.OUT-2 respectively. Simple operation of the Reprint Switch makes it possible to reprint the tape from one to the other or vice versa without reconnection of these pin-jack cords. Furthermore, operation of the Monitor Switch ensures listening comparison between the master tape and reprinted one.

Simultaneous Recording

This amplifier is provided with 2 sets of Recording Output

terminals (REC.OUT) enabling you to record simultaneously on 2 tape-recorders. The connection is the same as for reprinting of tape, and if the Reprint Switch is set at the "SOURCE" position an interchange of the Monitor Switch among "TAPE-1", "SOURCE" and "TAPE-2" makes it possible to compare the original sound and either of the recorded ones. The Reprint Switch must be kept at the "SOURCE" position. Otherwise, no signal is fed to one of the Recording Output terminals.

Simultaneous Playback Monitoring

3-head tape-recorder ensures Simultaneous Playback Monitoring enabling you to achieve perfect recording. In the case of a 3-head tape-recorder, heads and amplifiers for recording and playback exist independently in the circuit, which permits simultaneous recording on tape and playback of the sound recorded on the tape.

In this case recording on tape and playback of the recorded sound is practised at the same time, and connection must be made for both functions. Connect the Recording Output terminals (18) or (20) to the Line Input terminals (AUX input) of tape-recorder, and the Monitor terminals (17) or (19) to the Output terminals (LINE OUT) of the tape-recorder.

Set the Monitor Switch at the position corresponding to the terminals to which the tape-recorder is connected, and repetition of switching between "SOURCE" and "TAPE-1" or "TAPE-2" makes it feasible to compare the original sound with recorded one. Thus, possible recording error can be prevented in case of 3-head tape-recorder. Incidentally, note that reproduction of recorded sound is a little bit delayed as compared with that of original sound since there is a gap between the recording and playback heads.

PLAYBACK OF AM/FM PROGRAM

Playback of AM/FM Program

Connection of the output terminals of AM/FM tuner to the AUX terminal of this amplifier permits playback of AM/FM broadcasting program. You may connect either of the input terminals; TUNER, AUX-1, AUX-2. The Input Selector Switch must be set to the corresponding position.

As shown in the block diagram, the input signals from tuner are directly fed to the Input Selector Switch. Afterwards the signals trace the same blocks as explained in the paragraph of Playback from Record Disc, and are reproduced from the speaker systems through a power amplifier. Both for FM stereophonic and monaural broadcasting the Mode Selector Switch can be set at the position of "STEREO", for such accommodation to the input source can be made in the tuner.

In case of AM program there is possible trouble of modulation hum, which can be eliminated by varying the distance and angle of these components.

Level Set Control Volume

All AUX-1, AUX-2 and TUNER are same auxiliary input terminals for signals of flat frequency response, and TUNER and AUX-2 have a volume control just above the terminals. If the volume is turned to the extreme end of clockwise direction all these 3 terminals have the same input sensitivity (160mV,) while when these controls are turned fully counter-clockwise sensitivity is 5V.

When all 3 terminals are used, if the equipment of the lowest output is connected to AUX-1 and others are connected to

AUX-1 and TUNER, all 3 program sources can be set at the same input level.

Playback From Other Sources

The signals of flat frequency response from such sources as TV receivers do not need an equalizer stage. For playback of such audio equipment, either of the AUX terminals or the TUNER terminal can be used. Connection and operation is the same as those of a tuner.



