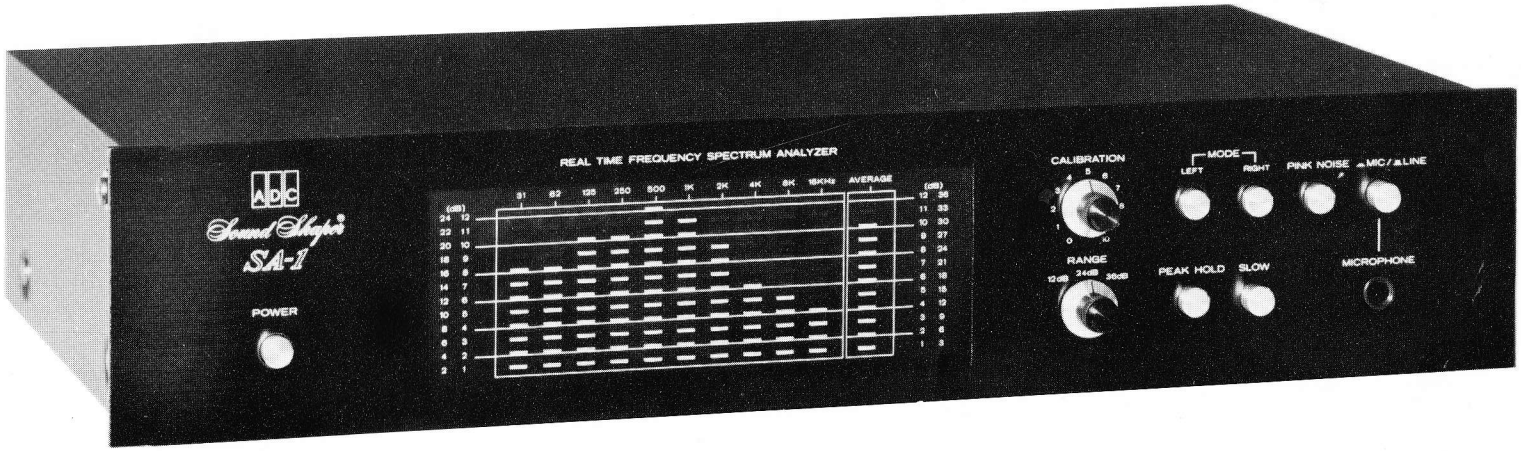
Sound Shaper

ADC

SA-1

OWNER'S MANUAL



REAL TIME FREQUENCY SPECTRUM ANALYZER

Audio Dynamics Corporation

CONGRATULATIONS!

Audio Dynamic Corporation (ADC) is proud to provide the ultimate value in design and development of a Real Time Frequency Spectrum Analyzer, the "SA-1", for your superior sound analysis.

The "SA-1" has 120 separate LEDs plus 12 LED Average Response indicators for analysis of sound source frequencies and room acoustics.

Audio fans and music enthusiasts like yourself look forward to be able to enjoy the highest possible degree of sound quality when listening to their favorite music. Simply using high-cost, high-quality components, however, does not in itself guarantee that the listener will be able to obtain this sound quality. A wide variety of factors, including the nature of the listening environment as well as the placement of the speakers, play a major role in the acoustic quality of any music system. In order to provide for compensation of these factors, ADC has previously made a series of superior Sound Shaper graphic equalizers, which allows the tonal quality of the sound to be adjusted to the conditions of the listening room.

To further enhance the effectiveness of the audio equalizer, ADC has developed the ultimate component in audio measuring equipment: the new SA-1 Real Time Frequency Spectrum Analyzer.

The SA-1 offers the listener positive visual confirmation of all sound compensations made, whereas with just a graphic equalizer, the user is forced to rely solely on his sense of hearing when making these adjustments. The SA-1 gives you a wide range of use potentials, including division of program source frequency bands, as well as compensation of room acoustics. In addition, the illuminated LED display, which allows visual monitoring of all frequencies, plus average response, adds a further dimension of pleasure to the use of this superior component. A high quality electret condenser microphone has been developed exclusively for pink noise measurement, and is included with your SA-1.

In addition to the excellent styling, your SPECTRUM ANALYZER has been carefully engineered to give you trouble-free performance and many years of listening enjoyment.

SPECIFICATIONS

1. Display Frequency Accuracy		
from 31 Hz to 1 KHz		: ± 10%
from 2 KHz to 16 KHz		: ± 5%
2. Meter Tolerance at 1 KHz	at 12 dB range	: ± 1 dB
	at 24 dB range	: ± 2 dB
	at 36 dB range	: ± 3 dB
3. Input Sensitivity	Microphone	: 0.5 mV
	Line In	: 150 mV
4. Input Impedance	Microphone	: 33 KΩ
	Line In	: 100 KΩ
5. Pink Noise Output Level		: 150 mV
6. Frequeuency Response at Line In		
from 31 Hz to 16 KHz		: ± 0.5 dB
7. Frequency Response at Mic. Input		: ± 3 dB

