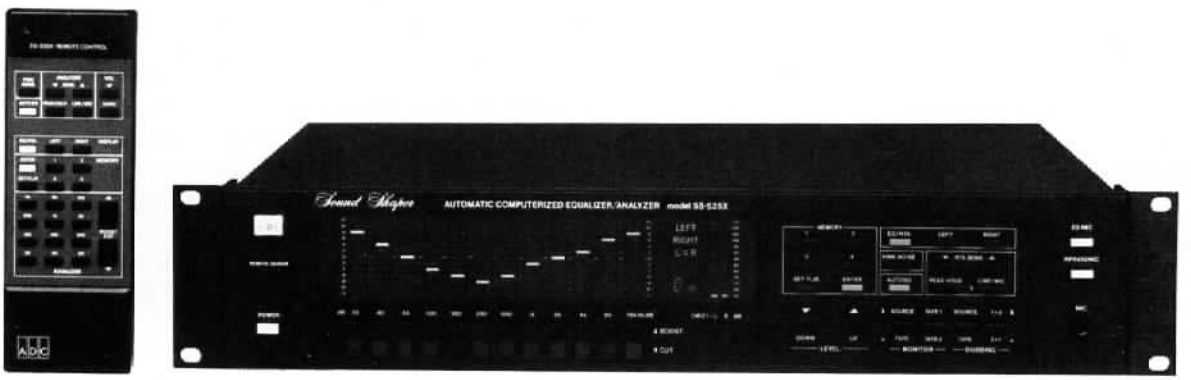
ADC

Sound Shaper®

Automatic Computerized Equalizer/Analyzer

SS-525X

Owner's Manual



Features

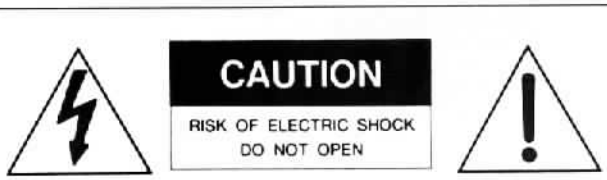
The ADC model SS-525X combines a microprocessor-controlled 12 band equalizer (EQ), a real-time analyzer (RTA), a pink-noise generator, an automatic equalizer, and a sound pressure-level meter into one unit. (And it comes with a calibrated microphone.)
Twelve rocker type electronic switches control the ±12 dB boost or cut response at each of twelve frequency ranges. The center frequencies are arranged in such a way that those at 250 Hz and above are exactly one full octave apart from each other, and below 250 Hz frequencies are only two-thirds of an octave apart. This arrangement gives you increased control of critical low frequency response, making the SS-525X especially useful when used with today's advanced digital equipment.
The SS-525X's automatic equalizer (AUTO EQ) can automatically produce an EQ curve to flat the sound for your speakers with the listener at the microphone's location. It "hears" pink noise generated by the built-in generator and "thinks" about what it is hearing and adjusts the EQ curve to get what it hears flat.

The other features of the SS-525X include:
- Large flourescent display, dominating the front panel, functions as a frequency equalizer display or as a spectrum analyzer display with the resolution of 2 dB in both modes.
- Separate channel output level display calibrated to 1V at 100 dB.
- LEFT/RIGHT buttons let you choose either the left or right channel, or a composite of both, and view the selected setting both in the EQ or RTA mode.
- SET FLAT button quickly makes the equalizer's band flat.
- Four memory buttons for four custom settings let you recall a pre-equalized response instantly.
- RTA SENS(itivity) buttons let you adjust the overall height of the RTA display.
- Bidirectional tape dubbing and equalized-response recording/dubbing.
- Output LEVEL up/down buttons and an infrasonic filter.
- Clip-type condenser microphone is attached.
- Full function remote control.

In the space provided below, record the serial number of your unit, located on the back of the cabinet. The attached microphone has the same number.

Unit description
AUTOMATIC COMPUTERIZED EQUALIZER/ANALYZER Sound Shaper SS-525X

Serial No. _____
Retain this number for future reference.



CAUTION

TO REDUCE THE RISK OF ELECTRIC SHOCK, DO NOT REMOVE COVER (OR BACK). NO USER-SERVICEABLE PARTS INSIDE. REFER SERVICING TO QUALIFIED SERVICE PERSONNEL.

This symbol is intended to alert you of the presence of uninsulated dangerous voltage within the unit's enclosure that may be of sufficient magnitude to constitute a risk of electric shock to persons.

This symbol is intended to alert you of the presence of important operating and maintenance instructions in the literature accompanying the unit.

WARNING

TO PREVENT FIRE OR SHOCK HAZARD, DO NOT EXPOSE THIS APPLIANCE TO RAIN OR MOISTURE.

CAUTION: TO PREVENT ELECTRIC SHOCK DO NOT USE THE POLARIZED PLUG WITH AN EXTENSION CORD, RECEPTACLE OR OTHER OUTLET UNLESS THE BLADES CAN BE FULLY INSERTED TO PREVENT BLADE EXPOSURE.

ATTENTION: POUR PREVENIR LES CHOCS ELECTRIQUES NE PAS UTILISER LE FICHE POLARISEE AVEC UN PROLONGA TEUR UNE PRISE DE COURANT OU UNE AUTRE SORTIE DE COURANT, SAUF SI LES LAMES PEUVENT ETRE INSEREES A FOND SANS EN LAISSER AUCUNE PARTIE A DECOUVERT.

Installation

As with other quality sound equipment, adequate ventilation will extend the trouble-free life of your equalizer. You should not install this unit in an overly confined area along with other heat generating equipment.
An unswitched AC outlet is available on the rear panel of your unit for connecting other sound equipment accessories and is limited to 200W maximum.
Connect the line cord to an AC outlet providing the proper AC voltage. The power consumed is 25W and if available, the switched accessory outlet of your amplifier may be used to turn the unit on or off with your sound system's main power switch.

About beep tone

When any of the buttons of MEMORY (⑧, page 6) through LEVEL (⑱, page 7) is operated, beep tone will sound to indicate that the entry is accepted by the unit. However, a continued beep sound in the auto-EQ mode represents that the auto-EQ has failed to operate due to the pink noise level being too low.
Refer to Page 16, ⑪ for the proper pink noise level adjustment and retry.

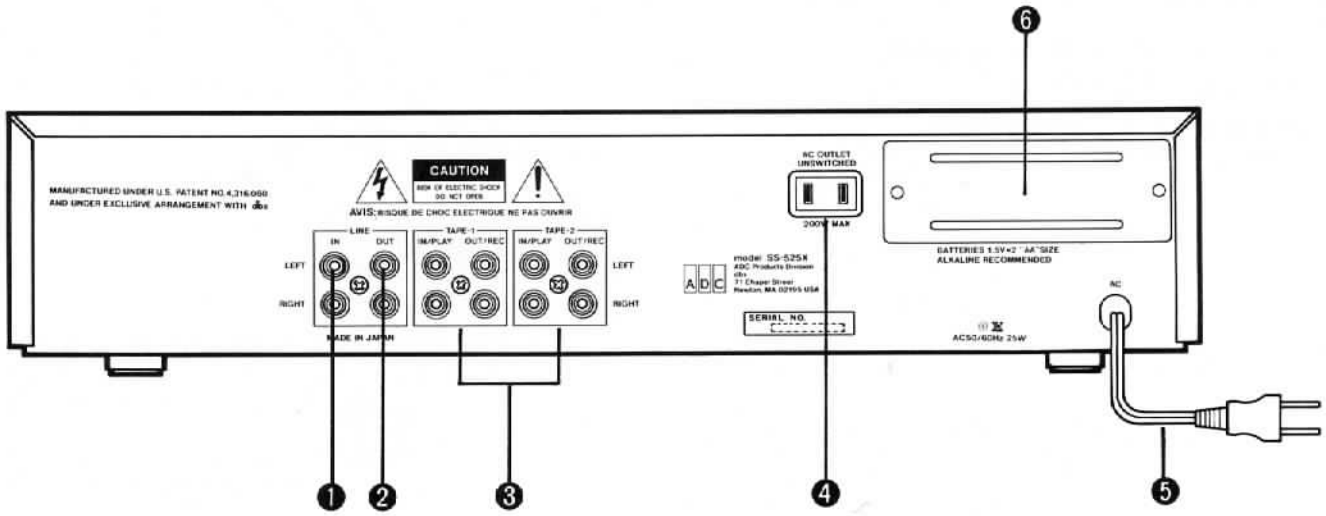
Important .... Before Operating the Equalizer

All equalizers are designed for 'unity gain', in other words, the level of signal output is the same as the level of signal input **when the level of frequency bands are set to 0 (FLAT).**
If one or several frequency bands are boosted in either or both channels (stereo), the output level from your equalizer will increase within the range of frequencies affected by those controls, thereby increasing the sound level or power output of your amplifier. Depending on the master volume control setting, this can result in over-driving of the power amplifier and/or speaker system and incurring possible damage.
It is suggested that you reduce the master volume control setting of your sound system before switching the equalizer in or out of the system and then restore the master volume control setting to your listening preference.
Do not use the equalizer to increase volume, it is not an amplifier, it is designed to tailor the frequency response of your system, either to your personal preference or help correct deficiencies of the sound system or room acoustics.

Connections

Turn your system off and the volume all the way down. "Preamp" stands for your preamplifier, receiver, or integrated amplifier.

The SS-525X has its own tape monitor loops to replace the ones it occupies.



❶ LINE IN jack
These jacks receive the signal from your preamp. Connect your preamp's "Tape Out*" to these inputs.

❷ LINE OUT jack
These are the outputs of the equalizer circuitry. Connect these jacks to your preamp's "Tape In*".

* Note that with some components, "Tape Out" is called "Tape Rec" and "Tape In" is called "Tape Play" or "Tape Monitor," and there are other variations.