OPERATION OF CONTROLS

Selection of Mode

This amplifier is for stereophonic reproduction and integrates independent amplifiers for 2 channels (right and left). Without the Mode Selector the signals fed to the right channel terminal is reproduced at the right channel speaker. The Mode Selector is placed between these 2 amplifiers to change the mode of reproduction.

knob position	connection		performance	use
	input	output		
STEREO	R → R L → L	R → R L → L	normal stereo playback	normal stereo playback
REVERSE	R → L L → R	R → R L → L	reversed stereo playback	when program source is reversely connected
MONO	R → R L → R	R → R L → L	right and left input signals are integrated	for playback of monaural record with a stereo phono pick-up

Control of Volume

Sound volume can be properly adjusted by means of the volume control. A precision detent-volume of high-grade attenuator type enables an accurate adjustment of attenuation of both the right and left channels. The variable resistor yields A type curve. In the attenuation characteristics of A type, turning angle is proportionate to attenuation degree of dB, and the dB value and the volume audible to human ears are in

the proportionate relation. That is to say, the rotation of knob is in proportion to the sound volume felt by human ears. The increasing degree of volume is therefore quite natural as the knob is turned on to the clockwise direction.

Control of Volume Balance

In case of deviation between the volume levels of right and left channels, adjust unbalanced volume level by means of the Balance Control (7). A complete turn of the knob to either clockwise or counter-clockwise directions cuts off the volume of the other end speaker.

The volume balance of both channels can be adjusted so that monaural disc sound reproduced by the stereo cartridge comes from the center, between right and left channels. Usually the volume will be equal when the click-stop position of the balancer is reached. If a program source has deviation of volume level between the 2 channels, establish correct balance with this balancer.

Operation of Linear Equalizer

Although recordings are equalized in accordance with RIAA standards, it is quite common to encounter variations in overall tonal balance from one recording to the next. In addition, differences in listening environment and room acoustics often require subtle degrees of tonal compensation that conventional tone controls cannot correct because of their wide range and overlapping crossover characteristics.

The Linear Equalizer control placed in the flat amp stage provides a new form of tonal compensation specifically intended for subtly augmenting regular tone controls.

Specifically, when the control is turned to the first "up-tilt" position, the entire response curve is rotated at 1kHz fixed axis, and it will decrease bass and increase treble by 0.75dB at 100Hz and 10kHz respectively, while selection of the second "up-tilt" position will result in a 1.5dB cut and boost at these same frequencies. Selection of the first "down-tilt" position provides 1.5dB of boost (at 100Hz) and cut (at 10kHz). Because of the inherently linear nature of this new circuit, it introduces no increase of harmonic distortion at any of its settings.

Operation of Filter Switch

The ultra low frequency noises caused by warping of disc, resonance of tonearm, wow and flutter, rumbling of phono motor and howling etc, mainly appear below 20Hz. Even if they are out of audible frequency, they move the speaker cone to cause harmful distortion. The filter of the CL32 eliminates such noises quite effectively.

When it is set at the "LOW CUT" position the low frequency range below 20Hz is cut off, while when set at the "SUBSONIC" position attenuation starts below 10Hz. This filter is designed to lower the level of signals which are out of the audible frequency range. Therefore it will never deteriorate the balance of the program source. At the "DEFEAT" position, the filter is bypassed to offer flat frequency response.

Operation of Audio Attenuator

This switch is usually set at the "NORMAL" position. If switched over to the "-20dB" position, the gain will be attenuated by 20dB (about 1/10). This feature is useful when subdued volume level is desired. At the "SIGNAL OFF" position signals are blocked here and no output is available regardless of VOLUME Control setting.

Also this can be used as a momentary speaker silencing switch in case of answering the phone etc. Avoid switching over to the "NORMAL" position at high volume level, since sometimes such loud momentary noise is reproduced as may destroy speakers. See to it that this switch is returned to the "NORMAL" position after using it for attenuation.



CIRCUIT DESCRIPTION

Equalizer Circuit

The equalizer circuit of control amplifier affects the tonal quality in the case of disc-reproduction. Therefore it is not too much to say that the performance of a control amplifier thoroughly depends on the circuit-design of the equalizer stage. Whatever circuit configuration it may be, the following items are at least indispensable to realize excellent equalizer circuit; to improve S/N ratio as much as possible, since it handles microscopic signals; to obtain precise RIAA compensation curve; to secure high stability against severe load condition connected thereafter; to be low in distortion through any audible frequency range; to realize excellent input overload characteristic which can match to any type of cartridge or to extremely wide dynamic range.