MICROPHONE

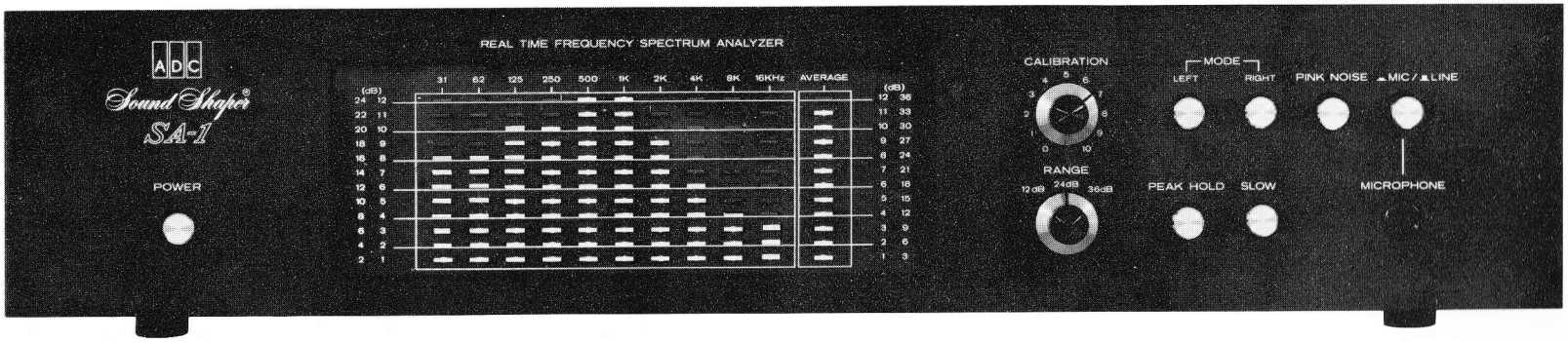
1. Type	: Electret condenser Microphone
2. Impedance at 1 KHz	: 600 Ω
3. Sensitivity	: −71 dB (0 dB = 1 V/1 μbar)
4. Frequency Response (compensated)	: from 30 Hz to 16 KHz
5. Directional Characteristic	: Omni-directional
6. Battery	: 1.5 V, UM-5/Size N (eveready E-90 or equivalent.)

General Description

Your SA-1 presents one of the best values available today in a high quality Real Time Frequency Spectrum Analyzer designed by ADC.

The SA-1 Real Time Frequency Spectrum Analyzer offers a means of effectively and accurately compensating for deficiencies. The SA-1 grasps the essence of the sound itself, and allows you to actually see the characteristics of the sound as the signal passes through the component, freeing you from the need to depend on your ears alone when using the graphic equalizer. From component-derived frequencies to room acoustics, you are able to visually determine all the minute compensations made by the graphic equalizer.

- 10 Bands (31 Hz, 62 Hz, 125 Hz, 250 Hz, 500 Hz, 1 KHz, 2 KHz, 4 KHz, 8 KHz, 16 KHz), plus an average band can provide Real Time Peak Level values of the sound frequency spectrum.
- The Peak Hold function allows the display to be held for the easiest to observe and most accurate frequency response.
- The Pink Noise generator produces a stable and constant level of noise output.
- The range selector switch enables you to choose a display based on maximum levels of 12 dB, 24 dB, or 36 dB to match the level of input power and to obtain the most functional display.
- The calibration control allows the display to be regulated to the easiest to read position in relation to the value setting of the range selector.
- The mode switches allow you to select modes for either right or left channels separately, or both channels together for simultaneous measurement.



CONTROL FUNCTIONS

POWER SWITCH

The display panel will illuminate when this button is pressed, indicating that the unit is in operation. Pressing the button again will turn the power off.

DISPLAY PANEL

The LED display panel is divided into ten separate bands, set at frequencies of 31, 62, 125, 250, 500, 1 K, 2 K, 4 K, 8 K, and 16 KHz, plus an average band of all audible frequencies.

RANGE SELECTOR SWITCH

This switch is used to select for a 12, 24, or 36 dB reading on the LED display panel, in order to show dynamic ranges for the line, microphone or pink noise input.

CALIBRATION LEVEL CONTROL

In conjunction with the Range switch, this control allows for regulation of the LED display so that you can obtain the easiest to read setting in terms of the 12, 24, or 36 dB position of the Range Selector Switch.

PEAK HOLD SWITCH

This switch is used to "FREEZE" the display at any desired point. When the switch is depressed, the display will "HOLD" for a period of approximately ten seconds. This is useful in examining the level during certain passages to determine average levels.

Caution: When the Peak Hold switch is engaged, after a period of approximately ten seconds, the entire range of LED's will begin to light and the immediate reading will be lost. It is necessary to disengage the Peak Hold switch before making further measurements.

SLOW DISPLAY ACTION SWITCH

When the Slow button is pressed, the slow mode is activated for making room equalization measurements where the averaging nature of this display makes it easier to make sound pressure level measurement while analyzing musical phrases.

Many sounds occur so quickly that the slower display action is preferable for averaging sounds, when seriously analyzing passages.

When the Slow button is out, the fast display more accurately displays, what is happening at any given instant.

MODE SWITCH

These two push-push switches operate independently. Actually, 3 positions can be provided. These switches allow you to display either the right channel, left channel, or both channels (both buttons are pressed at the same time) of the input signal on the display graph. These switches do not operate when the input signal is derived from a microphone source.

PINK NOISE SWITCH

Pressing this button "IN" causes a pink noise signal to be provided through the SA-1 PINK NOISE OUT terminals.

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 airy rushing sound. White noise exhibits a 3 dB increase per octave as the frequency is increased. Pink noise offers a constant level of noise that eliminates this dB increase in terms of octave ratings.