❸ TAPE-1/TAPE-2 (IN/PLAY and OUT/REC) jacks
This, of course, is where you connect your cassette deck(s) and/or your reel-to-reel recorder(s). The hookup is simple. Connect the SS-525X's TAPE (1 or 2) OUT/REC jacks to the INPUT on your deck, and return its OUTPUT to the SS-525X's TAPE IN/PLAY (same loop number as going out, naturally).

❹ AC OUTLET UNSWITCHED (200W MAX)
The AC OUTLET receptacle may be used to power the one of associated equipment regardless of the POWER button. Plug the power plug from the associated equipment into this receptacle.
Important! Do not plug in any equipment with the rated power consumption greater than 200W.

❺ Power cord
Connect this cable to the appropriate power source. If another piece of equipment has a switched outlet (your preamp, for instance), that's one good place to plug in.
Warning: Be sure to remove the power cord from the AC outlet before changing the setting.

For PX version: If you ever need to change the voltage setting, unscrew the small voltage cover plate near the ac cord, move the switch with a small driver, turn the plate upside down (180°, in other words, which exposes the switch in its new voltage position), and screw it back on.

❻ Batteries
When the power is off or the AC cord is unplugged, the batteries inside keep the memory intact (the SS-525X remembers all other settings too). To replace them, refer to "Replacing the batteries", next page.

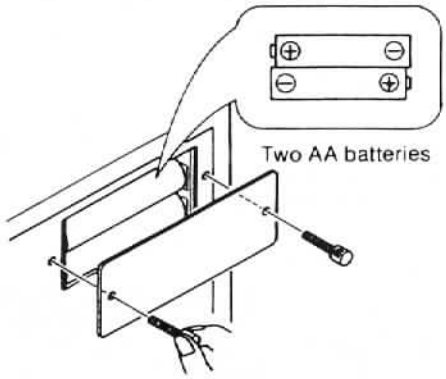
Typical Hookup

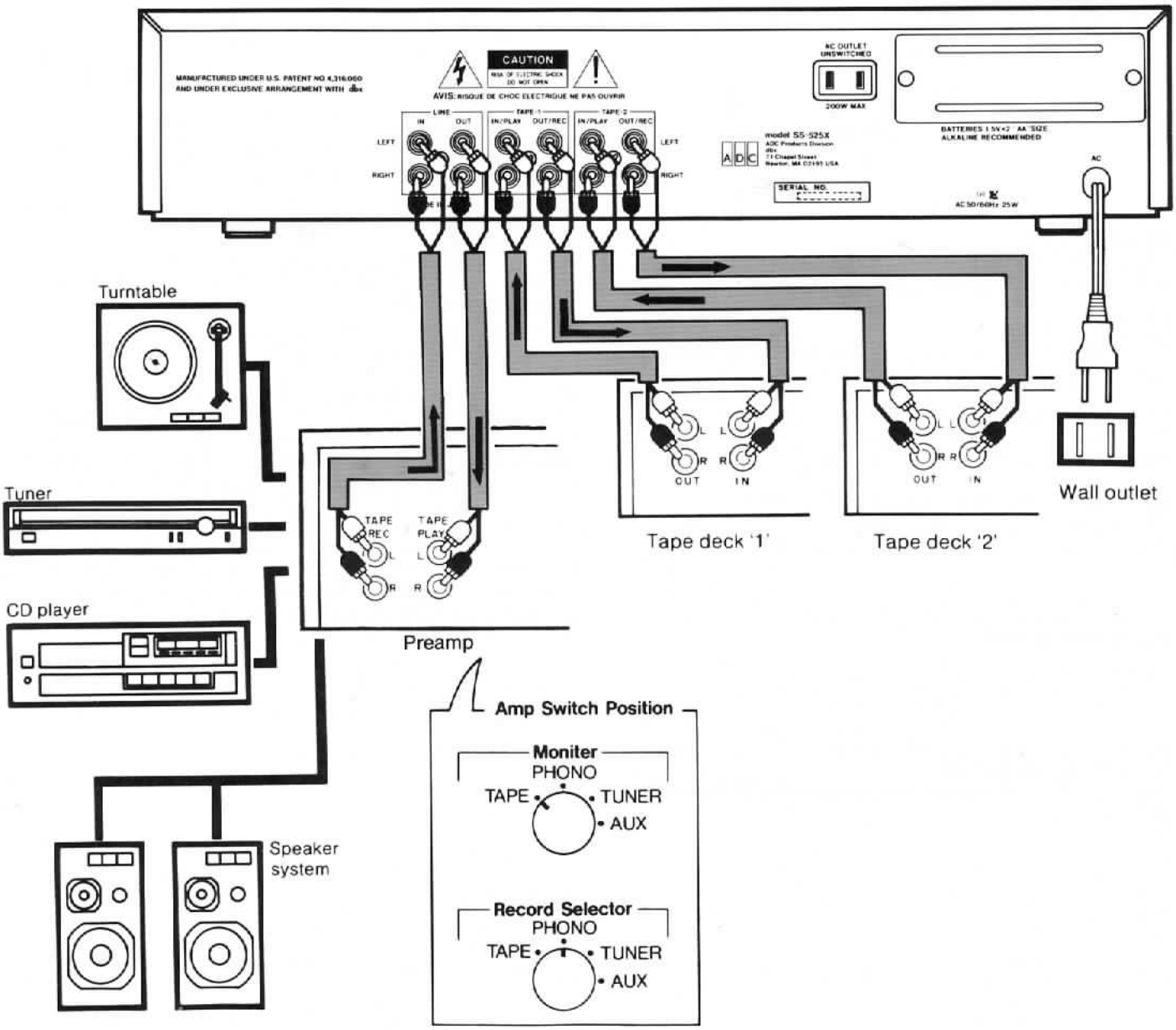
The SS-525X goes in the preamp's tape monitor loop, as shown. The tape deck(s) then go in the SS-525X's tape loops.

Power requirements
Power requirements for electrical equipment differ from area to area.
Please ensure that your unit meets the power requirements in your area.
If in doubt, consult a qualified electrician.

100V, 50/60 Hz for Japan
120V, 60 Hz for U.S.A. and Canada
220V, 50 Hz for Europe except U.K.
240V, 50 Hz for U.K. and Australia

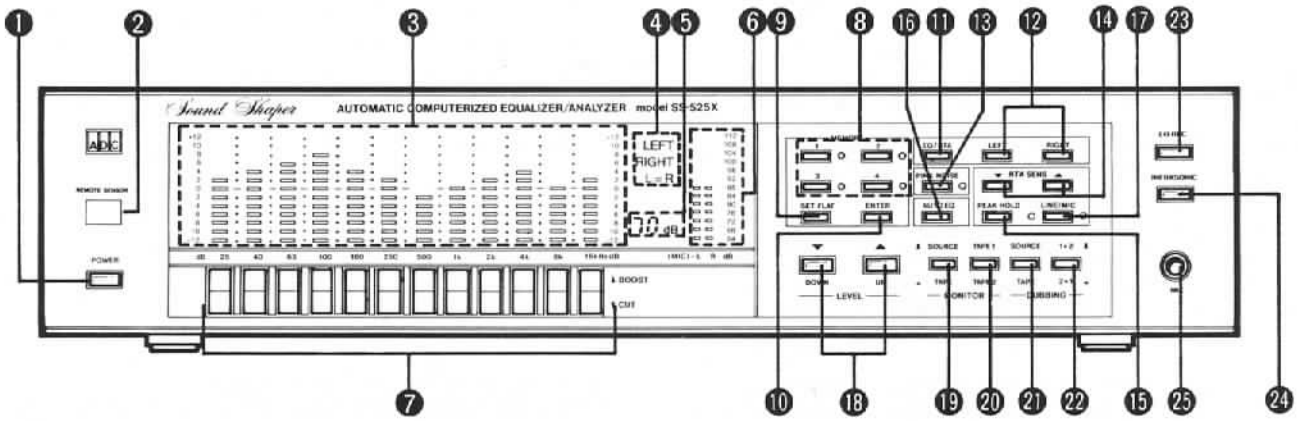
Replacing the batteries
Remove the cover by loosening the knurled thumb-screws to expose the two supplied AA (penlight) alkaline batteries. Replace with the same type. Keep the AC power on to preserve the memory during replacement.





** The SS-525X is connected to TAPE terminals of a preamp. To play or record through the equalizer, set the amp's MONITOR switch to TAPE and the RECORD switch to the desired program source (PHONO, for instance).*

Controls and functions



R/C : The remote control duplicates the basic functions.
Beep : Pressing the button causes beep.

❶ POWER button
Depress to turn the unit on or off. The "ADC" emblem above the button is illuminated when the unit is on.

❷ REMOTE SENSOR
Through this window the unit receives the commands from the remote controller. Do not block here or the remote control function will not work.

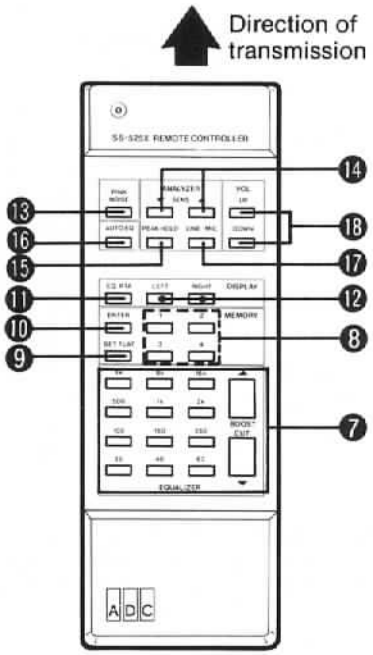
❸ Frequency response display
A fluorescent display consisting of bar or bar-graph indicators numbered in 2 dB resolution. In the EQ mode, it shows the equalization curve by means of twelve bars; in the RTA mode, it shows the frequency content of the program by twelve rising and falling bar-graphs as a spectrum analyzer.