The type of the equalizer circuit may be classified into the CR type and NF type. Usually the products of famous brands carry NF type. Some audiophiles tend to make up CR type, but in case quite same condition is applied to the section that relates to the sound quality, these two different types may considered to be the same.

In designing the CL32, we have studied both NF and CR types and found that in the case of CR type tube amplifier, it is rather hard to improve the S/N ratio realizing satisfactory characteristics. Therefore our conclusion is that NF type is more advantageous.

Fundamentally, the equalizer stage adopts 3-stage K-K-NF type. (Negative feedback is applied from the cathode of the output tube to that of the first stage.) Usually, in this configuration, the cathode follower is used at the output stage, but for the CL32, adopted is SRPP (Shunt Regulated Push Pull) circuit. (As for the distortion, this is far superior to conventional 3-stage K-K-NF type.)

At the output stage, adopted is the SRPP circuit, which is equivalent to cathode-follower in operation, and offers no gain. It produces high output voltage and further the distortion characteristic is better than that of cathode-follower. Of course input impedance is high and output impedance is low.

Fig. 2 (A) shows conventional cathode-follower and (B) shows the SRPP circuit adopted in the CL32. For the SRPP circuit, V2 is placed instead of the cathode-follower R_k . And the grid of V2 is controlled by the reverse-phased input from the V1 output voltage, therefore this circuit configuration can be regarded as a sort of cathode-follower.

In this case V2 operates not only as a cathode resistor but to compensate the non-linear operation of V1 to improve the linearity at the output stage. And the distortion is much improved comparing with that of conventional cathode-follower. The high input impedance is ideal for the load condition at the second stage, which contributes to improve the overload characteristics. On the other hand, the low output impedance ensures high stability against severe load condition connected thereafter.

At the first and second stages, specially selected 12AX7's of low noise type are adopted for better signal-to-noise ratio. Our most careful attention is paid to the operating point of these stages to offset the wave-form distortion. In addition, the plate of the second stage is direct coupled to the grid of the output stage, thus suppressing the time-constant circuit down to the minimum. A minor feedback is applied from the output stage to the plate of the first stage to improve the inherent characteristic. All of these contribute to realize excellent distortion characteristic of the entire equalizer circuit.