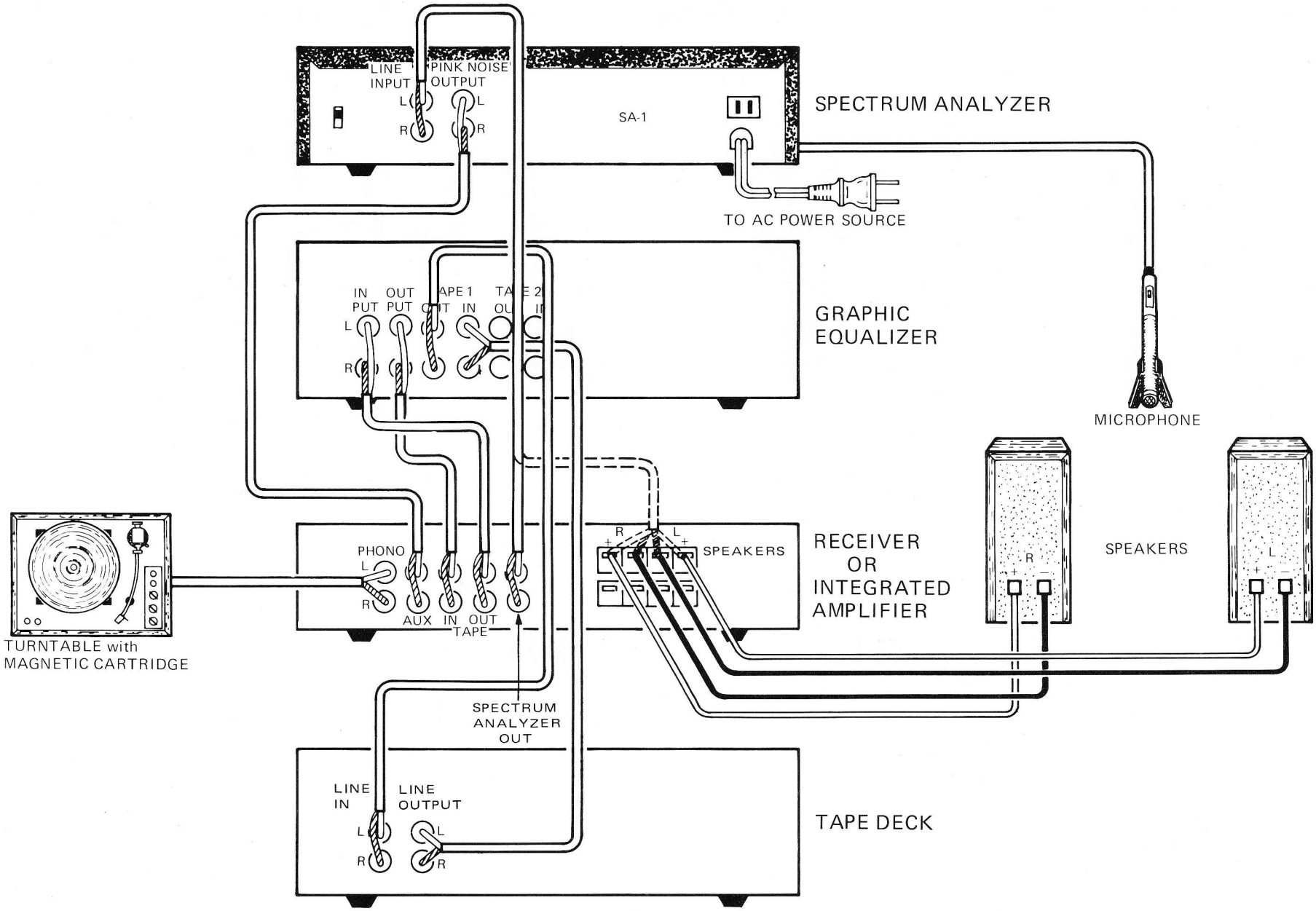
MIC/LINE SWITCH

This switch button should be pressed when you want to make measurements of the signal from the microphone.
In the out position, the analyzer measurements are made from the line input signal.

MICROPHONE JACK

Employed when a microphone is used for the measurement of frequencies involving voices, instruments, music or pink noise.