❹ Channel indicator
Indicates the channel of the equalizer or analyzer. The L = R indicator lights when the equalization curves for left and right channels are identical.

❺ Sensitivity indicators
In the RTA mode, this indicates the sensitivity of the spectrum analyzer from 60 dB to 110 dB in 10 dB step (with 100 dB equaling 1V rms for 0 level). In the EQ mode, this indicates 0 dB.

❻ Output level L/R indicators
When the LINE/MIC button is set to LINE, bar-graph indicators show the output level of each channel, with 100 dB equaling 1V (rms). When the LINE/MIC button is set to MIC, the signal from the microphone is indicated on the left channel output indicator only.

❼ Equalization BOOST/CUT switches R/C Beep
Each of these electronic rocker switches increases or decreases the amplitude of its frequency band ±12 dB in 2 dB steps. When either the LEFT or RIGHT indicator is on, they affect only that channel; when both are on, they affect both channels.
To adjust from the remote controller, press the desired frequency button and press the BOOST or CUT button.



❽ MEMORY/1-4 buttons/indicators R/C Beep
Each button stores and recalls a stereo pair of equalization curves. The curve for each channel may or may not be identical with the other. The red indicator lights up at pressing of the corresponding button.

❾ SET FLAT button R/C Beep
This button resets the equalizer's bands (of both left and right channels at a time) to their center (0 dB) positions so the signals are unequalized. Pressing it doesn't affect any equalization curves actually stored in the MEMORY/1-4 buttons.

❿ ENTER button R/C Beep
This allows you to store any displayed curve in memory. Once the desired curve is produced by the frequency BOOST/CUT switches, press the ENTER button and one of the MEMORY buttons (1-4) where you want the curve stored. Any previous curve stored in that location will be erased.

⓫ EQ/RTA button R/C Beep
Pressing this button selects the RTA mode or EQ mode. When this button is operated for the RTA mode, the indicator shows the frequency spectrum by the bar-graph indicators. When this button is operated for the EQ mode, the indicator shows the EQ curve by the twelve bars. The equalizer adjustment can be made during the RTA mode.

⓬ LEFT/RIGHT buttons R/C Beep
If you press the LEFT button, the display shows the equalization curve or frequency spectrum of the left channel (the LEFT indicator in the upper-right corner also lights). If you press the RIGHT button, it's the right channel equalization curve or frequency spectrum of the right channel (the RIGHT indicator lights). Pressing both buttons at a time (lighting the both LEFT and RIGHT indicators) shows the average of the two curves or the average spectrum of both channels. This doesn't affect the actual equalization on each channel. (When the equalization curves for the left and right channels are identical, the L = R indicator lights.)

⓭ PINK NOISE button/indicator R/C Beep
Press this button (while the MONITOR SOURCE/TAPE switch is set to SOURCE) and pink noise will go out from the LINE OUT jacks. The channel on which the pink noise is fed is determined by the LEFT/RIGHT buttons. Pink noise offers a constant frequency spectrum of noise.

⓮ RTA SENSitivity UP/DOWN buttons R/C Beep
Allows you to adjust the sensitivity of the RTA display from 110 to 60 dB in 10 dB step so that you can obtain the easiest reading. As the number in the display increases, the sensitivity decreases.

⓯ PEAK HOLD button R/C Beep
When this button is pressed in the RTA mode, only the highest bars are fixed on the display. Press the button two times to cancel peak-holding. (It is also cancelled by switching the LINE/MIC button.)

⓰ AUTO EQ button R/C Beep
Plug in the microphone and locate it at a typical listening position. Turn on pink noise and raise it to a healthy level. Then press this button. SS-525X starts auto-equalizing to flat the sound. Press the button two times to cancel the auto-EQ. When the pink noise level is so small that the auto-EQ is impossible, warning is made with beep.

⓱ LINE/MIC button/indicators R/C Beep
To make an analyzer measurement of the signal from the microphone, operate this button to light the MIC indicator. When the button is operated to light the LINE indicator, the analyzer measurements are made from the LINE input on the channel selected by the LEFT/RIGHT buttons.

⓲ LEVEL UP/DOWN buttons R/C Beep
When the LEVEL/UP button is pressed until the beep stops, the equalizer provides "unity gain" which means that the level of signal output is the same as the level of signal input when all frequency bands are adjusted to be flat (0). When the LEVEL/DOWN is pressed, the output level of the equalizer is attenuated.
(This does not affect the recording output signals to tape decks, however.) While either button is pressed, the sensitivity indicator shows the output level.

⓳ MONITOR SOURCE/TAPE buttons
This button selects the source signal or output of the tape decks for monitoring. Set this button to SOURCE to listen to the LINE inputs (preamp output — tuner, phono, CD, etc.). Set this to TAPE to listen to the tape decks selected by the MONITOR TAPE1/TAPE2 button.

⓴ MONITOR TAPE1/TAPE2 button
This button selects the output of either of two tape decks connected to TAPE1 or TAPE2 jacks on the rear panel when the MONITOR SOURCE/TAPE is pressed (TAPE).

㉑ DUBBING SOURCE/TAPE button
This button is used to dub (copy) a tape program onto the other tape deck. Set this switch to the SOURCE position when recording the LINE inputs (preamp output, tuner, phono, CD, etc.) on the tape deck(s). Set this button to TAPE to dub from one tape deck to the other. The direction of dubbing is selected by the DUBBING 1 ► 2/2 ► 1 button. To make an equalized dubbing, the EQ REC button must be depressed.

㉒ DUBBING 1 ► 2/2 ► 1 button
This button selects the direction of dubbing. When this button is released, dubbing is made from TAPE1 deck to TAPE2 deck. Press this button to dub in reverse direction.

㉓ EQ REC button
This button is pressed to make an equalized tape recording or dubbing. While the EQ REC button is pressed, the equalizer doesn't affect monitor output.

㉔ INFRASONIC button
This button is used to switch in the subsonic filter which functions to attenuate the low frequencies below 15 Hz by −18 dB/octave and to eliminate low frequency hum or turntable rumble.

㉕ MICrophone jack
Connect the microphone supplied only.
Caution: Use the supplied microphone with the same serial number as the main unit. The use of other microphones (dynamic type etc.) will damage your system. (Never connect a headphone here!)

Using Remote Control

The Remote control trnasmitter supplied duplicates basic functions on the SS-525X. Simply aim the top of the transmitter at the REMOTE SENSOR proximity on the unit front panel and press the desired button.
Clear away obstacles between the transmitter and the REMOTE SENSOR of the unit.
The remote control range is approx. 24' (7m).

Battery Installation/Replacement
The detachable back plate of the transmitter covers the compartment to house two AA size batteries. Install the batteries as depicted in the compartment.
Do not leave the batteries when the transmitter is not used for a prolonged period of time. Replace the batteries if the indicator of the transmitter doesn't light up.

Using the Equalizer(EQ)

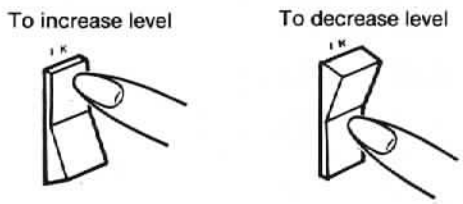
❶ Note that in order for your equalizer to be in operation — that is, in the signal path — the signal always has to be going to and from it. In other words, if you've connected the equalizer in the "Tape1" loop, leave the preamp set to monitor "Tape1." If your preamp is one of those that have separate input selector and "Rec Out" switches, leave the input selector knob or whatever on "Tape1" and choose the program source with the "Rec Out" knob.

❷ Confirm pink noise is off and set the MONITOR buttons to the position which you wish to listen to. Press the MONITOR SOURCE/TAPE button to listen to a tape program and select Tape1 deck or Tape2 with the MONITOR TAPE1/TAPE2.

❸ Using the EQ/RTA button and LEFT/RIGHT buttons
Press the EQ/RTA button for the EQ mode (The sensitivity indicator shows "0 dB").
To adjust the equalization applied to the left channel, press LEFT. You can view the left channel equalization curve on the display. To adjust the equalization applied to the right channel, press RIGHT. You can view the right channel equalization curve on the display. To adjust the left and right channels simultaneously, press LEFT and RIGHT at a time. You can view the average of the two curves on the display. (This doesn't affect the actual equalization curve.)
When the equalization curves for left and right channels are identical, the L = R indicator also lights.

❹ Press the SET FLAT button.

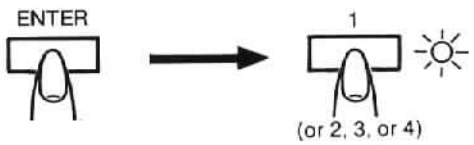
❺ Equalizer adjustment
The 12 electronic rocker switches permit the individual adjustment of each octave. Pressing upper part of them increases level; pressing lower part decreases level.



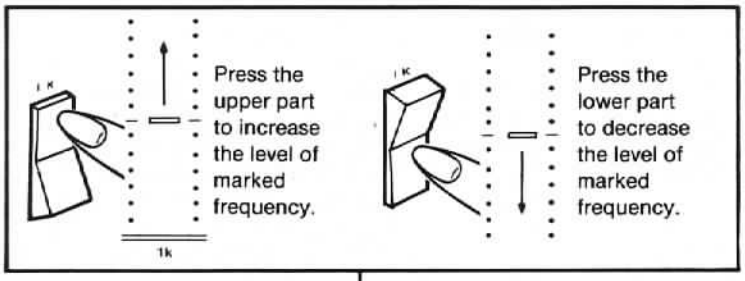
Their action accelerates as they are held. Of course, more than one switch may be pressed at a time. You can correlate what you see with that you hear; you will want to experiment with the different switches to remind your ear what the various frequencies actually sound like (but be careful with the volume). You can become a better-educated listener (and judge of speakers). Where is most so-called low bass? (Around 63 Hz-adds oomph. Boosting 25 Hz seldom does much.) "Thickness"? (100, 160 and 250 Hz — boomy, too. The 250 Hz area correlates also with "colored", "hollow" — but with a thump.) "Honkiness", "nasality"? (500-1k-2 kHz. The general sound is of congestion, but as you go higher, the sound assumes a "telephony" quality, too.) "Brightness"? (4 kHz. Don't forget that the ear is most sensitive in the 1-3 kHz area). "Air"? (8 kHz — also scrathy, sometimes spitty). The 16 kHz band fully increased can add sparkle, and fully decreased make a strong and effective scratch/hiss filter for some sources. The SET FLAT button returns any new setting to flat.