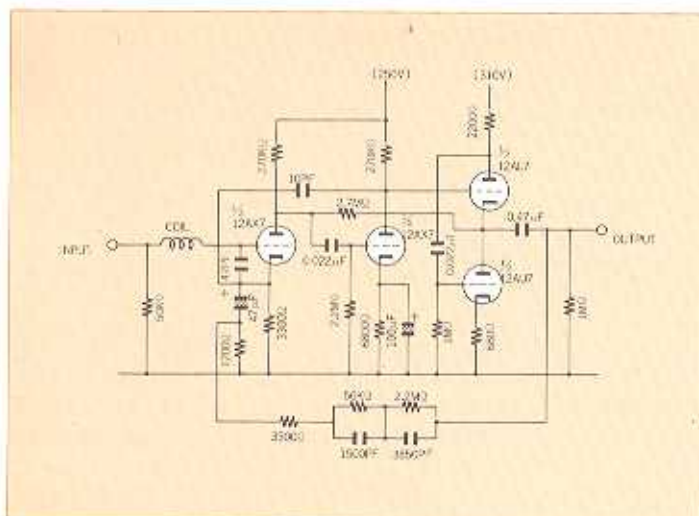


Fig. 1

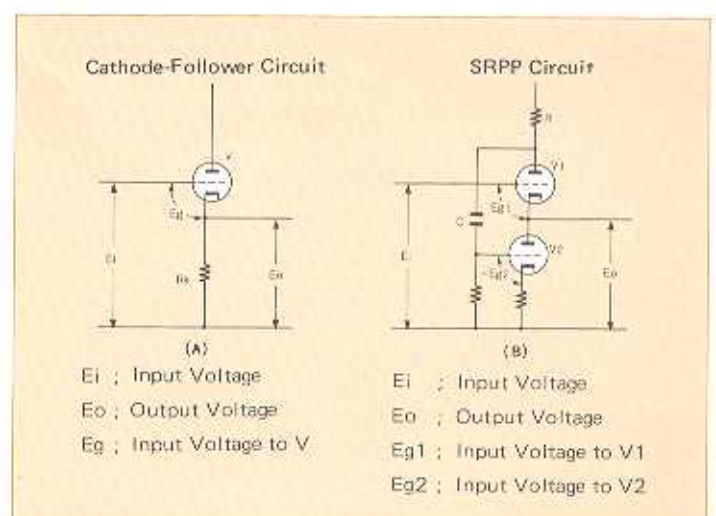


Fig. 2

[Flat Amplifier & Linear Equalizer]

The flat amp section offers 22dB gain (approx. 13 times) by means of 2-stage configuration of triode. Reasonable total gain is obtained by use of B-type balance volume (6dB attenuated at the center). In case the high gain is unnecessary with the configuration, it is inevitable that the amount of negative feedback increases, and incidentally the resistor for the feedback gets small. The resistor is considered to be in parallel with the load resistance to the plate of the second stage tube, which reduces distortion at high output level.

Therefore by arranging the balance volume which has large insertion-loss, reasonable total gain is realized without much reducing gain of the 2-stage amp. Also at this point a plate-to-plate minor feedback is applied between the 2 stages to improve the inherent characteristic, thus realizing excellent distortion characteristic.

The flat amplifier section originally operates as an amplifier of flat frequency characteristic, but the one of the CL32 offers some linear-sloped frequency response by selecting the feedback elements in the plate circuit. We call this circuit a Linear Equalizer.

[4-gang Volume]

Usually, 2-gang volume is used for the volume control of preamplifier. Its insertion point is conventionally just before or after the flat amp section. When placed after the flat amp, it is effective with respect to residual noise, but on the contrary it is ineffective with respect to overload characteristic, and vice versa when placed before the flat amp.

In this case good 4-gang volume is placed both near at input and output, realizing practical higher-level signal-to-noise ratio, and good overload characteristic at the same time. Therefore, the CL32 adopts a 4-gang detent volume. 31 points are provided from 0 to -50dB, and further "∞" range. This arrangement contributes to improve the signal-to-noise ratio at the actual use, and further prevents overload characteristic from deterioration. Of course the residual noise is perfectly eliminated at the extreme counter-clockwise turn.

[Filter Circuit]

It is necessary to have sharp cut-off characteristic as much as possible when ultra low frequency noise is required to be removed without affecting the audible frequency range. For this purpose it is easy to adopt NF type circuit with active elements. But for the CL32 we adopted a "TWIN-T" type circuit which can be composed only by capacitors and resistors, since we want to eliminate active elements as much as possible, possible.

Fig. 3 shows typical "TWIN-T" filter circuit, which can attenuate a certain frequency range sharply, but has such attenuation characteristic as shown in the fig. 4. In order to improve the filter effect even more, a single stage RC type filter is combined thus realizing an effective filter to remove super low frequency in overall characteristics.