A TYPICAL SYSTEM



CONNECTIONS

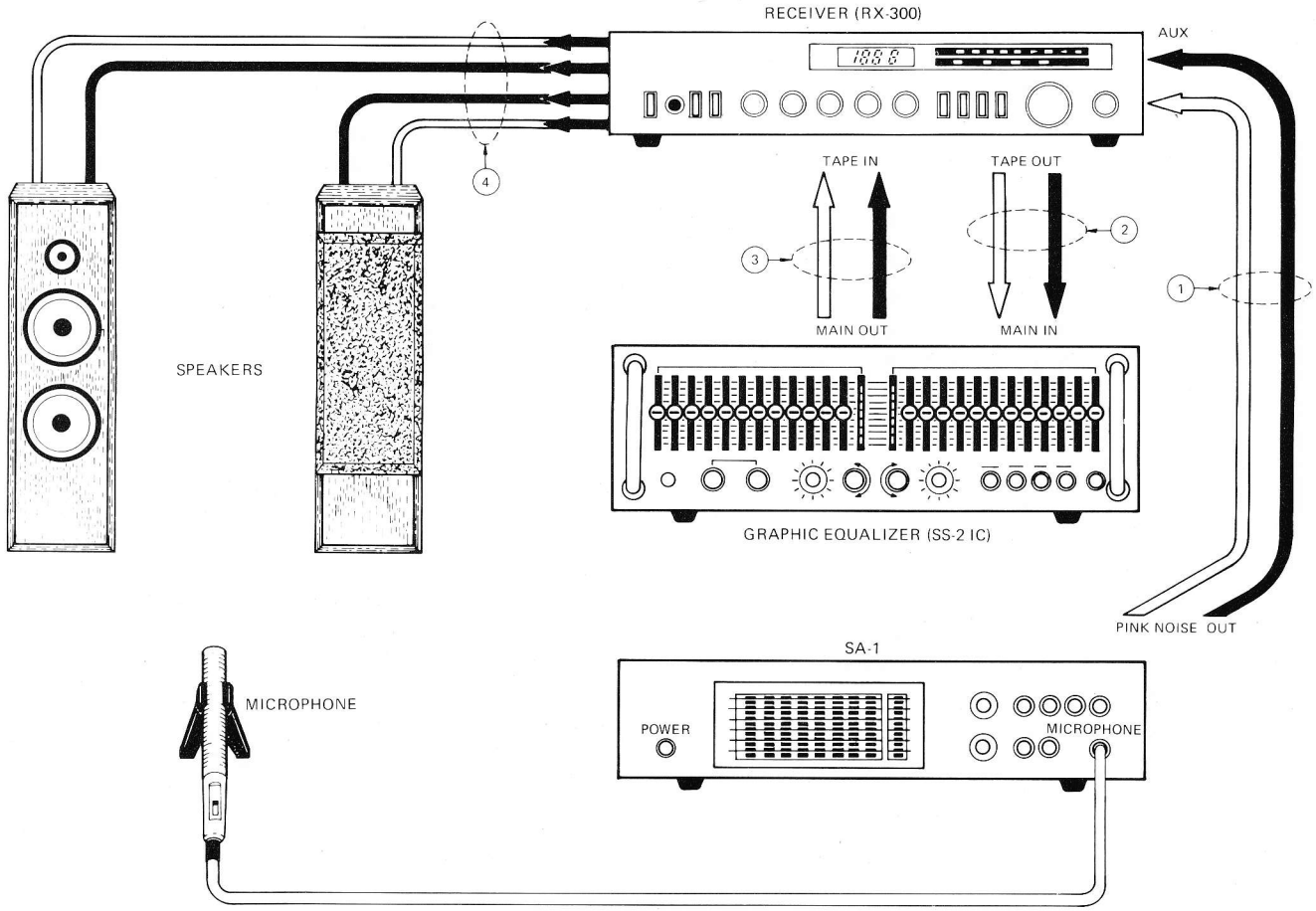
BEFORE MAKING CONNECTIONS:

NOTE: Be sure POWER of all Audio Equipments is off, and to reduce hum, use shielded audio cables for all connections except the speakers.

CONNECTIONS

1. Connect the Line In terminals of the SA-1 to the Spectrum Analyzer Out, or speaker terminals of your Receiver or Amplifier.
2. Connect the Pink Noise Out terminal of your SA-1 to the AUX INPUT terminals of your Receiver or integrated amplifier. This will allow the pink noise signal to be transmitted through the receiver and speakers of your system.
3. The Input Terminals and Output terminals of your equalizer should be left as they are normally connected to the respective Tape Out and Tape In terminals of the receiver or integrated amplifier.
4. The Sound Shaper equalizer has one or two Tape monitor jacks, so you can connect Line In (Input) and Line Out (Output) terminals from your Tape Decks.
5. Record player and tuner connections should remain as normally connected to the receiver or integrated amplifier.

MEASUREMENT OF LISTENING ROOM ACOUSTIC CHARACTERISTICS



OPERATING THE SA-1

MEASUREMENT OF LISTENING ROOM ACOUSTIC CHARACTERISTICS

1. Set the Pink Noise button of the SA-1 to the ON position ("IN").
   Set the Range Selector switch to the 24 dB position. Set the Slow/Fast button to the Slow position.
2. Connect a microphone to the microphone jack of the SA-1, and then place the microphone in your own normal listening position.
   (Be sure the microphone switch is turned ON.)
3. Set the controls of the graphic equalizer to the central flat response position.
4. Set the Selector switch of your receiver or integrated amplifier to the AUX position, to which the Pink Noise Out terminals of the SA-1 have been connected. At the same time, the Tape Monitor switch of your receiver or integrated amplifier should be turned to the ON position, at which position the graphic equalizer will be in operation.
5. After setting the volume controls of the receiver or integrated amplifier to the minimum position, then turn the power on for any other equipment being used. – This is very important for eliminating pop noise when the power switches are actuated.
6. As the volume control of the receiver or integrated amplifier is increased gradually, the pink noise signal from the SA-1 will be transmitted through the AUX terminals and into the Main Input terminals of the graphic equalizer. The graphic equalizer will then pass the signal through its Output terminals into the receiver's or amplifier's Tape In terminals, and the pink noise signal will thus be sent through the speakers.
7. Using the balance control of the receiver or amplifier, you can now measure the signal through each channel separately, as well as the characteristics of both channels together.
8. Using the graphic equalizer, you can make adjustments to equalize frequency levels and to achieve optimum compensations in the characteristics of your listening room.

NOTE 1. Setting the tape monitor switch of your receiver or integrated amplifier to the Source position will allow you to obtain the pink noise signal while bypassing the graphic equalizer circuit, letting you make instantaneous comparison between the original and compensated frequencies.

NOTE 2. Should there be any difficulty in reading the digital frequency spectrum on the display panel of the SA-1, the Calibration Level control may be adjusted to compensate for this.

NOTE 3. Should there be any difficulty in reading the frequency spectrum response on the display, because of rapid movement, the Peak hold button may be pressed.