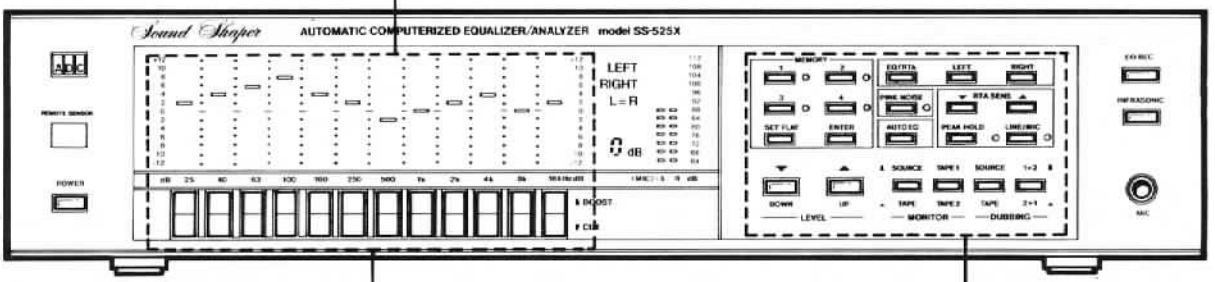
Separate channel equalization vs. simultaneous channel equalization
Studies show that it is this total power response, reflections included, which is most influential in our perception of spectral (tonal) balance. However, localization is determined primarily by direct sound. Equalizing two channels of a stereo system differently, therefore, can adversely affect stereo imaging. So for most cases where speakers are similarly loaded into the room (symmetrical environments etc.), we recommend using the SS-525X to apply the same curve to both speakers, by pressing the LEFT/RIGHT buttons at a time (lighting LEFT and RIGHT indicators) and by adjusting the EQ curve until the L = R indicator lights. For different environments and/or different speakers in a pair, you probably will want to do them separately, by pressing either the LEFT or RIGHT button, lighting the corresponding indicator.

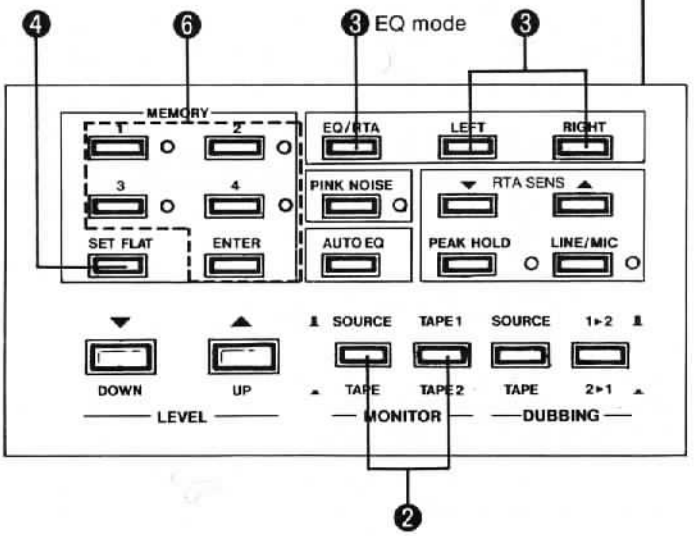
❻ Entering curves into memory
Once you have a desired curve by adjusting the equalization BOOST/CUT switches, press the ENTER and one of the MEMORY buttons(1-4), where you want the curve to be located. Whichever MEMORY you choose for the new curve will have its old curve erased, of course. Comparisons among curves or between a curve and no equalization (SET FLAT) are simple and instantaneous.



If you desire, you can change the left or right channel equalization only of a stored curve pair. e.g. To change the right channel curve to a new curve, press RIGHT (lighting the RIGHT indicator in the display). Set a new equalization curve. Press ENTER. Press the MEMORY/1 button (lighting the 1 indicator). Now the right channel curve has been changed to new one while allowing the left channel curve remaining the same.


Press the upper part to increase the level of marked frequency.
Press the lower part to decrease the level of marked frequency.
1k
1k


Sound Shaper
AUTOMATIC COMPUTERIZED EQUALIZER/ANALYZER model SS-525X
LEFT
RIGHT
L=R
dB
5


4
6
3 EQ mode
3
MEMORY
1
2
3
4
SET FLAT
ENTER
EQ/RTA
LEFT
RIGHT
PINK NOISE
AUTO EQ
RTA SENS
PEAK HOLD
LINE/MIC
DOWN
UP
LEVEL
SOURCE
TAPE1
TAPE2
MONITOR
SOURCE
1▸2
TAPE
2▸1
DUBBING
2

Using the Real-Time Analyzer(RTA)

Real-time analysis of LINE inputs

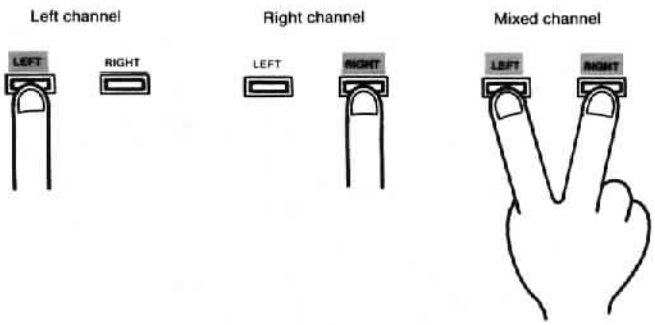
To analyze the program from the preamp, etc., turn the program up to a comfortable listening level.

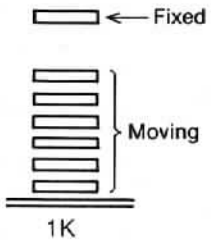
❶ Set the EQ/RTA button for the RTA mode (the sensitivity indicator shows 60-110 dB). To make an analysis on the mixed channels press the LEFT and RIGHT buttons simultaneously (lighting both LEFT and RIGHT indicator). The equalizer adjustment can be made during the RTA mode.

❷ Set the LINE/MIC button to LINE (the LINE indicator lighting).

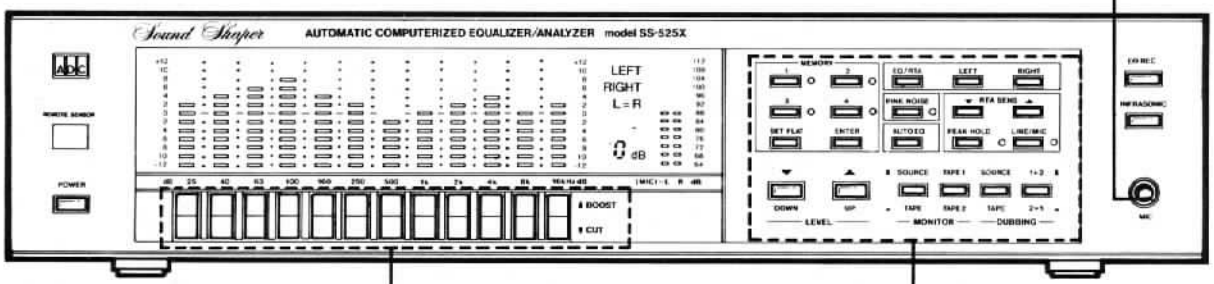
❸ Operate the RTA SENS buttons to roughly center the display.

❹ Operate the PEAK HOLD button to fix the highest bars in the display.

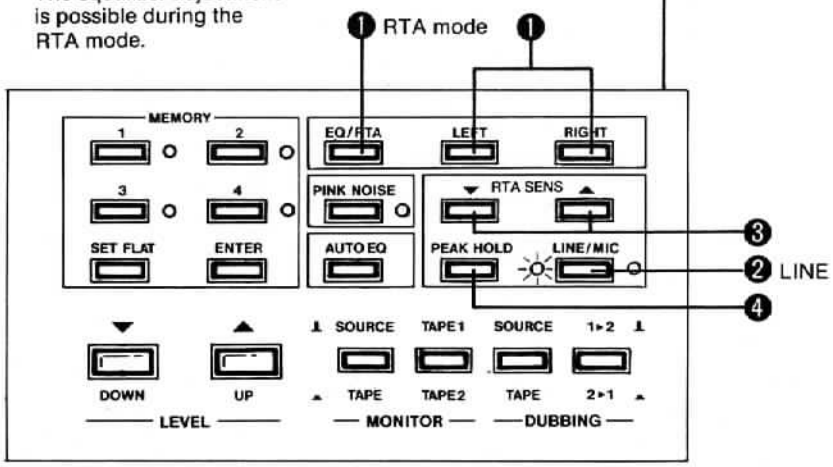




Plug the microphone to analyze the program as it is played in the instening room. (Refer to next page.)



The equalizer adjustment is possible during the RTA mode.