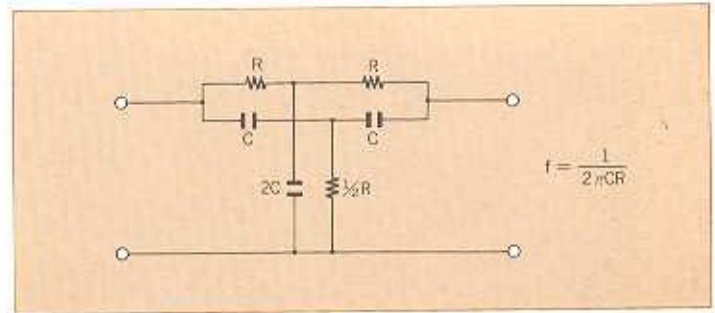


Fig. 3

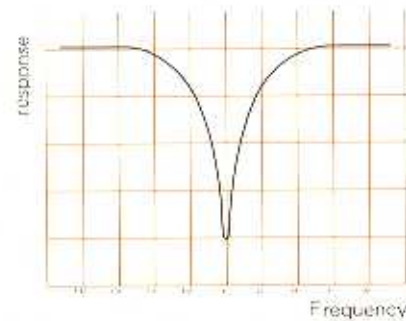
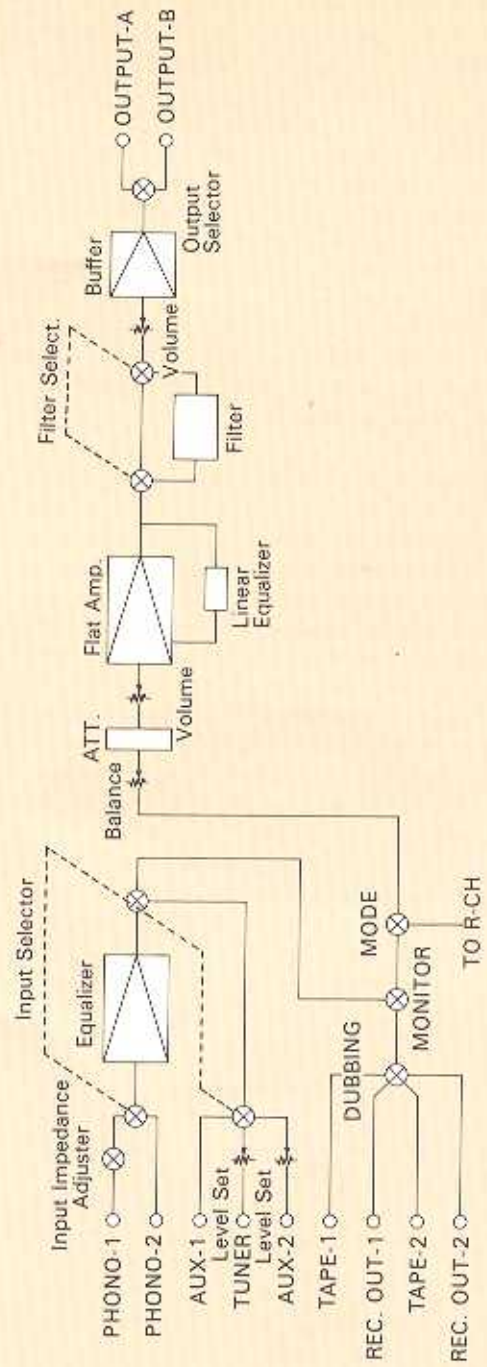