NOTE 4. If you activate to press the Peak Hold switch for 10 seconds or more, the LED's display will gradually fully light up and the real peak level will not be shown. In this case, reset the Peak Hold switch to the OFF position and then reactivate the Peak Hold function again.

CAUTION

1. Exaggerated boosts of bass frequencies can strain power amplifiers and woofers. Inflated high-frequency levels can ruin tweeters. REMEMBER: 10 dB boost demands 10 times the amplifier power at that frequency. Do not overdrive amplifiers and loudspeakers with equalizer settings and volume levels beyond their capacity.
2. In a live performance, the sound heard by the audience is made up of a combination of direct and reflected (reverberant) sound. For most concert halls, the reflected sound makes up the majority of the sound reaching the audience. Due to the long path length and many reflections which the reverberant sound undergoes, the high frequencies are usually attenuated more than the low frequencies. Therefore, the effective "frequency response" of a good seat in a typical concert hall is rolled off at the high frequency end.

   When recordings are made, microphones are often placed quite close to the instruments capturing mostly direct sound, without the rolloff involved in the reverberant sound. Thus, a 'flat' hi-fi system will tend to reproduce high frequencies with more intensity than would be heard during a live performance. Therefore you will find, in most instances, more satisfying sound reproduction with a slight high-frequency rolloff, particularly at the 16 KHz level.