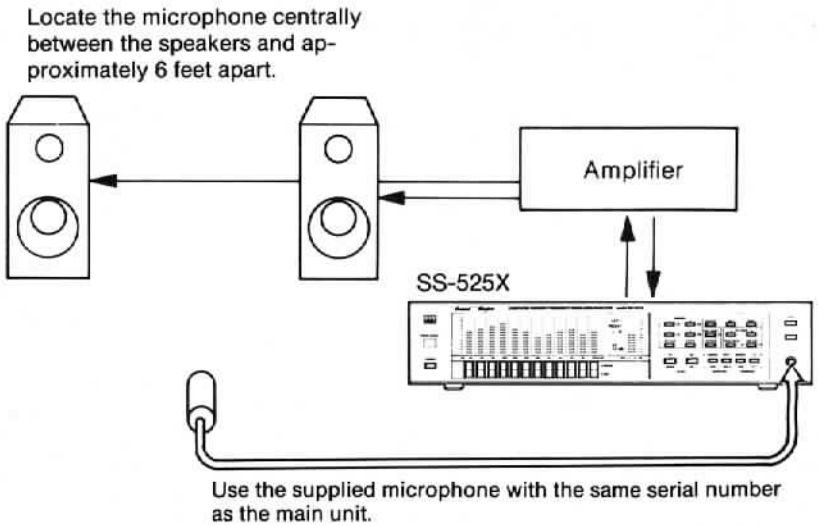
To analyze the program in the listening room

❶ Plug the microphone into the MIC jack. The microphone should be placed at a convenient location in the room. For the most accurate measurement of frequency response, the microphone should be placed in a typical listening location, and the grille should be aimed at a point midway between the two loudspeakers.

❷ Set the LINE/MIC button to MIC (the MIC indicator lighting).

❸ Refer to steps 3 and 4 of "Real-time analysis of LINE inputs", facing page.

Note: The equalizer adjustment can be made during the RTA mode. (The output indicator displays the left channel only. The channel to observe is selected by the LEFT/RIGHT button.)



To Listen to TAPE or SOURCE Programs

1 To listen to the LINE input sources, first select the program — phono, tuner, etc. — on your stereo system.

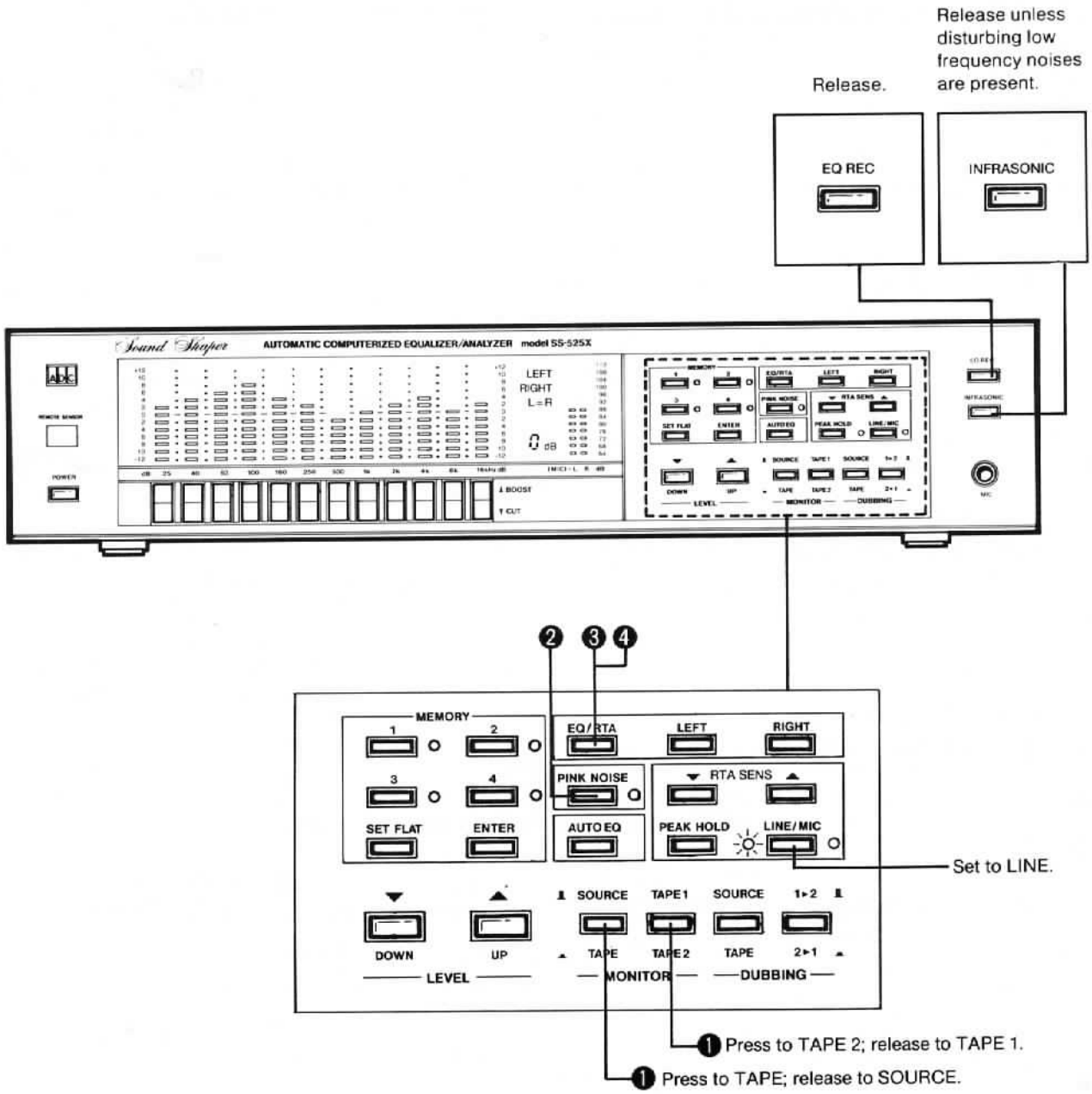
2 Before starting to use the equalizer, set the tape monitor switch of the preamp to on and set the loudness switch and low/high frequency filters (if any) to off.
Note: If your preamp is equipped with a REC OUT selector, first set the input selector on the preamp to the tape (monitor) position, and set the REC OUT selector to the position which selects the program source you desire to make an equalization.

❶ To listen to the SOURCE programs, set the MONITOR SOURCE/TAPE switch to SOURCE; to listen to the TAPE programs, set the switch to TAPE.

❷ Make sure the pink noise is off (extinguishing the indicator).

❸ To analyze, press the EQ/RTA button for the RTA mode (the sensitivity indicator shows 60-110 dB). Refer to page 10.

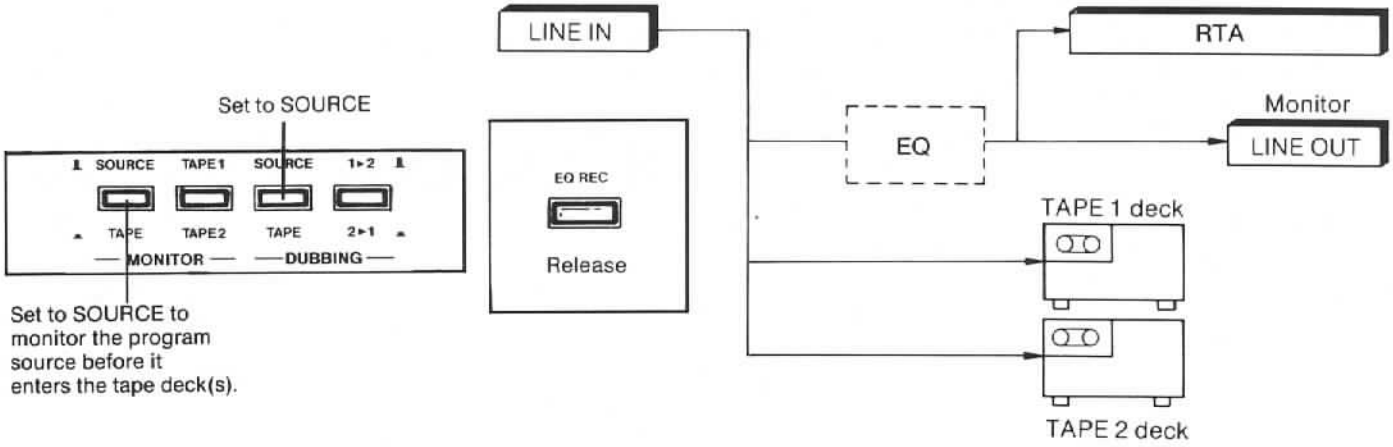
❹ To equalize, press the EQ/RTA button for the EQ mode (The sensitivity indicator shows 0 dB). Refer to page 8.



To Record the LINE Inputs on Tape Decks

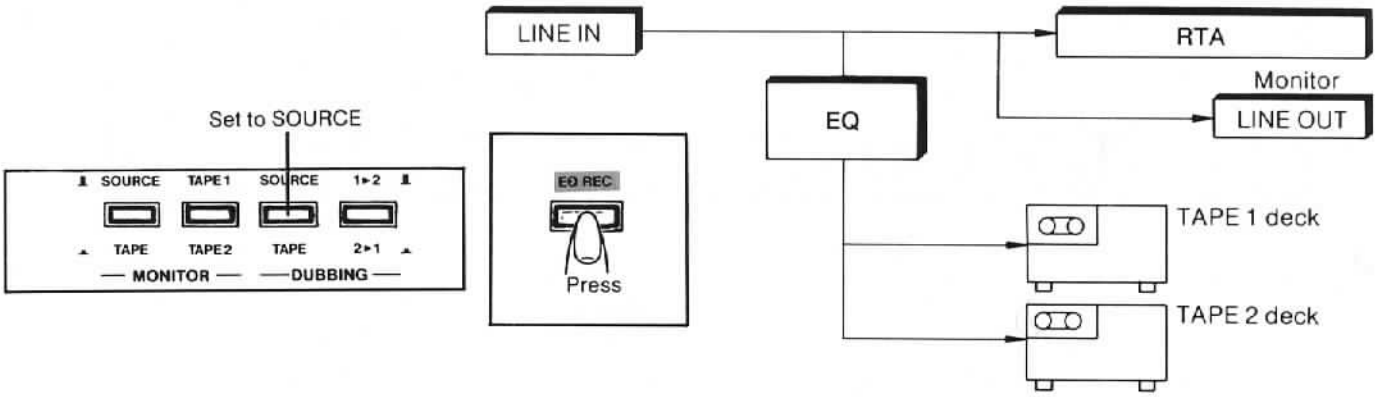
Since the REC output jacks of the TAPE1 and TAPE2 will provide the same recording signal simultaneously, you can set both the TAPE1 and TAPE2 decks to recording mode for a simultaneous recording.