Fig. 4



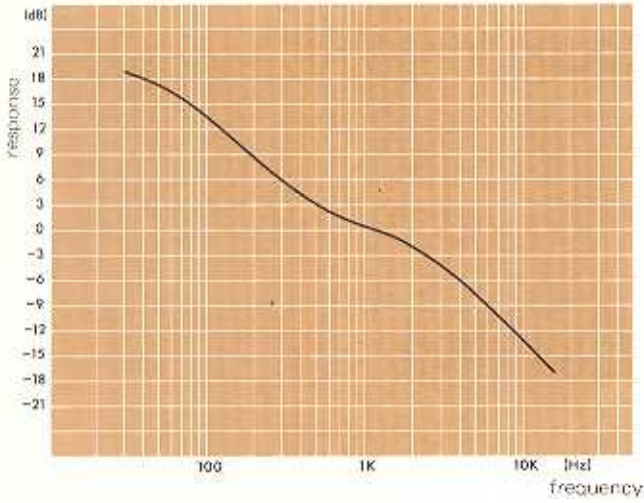
BLOCK DIAGRAM



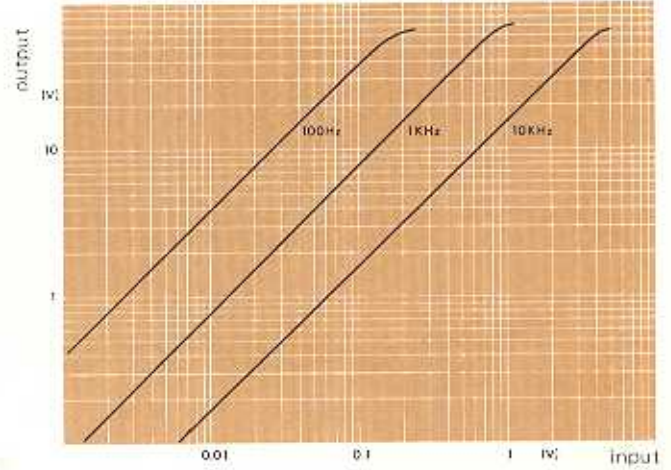


STANDARD CURVES

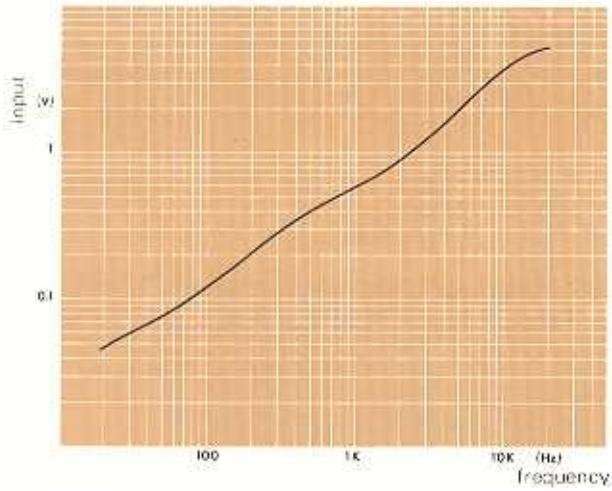
Equalizer (RIAA)
(output ; REC. OUT)



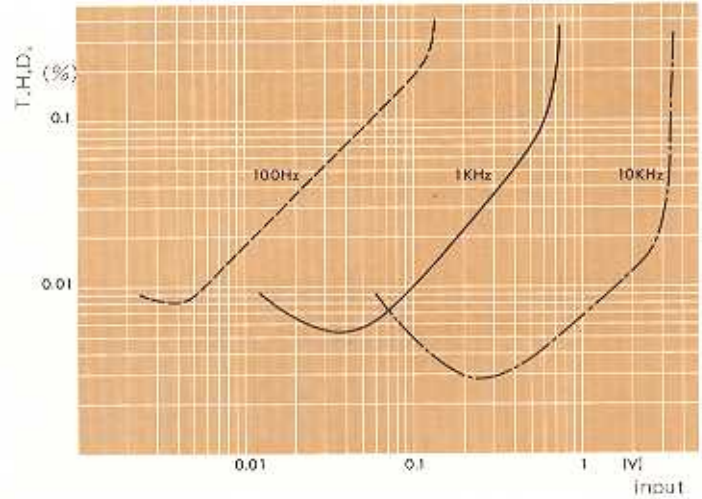
PHONO Input vs. Output
(output ; REC. OUT)



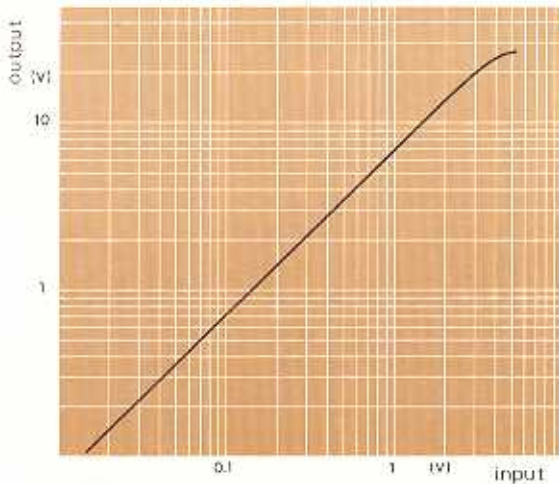
PHONO Overload
(output ; REC. OUT)