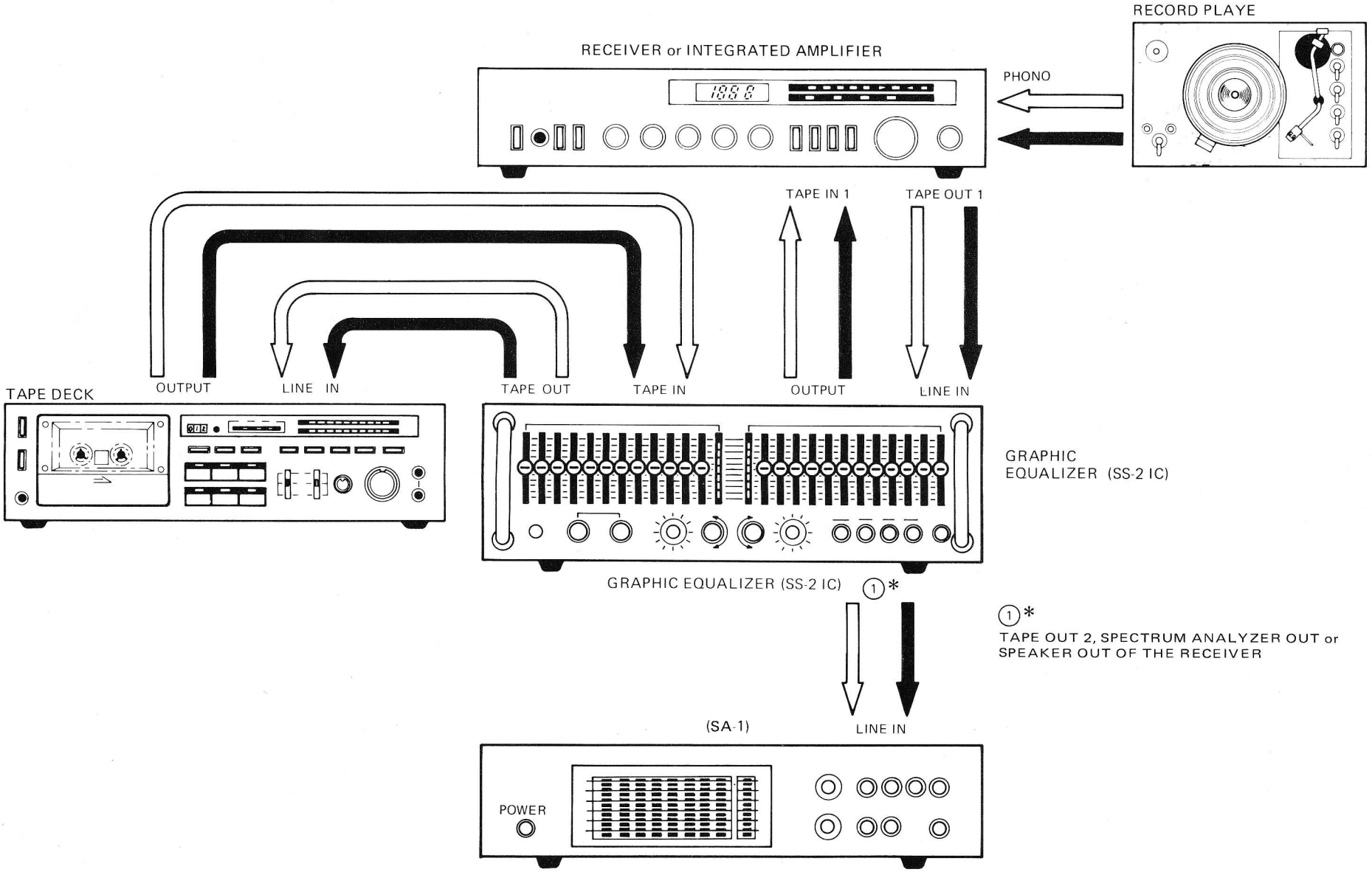
Safety Instructions

1. Read Instructions – All the safety and operating instructions should be read before the appliance is operated.
2. Retain Instructions – The safety and operating instructions should be retained for future reference.
3. Heed Warnings – All warnings on the appliance and in the operating instructions should be adhered to.
4. Follow Instructions – All operating and use instructions should be followed.
5. Water and Moisture – The appliance should not be used near water – for example, near a bathtub, washbowl, kitchen sink, laundry tub, in a wet basement, or near a swimming pool, etc.
6. Mount the appliance either on a stable shelf or table.
7. Ventilation – The appliance should be situated so that its location does not interfere with its proper ventilation. For example, the appliance should not be situated on a bed, sofa, rug, or similar surface that may block the ventilation openings; or, placed in a built-in installation, such as a bookcase or cabinet that may impede the flow of air through the ventilation openings.
8. Heat – The appliance should be situated away from heat sources such as radiators, heat registers, stoves, or other appliances (including amplifiers) that produce heat.
9. Power Sources – The appliance should be connected to a power supply only of the type described in the operating instructions or as marked on the appliance.
10. Grounding instructions or polarized connectors, if described in the operating instructions must not be defeated.
11. Power-Cord Protection – Power supply cords should be routed so that they are not likely to be walked on or pinched by items placed upon or against them, paying particular attention to cords at plugs, convenience receptacles, and the point where they exit from the appliance.
12. Cleaning – Clean the equipment with a dry dust cloth.
13. Nonuse Periods – The power cord of the appliance should be unplugged from the outlet when left unused for a long period of time.
14. Object and Liquid Entry – Care should be taken so that objects do not fall and liquids are not spilled into the enclosure through openings.
15. Damage Requiring Service – The appliance should be serviced by qualified service personnel when:
    A. The power-supply cord of the plug has been damaged; or
    B. Objects have fallen, or liquid has been spilled into the appliance; or
    C. The appliance has been exposed to rain; or
    D. The appliance does not appear to operate normally or exhibits a marked change in performance; or
    E. The appliance has been dropped, or the enclosure damaged.
16. Servicing – The user should not attempt to service the appliance beyond that described in the operating instructions. All other servicing should be referred to qualified service personnel.

CAUTION

When you wish to observe the frequency response of the receiver or power amplifier with the SA-1 connected to the speaker terminals, please be sure the attenuater switch located on the rear panel is set at the –26 dB position in order to avoid saturation at the input stage.

MEASUREMENT OF PROGRAM SOURCE
(Tape, Records, Radio, etc.)



MEASUREMENT OF PROGRAM SOURCES (TAPE, RECORDS, RADIO, ETC.)

1. Set the Line/Mic. button of the SA-1 to the Line position. (Out position)
   Set the Mode button to the L + R position (L and R buttons are both in).
   Set the Slow/Fast button to the Fast position. (Out position)
2. Set the controls of the graphic equalizer to the control flat position.
3. Set the function (Selector) switch of your receiver or integrated amplifier to the position for the source you wish to measure – tuner, phono, tape, etc.
   Set the Tape monitor switch of your receiver or integrated amplifier to the on position, allowing the graphic equalizer to function.
4. After setting the volume control of the receiver or integrated amplifier to the minimum position, then turn the power on for the other equipment.
5. As the volume is increased, the signal from the source will be transmitted into the graphic equalizer. The graphic equalizer signal will then be provided through the Tape Out terminals of the receiver into the Line In terminals of the SA-1, causing the music signal to be shown on the LED display panel.
6. As adjustments are made with the controls of the graphic equalizer, the adjustments in the particular frequency bands will be shown on the display panel, while the adjusted signal will be sent through the receiver or integrated amplifier.

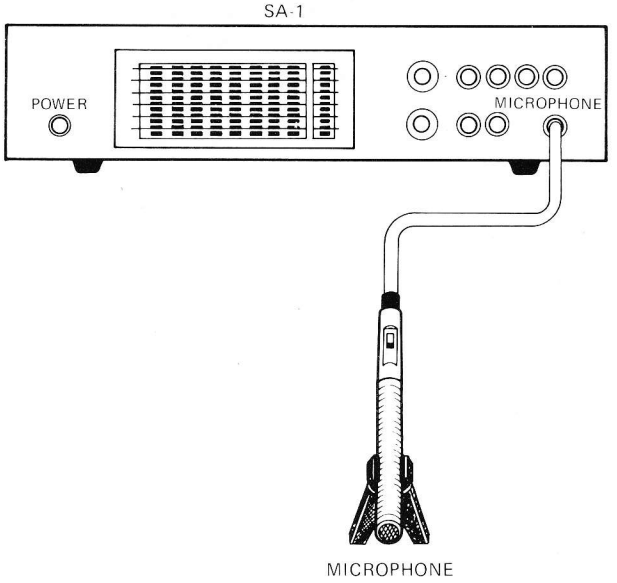
NOTE 1. When measuring the signal from your Tape Deck, the Tape Monitor switch of the graphic equalizer should be turned on.

NOTE 2. When the source signal is characterized by a wide dynamic range, the Range Switch of the SA-1 should be set to the 36 dB position, and the 12 dB position display panel. Should there be any difficulty in reading the frequency spectrum on the display panel of the SA-1 the calibration control may be employed to move the indicator display up or down for easier reading (shifts the "0" point).

NOTE 3. When measuring the signal from the speaker output of your receiver or integrated amplifier, the Range Switch of the SA-1 should be set to the 36 dB position and the Attenuator switch, located on the rear panel, should be set to the –26 dB position to avoid saturation due to an over load of the input level of the amplifier of the SA-1.

NOTE 4. Setting the Mode switch to either the Right or Left setting will allow you to make measurement of the individual channels.

MEASUREMENT OF DIRECT SOUND SOURCES



(VOICE, INSTRUMENTS, MUSIC, NOISE, ETC.)