To make a normal recording



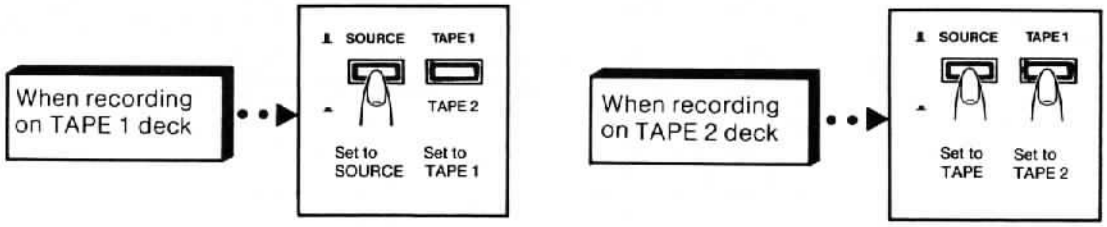
Note: To use the spectrum analyzer as a level meter during recording, the LINE/MIC button should be set to LINE.

To make an equalized recording



Monitoring the recording

If the tape deck employs independent record and playback heads, a true tape monitoring will be possible. This will enable you to hear the program actually on the tape a fraction of a second after you have recorded it.



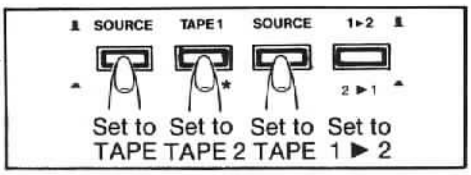
In the SOURCE position, you can monitor the program before it enters the tape deck. The effect of the equalizer will not be monitored.

Note: Switching these buttons during recording may cause pop noise.

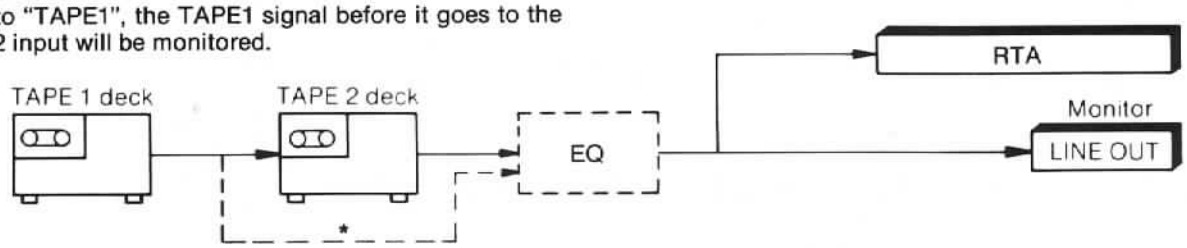
Dubbing

From TAPE 1 to TAPE 2

Playback the TAPE1 and record it on the TAPE2.

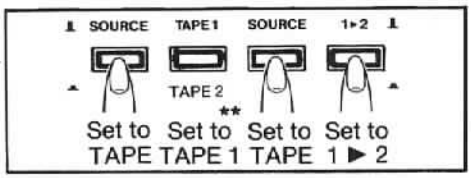


*** MONITOR TAPE1/TAPE2 button**
If set to "TAPE1", the TAPE1 signal before it goes to the TAPE2 input will be monitored.

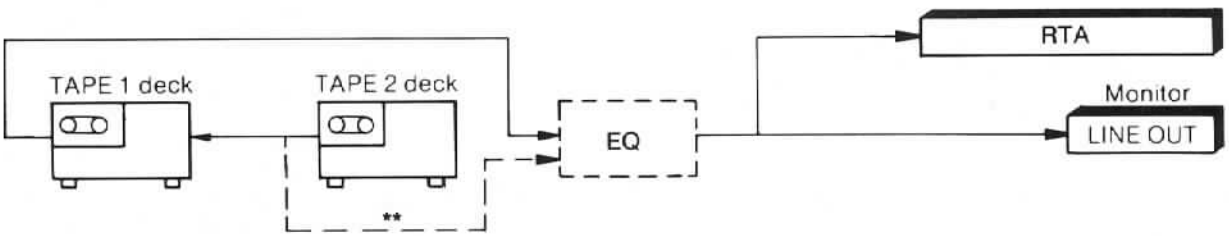


From TAPE 2 to TAPE 1

Playback the TAPE2 and record it on the TAPE1.

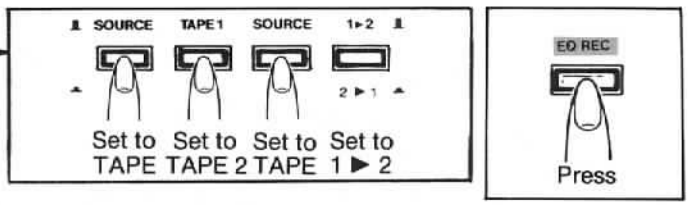


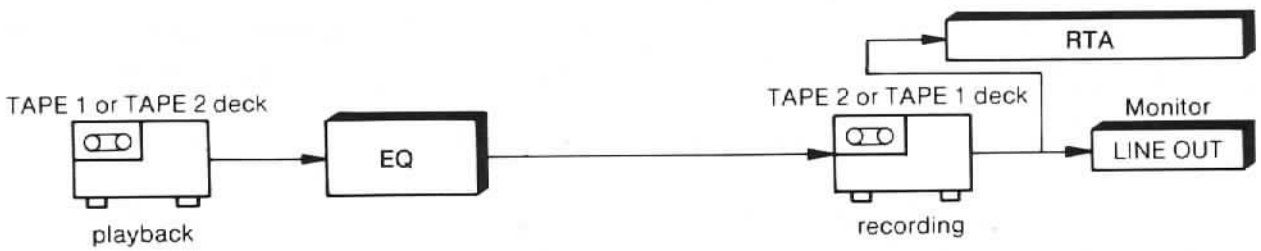
**** MONITOR TAPE1/TAPE2 button**
If set to "TAPE2", the TAPE2 signal before it goes to the TAPE1 will be monitored.



To make an equalized dubbing

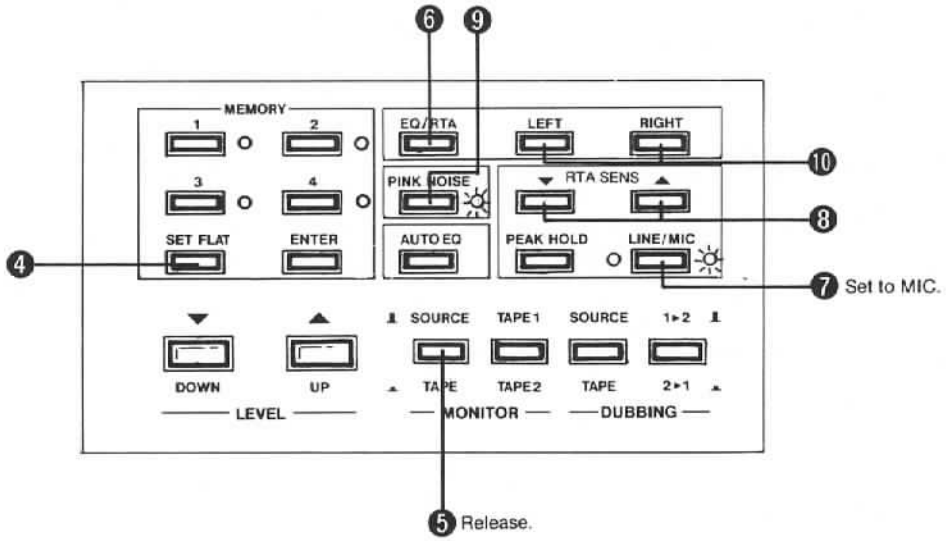
Press the EQ REC button and EQ/RTA buttons to switch the equalizer in between TAPE1 and TAPE2.





Note: During dubbing process, listening to LINE input program is possible without disturbing the dubbing process, by setting the MONITOR switch to the SOURCE position. The spectrum analyzer will indicate the level of the LINE output signals.

To Analyze the Sound Field and to use the AUTO EQ.



Using the RTA

❶ Turn your preamp's input selector or tape monitor selector to TAPE.

❷ Turn down the volume control of your preamp.

❸ Plug the microphone into the microphone jack. The microphone should be placed at a convenient location in the room. For the most accurate measurement of frequency response, the microphone should be place in a typical listening location, and the grille should be aimed at a point midway between the two loudspeakers.

❹ Press the SET FLAT button.

❺ Set the MONITOR SOURCE/TAPE switch to SOURCE.

❻ Set the EQ/RTA button to RTA.

❼ Set the LINE/MIC button to MIC.

❽ Operate the RTA SENS up/down buttons. The level of ambient noise is shown on the display. Note the level. Most rooms have some reading in the lowest frequencies at the most sensitive setting of the spectrum analyzer. This ambient noise reading is caused by traffic noise, air conditioners, heaters, etc.

❾ Press the PINK NOISE button to turn on pink noise.

❿ Press the LEFT/RIGHT buttons to select the channel to which the pink noise is fed. Press both buttons simultaneously to feed to both channels.

⓫ Slowly rotate the volume control of the preamp. For accurate readings, the spectrum analyzer should now indicate at least 10 dB greater level in each band than the ambient noise level previously measured. For example, the sensitivity is 60 dB and the highest ambient noise is 0 dB, set the sensitivity to 70 dB by pushing the RTA SENS/ down button to center the pink noise level.

Caution: Very high levels of pink noise (greater than 95 dBSPL) may damage speakers. Use care in setting the preamp's volume control.

