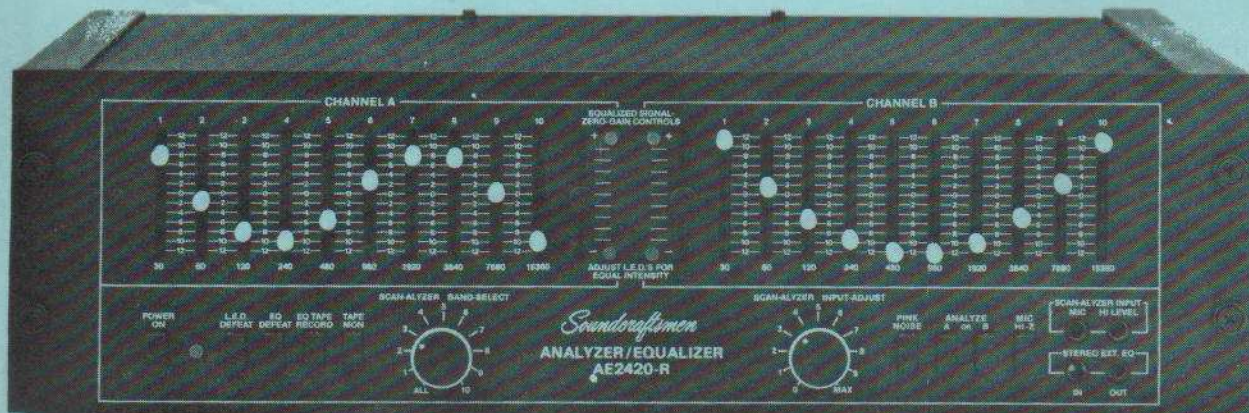


# Soundcraftsmen

## AE2420-R ANALYZER/EQUALIZER

### OPERATING INSTRUCTIONS

Please refer to TEST RECORD JACKET OWNER'S MANUAL for further instructions on Equalization in general, Zero-Gain Control and Test Lights operation, and Trouble-Shooting Hints...



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## SPECIAL NOTE ON MICROPHONES & YOUR ANALYZER

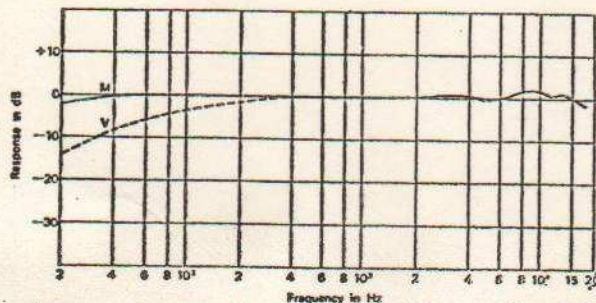
A manufacturer has three options to consider regarding whether or not he should supply a microphone with his analyzer.

#1-LOW COST: (NOTHING is ever "free") Providing a cost-effective analyzer which includes a microphone requires the use of a very inexpensive, and therefore inaccurate, microphone. Then the analyzer's frequency response must be "calibrated" (distorted) so it will match the inaccurate microphone. Since the analyzer is no longer flat, a more accurate microphone cannot be used. (If any other mic is used, it cannot match the altered analyzer.)

#2-HIGH COST: The second option is to provide a very accurate microphone, which will approximately double the purchase price of the analyzer.

#3-The Best of Both Worlds: The third option, and the one we have chosen, is to provide an analyzer with a perfectly flat microphone input. This allows you the most versatility in selecting the mic you wish to use. The only requirement is that a frequency response graph be supplied with the mic so that you can easily make the needed correction to match the accurate (flat) mic input on your Soundcraftsmen Analyzer. See example below.

Frequency response



With this graphic information it is easy to make the necessary corrections after the analyzation is complete. As an example, using the graph, you would adjust the equalizers #1 (30Hz) control Down 1dB, #8 (3840Hz) Up 1dB, and #9 (7680 Hz) Up 2dB. Note the adjustments are all made in the same direction shown on the mic response graph, because your Soundcraftsmen Analyzer's exclusive Differential Comparator circuits have already made the opposite compensating equalization.

The mic you select should be a low impedance, cardioid type. A partial list of mics we have found to work well would include:

Sony ECM 990F  
Audio Technica AT813  
Sennheiser MD402U

AE242J-R SCAN-ALYZER  
OPERATING INSTRUCTIONS

I. ROOM ANALYZATION

1. HOOK-UP: (see diagram I)

Connections to system are the same as for an equalizer either in the tape monitor loop, or external processing loop of preamp or receiver. (All system controls flat, loudness out.)

2. MICROPHONE:

Place any good microphone (preferably one with a calibration chart) at the desired listening position.