1. Connect a microphone to the microphone jack of the SA-1.
   Set the Line/Mic. button to the Mic. position.
2. Turn the power on for the SA-1.
3. Choose the position of the Range Selector switch that corresponds to the response range of the microphone which will vary with amplifier volume and microphone position.

NOTE 1. Should there be any difficulty in reading the frequency spectrum on the display panel of the SA-1 the calibration control may be employed to move the indicator display up or down for easier reading (shifts the "0" point).

THE MUSICAL SPECTRUM

This chart 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 3500 Hz.) It should be understood however that if all instruments were perceived only by their fundamental frequency output (black bands), they would all tend to sound alike. It is the harmonics or 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".

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. 400–2600 Hz).

As the area where the ear is most sensitive to tonal balance, the mid-range 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. 2600–5200 Hz).

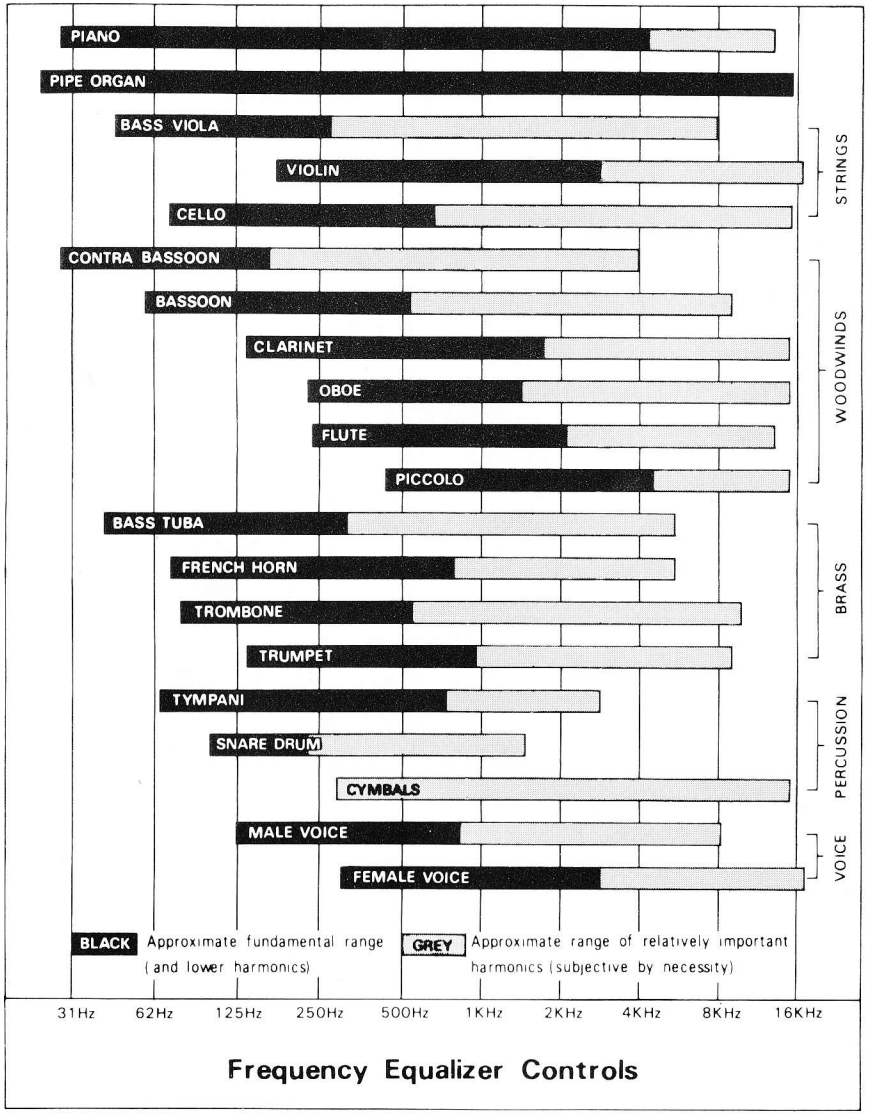
Speaker designers often boost output in this range to effect a quality of "presence" to the music. Too much energy, on the other hand, sounds overbearingly harsh and strident. A good balance should be achieved between this and a more muffled sound.

THE HIGH END (approx. 5200–20,000 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 rolls off rapidly above 16 or 17 KHz. As a consequence, any 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



Frequency Equalizer Controls

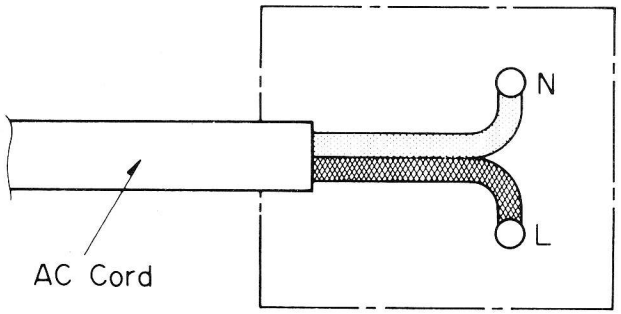
ADDENDUM for UK MODELS

CAUTION for MAINS CONNECTIONS

As the colours of the wires in the mains lead of this apparatus may not correspond with the coloured markings identifying the terminals in your plug proceed as follows:

- The wire which is coloured BLUE must be connected to the terminal which is marked with the letter N or coloured BLACK.
- The wire which is coloured BROWN must be connected to the terminal which is marked with the letter L or coloured RED.