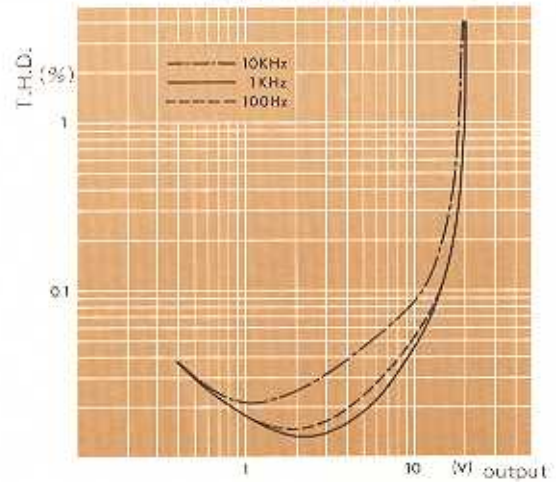
PHONO Input vs. T.H.D.
(output ; REC. OUT)



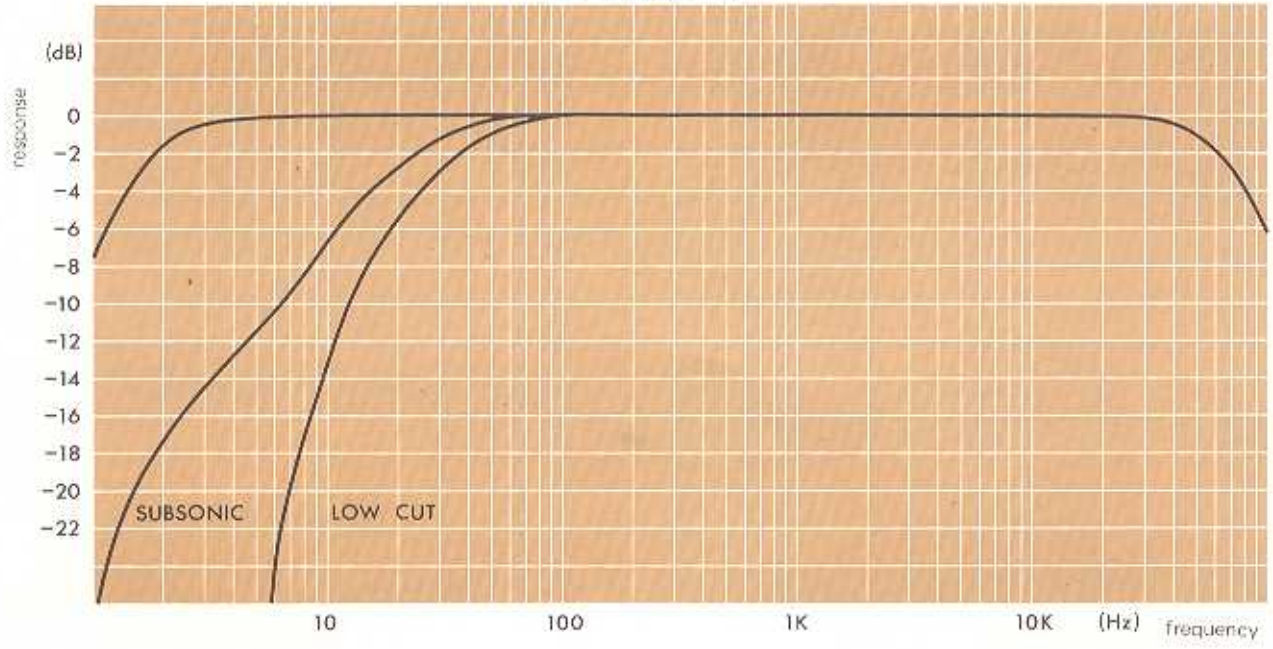
AUX Input vs. Output
(output ; PRE. OUT)