⓬ The spectrum analyzer now shows the frequency response of the sound system for that microphone location.

⓭ As the microphone is moved about the room, the effect on frequency response by room boundaries (walls, ceilings, floor, furniture, and speaker placement) can be evaluated.

(Refer to next page for using the AUTO EQ.)

Using the AUTO EQ

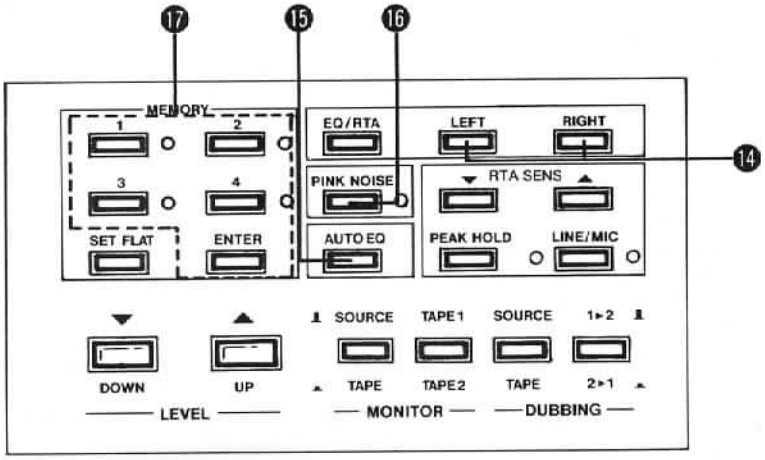
The built-in automatic equalizer (AUTO EQ) measures the frequency response at microphone location and controls the EQ curve to make sound flat automatically.

⓮ Set the LEFT/RIGHT buttons to select the channel on which you wish to make an auto-EQ. To make it on both channels, press the buttons simultaneously.

⓯ Press the AUTO EQ button. The sensitivity indicator shows "AE" and the SS-525X starts the auto-EQ. If the level of pink noise is not sufficient, the sensitivity indicator shows flashing "E" (Error) and the auto-EQ is cancelled. For accurate equalization, the level of pink noise should be aboat 76 dB. To cancel the auto-EQ press the AUTO EQ button two fimes.
After 23 seconds at most, the display switches from the EQ to RTA or vice versa momentarily, then the auto-EQ completes.

⓰ Set the PINK NOISE button to stop pink noise.
Note: During the auto-EQ, only the POWER, MONITOR, DUBBING, EQ REC and INFRASONIC buttons are operative.

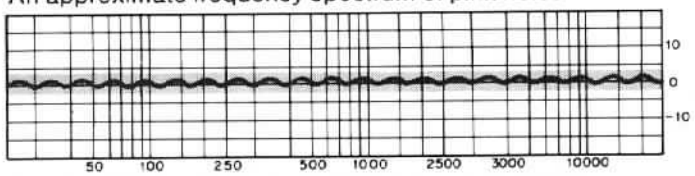
⓱ To store the obtained curve, press the ENTER and one of the MEMORY buttons (1-4). Refer ❻ of page 9.



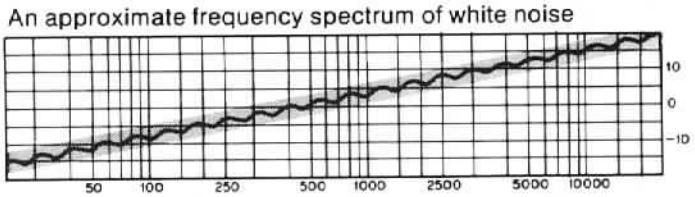
About pink noise signal

The pink noise signal consists of equal parts of each octave of the audio spectrum, like a deeper form of the white noise you hear between FM radio stations or on unoccupied TV channels: an airly rushing sound. White noise exhibits a 3dB increase per octave as the frequency is increased.

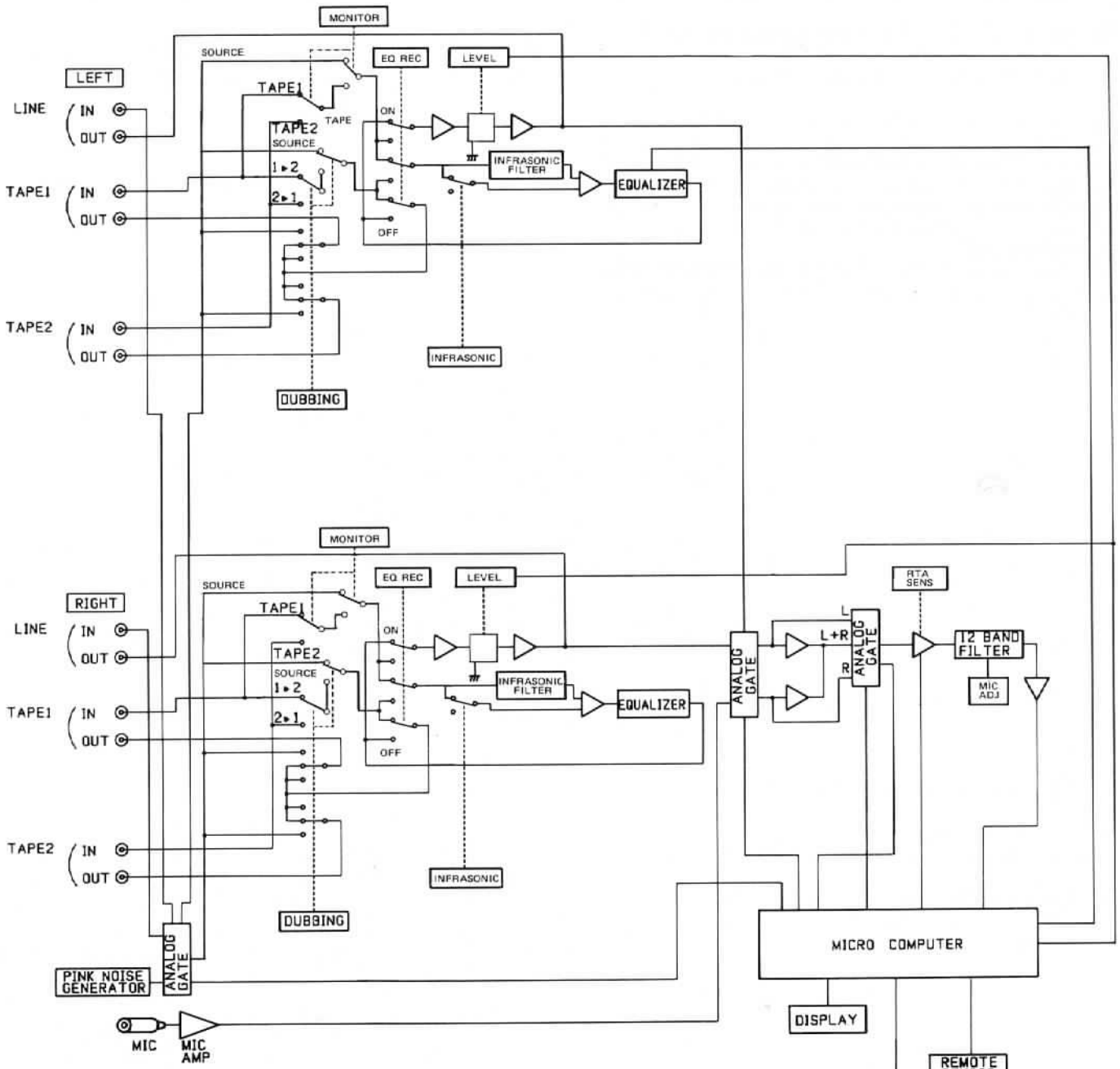
An approximate frequency spectrum of pink noise



An approximate frequency spectrum of white noise



Signal Process



MEMO 1	MEMO 2	MEMO 3	MEMO 4
SET FLAT	ENTER	EQ/RTA	LEFT
RIGHT	PINK NOISE	AUTO EQ	PEAK HOLD
SENS ▼	SENS ▲	LINE/ MIC	LEVEL UP
LEVEL DOWN			

Keyboard

Remote Control Transmitter

About Frequency Equalization

The front panel has 12 controls, each varying by ±12 dB the level of a small range of audio frequencies which is centered around the frequency marked over each control. In order to achieve a smooth response, controls for adjacent frequencies within each channel must interact. For example, the 500 Hz control will affect the 1 kHz control. The net effect of such controls set in the same direction (both in + or both in −) will be greater than the panel marking indicates. The effect of such controls in opposite directions (one + and one −) will be less than indicates. Refer to figures in **Total system equalization** that follow for typical slide control effect.

In EQ mode, the frequency response display provides a visual display of the controls depicting graphically the curves you have created, to assist in tailoring the frequency response to your preference.

The musical spectrum

The **Approximate frequency ranges** chart on next page correlates familiar musical instruments with the numerical frequencies that they produce. Given the often talked about musical range of 20 Hz to 20 kHz, it is surprising to see how low musical fundamentals actually are. (Almost all are under 3,500 Hz.) It should be understood however that if all instruments were perceived only by their fundamental frequency output (black bands), they would all sound alike. It is the harmonics or overtones all sound alike. It is the harmonics of overtones (grey bands) that give each individual instrument its character or timbre and set it apart from the rest.

Interestingly enough, the human ear is more sensitive to certain octaves in the musical spectrum than to others.