This equipment must be protected by a 3 A fuse if a 13 A (B.S. 1363) plug is used.
If another type of plug is used a 5 A fuse or lower shall be used, either in the plug or adapter or at the distribution board.



N : NEUTRAL ----- BLUE
L : LIVE ---------- BROWN

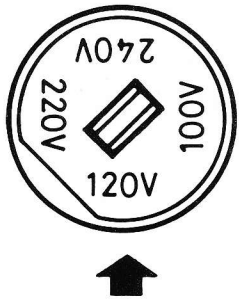
ADDENDUM

When this unit is despatched it is set to operate on 120 volts. This should be checked against the mains supply figure. If the figures do not agree then the following procedure must be followed before operating. Voltages of 100/120/220/240 are accommodated.

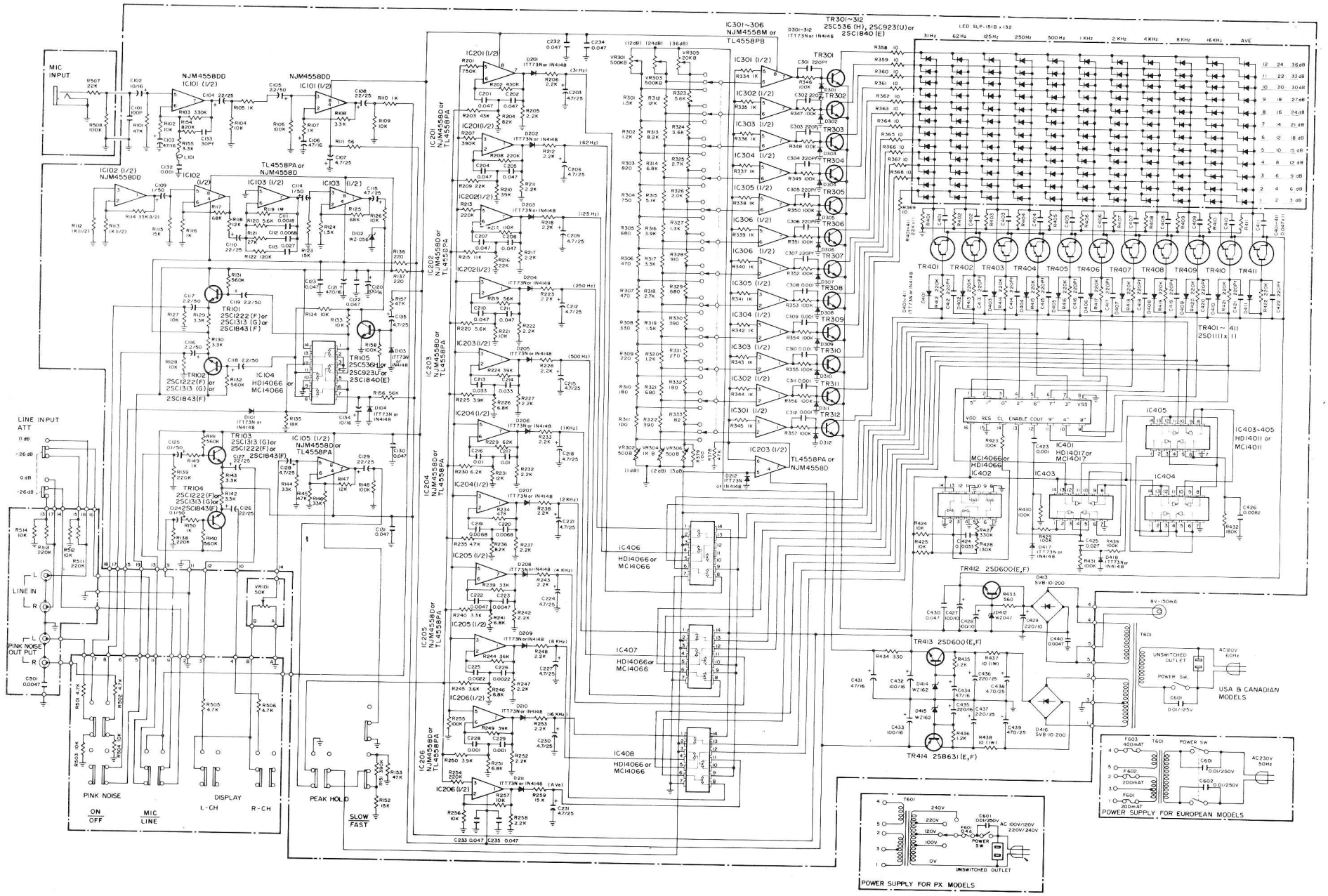
1. Ensure the SA-1 is unplugged from the mains outlet.
2. The voltage selector socket is situated on the rear of the Sound Shaper SA-1 (See Dia).
3. Rotate the voltage selector by using a (–) screw driver so that the correct operating voltage figure is set to the arrow mark on the rear of the unit.
4. If operating on 220/240 volts, bring your unit to any ADC service agency to exchange the fuse inside of the unit. You should not do it yourself for reason of safety.

The unit may now be plugged into the mains supply and switched on. When moving to another area/country please recheck the supply voltage.

VOLTAGE SELECTOR



SCHEMATIC DIAGRAM



NOTE: (1) ALL RESISTANCE VALUES ARE INDICATED IN "OHM" (K = 10^3 OHM, M = 10^6 OHM).
(2) ALL CAPACITANCE VALUES ARE INDICATED IN "μF" (Pf = 10^{-6} μF).

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31-59-1681

PRINTED IN TAIWAN
P-811260