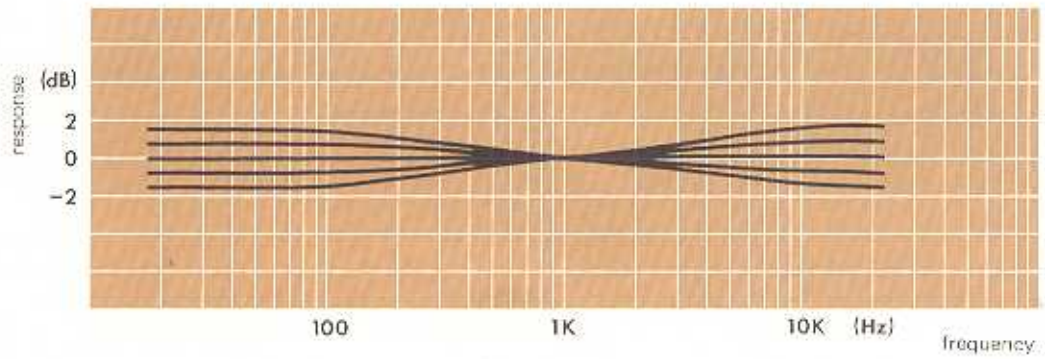
AUX Output vs. T.H.D.
(output ; PRE. OUT)



Frequency Response/Filter
(output : PRE, OUT)



Linear Equalizer





SPECIFICATION

Output Voltage:	1V (typical) 15V (max., distortion no more than 0.3%)
Total Harmonic Distortion:	no more than 0.03% (output 2V, 20Hz - 15kHz)
Frequency Response:	10Hz - 40,000Hz (-1dB)
Output Impedance:	600-ohm (pre out), 560-ohm (rec. out) (at 1kHz)
Input Sensitivity: (output 1V)	PHONO-1; 2mV PHONO-2; 2mV TUNER; 160mV - 5V (variable) AUX-1; 160mV AUX-2; 160mV - 5V (variable) TAPE-1; 160mV, TAPE-2; 160mV
Input Impedance:	PHONO-1; 30 - 50 - 100k ohms (variable) PHONO-2; 50k ohms TUNER; 100k ohms AUX-1; 200k ohms AUX-2; 100k ohms TAPE-1; 200k ohms TAPE-2; 200k ohms
Signal-to-Noise Ratio:	PHONO; better than 74dB (IHF, "A" network) TUNER; better than 89dB (IHF, "A" network) AUX; better than 89dB (IHF, "A" network) TAPE; better than 89dB (IHF, "A" network)
Phono Overload Voltage:	more than 400mV (1kHz, RMS)
RIAA Accuracy:	± 0.3dB (30Hz - 15kHz)
Crosstalk:	better than 60 dB (1 kHz)
Additional Features:	Linear Equalizer (up tilt; 2 points, flat, down tilt; 2 points), Filter (low cut, flat, subsonic), Tape Monitor (tape-1, source, tape-2), Tape Dubbing (1 to 2, source, 2 to 1), Input Impedance Adjuster (phono-1, variable), Input Level Set Control (tuner, aux-2), Audio Attenuator (-20dB, normal signal off), Pre-Out Selector (A, A+B, B), Extra AC outlet (SWITCHED x 2, UNSWITCHED x 1)
Tubes:	12AX7/ECC83 (5), 12AU7/ECC82 (2)
Transistors:	2SC735 (2), 2SD234 (1), 2SC562 (1)
Diodes:	RA-1 (4), S5VB (1), BZ-130 (1), WZ-054 (1), 1S2471 (4)
Power Consumption:	40W
Dimensions:	438(W) x 322(D) x 77(H) (17-1/4" x 12-11/16" x 3-1/32")
Weight:	Net 5.7Kgs (12.5 lbs.) Gross 7.0Kgs (15.4 lbs.)

Specification and appearance design subject to possible change without notice.



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