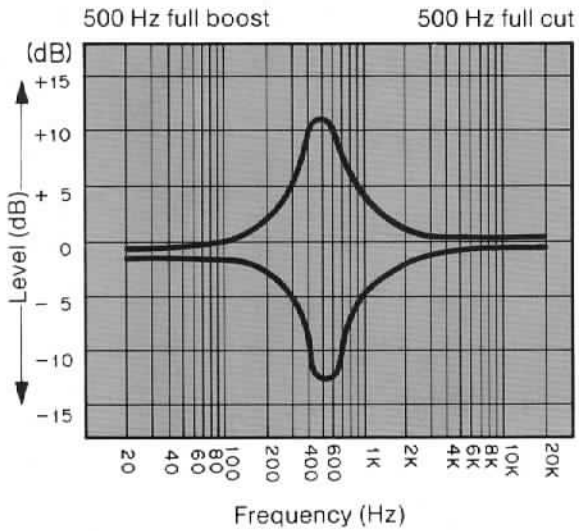
Whoever designed this engineering marvel deemed it necessary to tune the ear more toward the midrange frequencies where speech and voice communication occur than to the outer octaves of low bass and high musical overtones. As a result, very small energy changes here will cause a more drastic psychoacoustic effect than larger changes would at the frequency extremes.

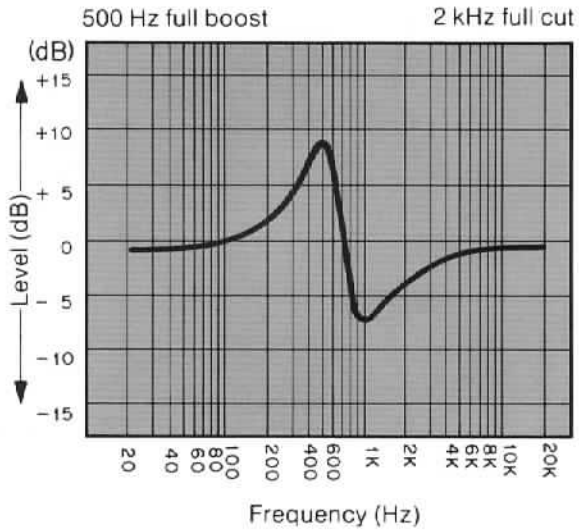
In order to discuss the qualitative effects of adjustment in tonal balance, it is best to arbitrarily divide the musical spectrum into five ranges.

The bass (approx. 20 — 140 Hz). There is little musical material with fundamental frequencies below about 60 Hz, and what is normally perceived as low bass material is actually in the 60 — 140 Hz range. The very lowest frequency controls can be used to enhance output for the few instruments in that range (organ, contrabassoon, etc.) or they can be used to reduce rumble, acoustic feedback and other low frequency aberrations. A control in what is normally labeled the 60 — 90 Hz area will usually cause the greatest perceptible changes in "bass response".

Total system equalization

Frequency response curves





The mid-bass (approx. 140 — 400 Hz). An over accentuated mid-bass region will yield a very muddy and "boomy" quality to the music A system shy of mid-bass will sound hollow and thin. Controls in this region are important for good overall balance.

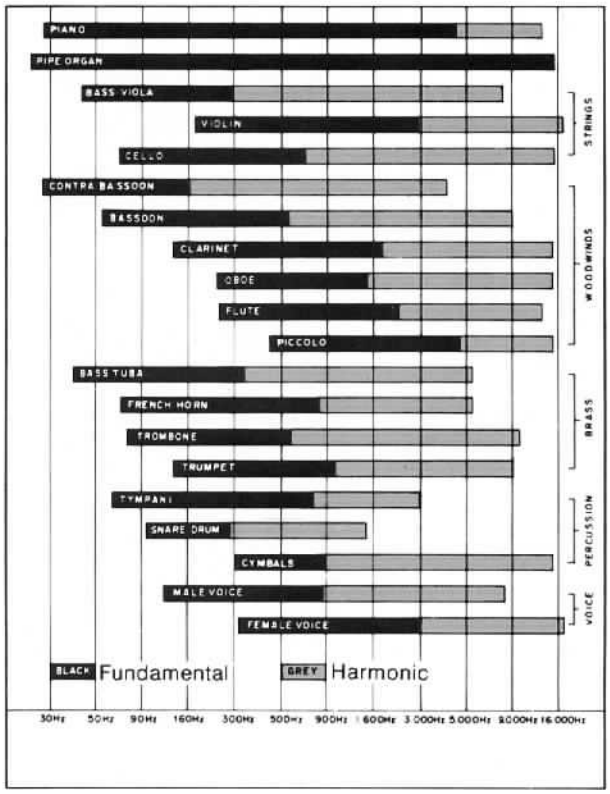
The mid-range (approx. 400 — 2,600 Hz). As the area where the ear is most sensitive to tonal balance, the midrange is important in adjusting the qualitative sonic characteristics of your system. There is controversy among engineers and audiophiles as to what the proper balance should be in this range. Moreover, you will find some settings optimum for certain types of music with other settings just right for different types.

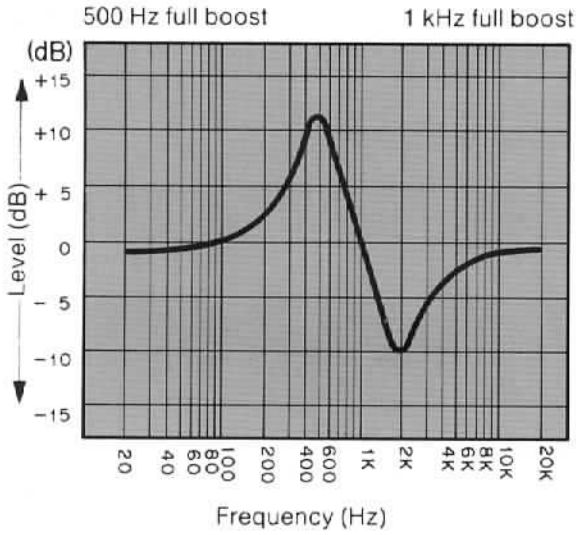
The upper mid-range (approx. 2,600 — 5,200 Hz). Speaker designers often boost output in this range to effect a quality of "presence" to the music. Too much energy, on the other hand, sounds overbearingly harsh and strident. A good balance should be achieved between this and a more muffled sound.

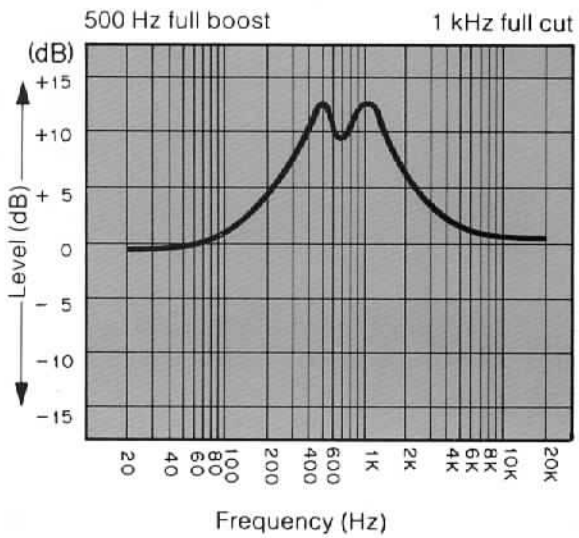
The high end (approx. 5,200 — 20,000 Hz). The region up to only about 12 kHz or so is what is normally perceived as high frequencies. Adjustment in this range affects the brilliance of music, with too much boost in energy yielding an unpleasant and piercing quality.

The last 8,000 Hz contains very little musical material. And most adults have hearing which control in the 14 — 20 kHz range will have a very subtle effect. It can be used to add a little more dimension to the sound or as very high frequency noise filter.

Approximate frequency ranges for musical instruments and voice







Specifications

Equalizer

Control range	±12 dB
Frequency response	5 to 100 kHz ±1 dB
Control frequencies	25 40 63 100 160 250 500 1k 2k 4k 8k 16k (Hz)
Gain (SET FLAT pressed)	±1 dB unity
Maximum input/output level	4V rms
Harmonic distortion over 20 Hz to 20 kHz	0.008% at 1V output
Intermodulation distortion, 60 Hz:7 kHz = 4:1	0.008% at 1V output
Hum and noise A-weighted	−100 dBV
Load impedance	10 kohm or greater
Subsonic filter	−18 dB/octave, 15 Hz
Input impedance at 1 kHz	47 kohm
Output impedance at 1 kHz	470 ohm

Analyzer

Center frequencies	25 40 63 100 160 250 50 1k 2k 4k 8k 16k (Hz)
Display accuracy	Over 16 to 1kHz, ±10% Over 2k to 20 kHz, ±5%
Frequency response from LINE IN	16 to 16 kHz, ±0.5 dB
Frequency response from cariblated MIC	25 to 16 kHz, ±3 dB
Peakhold duration	Continuous
Input impedance, MIC jack	2.2 kohm (at 1 kHz)
Input sensitivity, MIC jack	200 uV
Input sensitivity, LINE IN	150 mV
Pink noise generator output	100 mV (unity gain)
Pink noise frequency response	Over 20 to 16 kHz, ±3 dB rms

Microphone

Element type	Electret condenser
Directivity	Omni-directional
Impedance, at 1 kHz	2.2 kohm
Sensitivity	0 dB = 1V/microbar, −70 dB
Bias	1.5V DC supplied by SS-525X

Microcomputer

Four frequency curve memories back-up by batteries.
SET FLAT function
Automatic equalization function

Miscellaneous

Dimensions	
width	435 mm, 17-1/8" 483 mm, 19", with rack mounting bracket (PX version)
height	88 mm, 3-1/2"
depth	302 mm, 11-7/8"
Weight	4.8 kgs, 11 lbs.
Power requirement	AC 100-120V/220-240V 50-60 Hz, 25W (PX version) AC 120V 60 Hz, 25W (USA and Canada version)

Remote controller

Type	Infrared remote control
Control range	Approx. 24' (7m)
Batteries	"AA" 1.5V x 2
Dimensions	
width	63 mm (2-1/2")
height	175 mm (6-7/8")
depth	18 mm (3/4")

Designs and specifications subject to change without notice.

ADC Products Division
dbx
71 Chapel Street
Newton, MA 02195 USA

KTS525XPXX
0786SG
Printed in Japan