3. INITIAL SETTINGS:

All pushbuttons to "out" position, "SCAN-ALYZER BAND-SELECT" control to "ALL" position (fully counter-clockwise). Individual octave controls and EQUALIZED SIGNAL controls to "flat" (center detent) position.

4. TO ANALYZE CHANNEL A:

Turn down sound equipment and listen for any background noise such as air-conditioners, motors, fluorescent lights, etc. which could be picked up by the microphone and cause errors in room analysis. These should be turned off during room analysis.

- a) Insert microphone plug into "MIC" jack. (Push in "MIC HI-Z" if high impedance mic is used.) Push in buttons labeled "PINK NOISE" and "ANALYZE A".

b) Turn up the volume control on preamp, or receiver until the pink noise coming from speaker "A" (left side) is at normal listening level or higher to mask any further background noise. CAUTION: Excessively high levels of filtered pink noise for long periods of time may damage some speakers. Avoid uncomfortably loud levels during analyzation. Increase "SCAN-ALYZER INPUT-ADJUST" control until Ch. A Equalized Signal L.E.D.s are at equal intensities.

NOTE: If unable to balance L.E.D.s, move microphone closer to speakers.

c) Use one hand to advance "SCAN-ALYZER BAND-SELECT" control to position "1". Use other hand to adjust L.E.D.s for equal intensity with Ch. A octave control number "1". Continue through positions, "2,3,4,5,6,7,8,9,10, rapidly in sequence, balancing the L.E.D.s with the appropriate octave control. Each scan-setting requires only one or two seconds. Repeat this sequence in reverse, going from 10 to 1, then 1 to 10, and from 10 to 1 and return, to verify all octaves are equally balanced, by observing Ch.A L.E.D.s as you scan.

5. TO ANALYZE CHANNEL B:

Push in button labeled "ANALYZE B". Return "ANALYZE A" button to the "out" position. Adjust "SCAN-ALYZER INPUT-ADJUST" control until Ch. B Equalized Signal L.E.D.s are at equal intensities. Follow same instructions as for Ch. A, see 4c above.

6. Return "ANALYZE B" and "PINK NOISE" buttons to the "out" position. Re-adjust Octave Controls to compensate for your Mic by moving Octave Controls plus or minus exactly as shown, and in the same direction, as shown on your Mic Calibration Chart. Although any Mic having a Calibration Chart may be used, even those supplied with low-cost cassette recorders, greatest accuracy will be achieved by using a Mic of good quality.
7. Refer to the Owner's Operating Manual printed on the inside of the Test Record jacket for operating the SCAN-ALYZER as an equalizer. NOTE: "PINK NOISE" and "ANALYZE A and B" buttons must be "out" for equalizer operation.

## II. ROOM ANALYZATION WITH AN EXTERNAL EQUALIZER

The Soundcraftsmen SCAN-ALYZER may be used in conjunction with existing equalizers found in many sound installations.

Interconnections are made in one of two ways. First, the equalizer may be inserted anywhere in the signal path after the AE2420-R (usually just after it). The "EQ DEFEAT" button on the AE2420-R is depressed and analyzation is carried out as in Part I. The only difference is that the external equalizer is used to balance the SCAN-ALYZER'S Comparator lights.

The "STEREO EXTERNAL EQ" "in" and "out" jacks provided at the AE2420-R's front panel are also convenient for this purpose. One quarter inch stereo phone plugs are used for connections to the AE2420-R. (See diagram II.) Analyzation instructions are the same as before.

Note that the "STEREO EXTERNAL EQ OUT" jack may be used as an auxiliary line output if the "STEREO EXTERNAL EQ IN" jack is not used.

### III. ANALYZATION OF THREE-HEAD TAPE DECKS

The AE2420-R is a valuable tool in analyzing the frequency response characteristics of Three Head Tape Decks and the particular tape used for recording. Once the proper equalization curve has been found, it may be used while recording so the finished tapes will be pre-compensated for flat frequency response.

Equipment interconnections are shown in Diagram III. The output of the tape deck is plugged into the analyzer's "HI LEVEL INPUT" via a  $\frac{1}{4}$ -inch phone plug. This is a mono input, hence it must be switched at the Tape Deck Line Outputs for the particular channel being analyzed. Start with Channel A (left channel). If the "Tape Outputs" of the AE2420-R are used, the "EQ TAPE RECORD" button should be depressed. This does not have to be done if the "LINE OUTPUTS" are used.

After making connections to tape deck depress "PINK NOISE" and "ANALYZE A" button. Record noise on tape deck at approximately -3dB. Simultaneously while recording, place "TAPE MONITOR" switch on deck to "PLAY" or "TAPE" position. With "BAND SELECT" in "ALL" position advance "SCAN-ALYZER INPUT-ADJUST" control until Ch. A Equalized Signal L.E.D.s are at equal intensities. Proceed to step 4c and 5 of ROOM ANALYZATION INSTRUCTION (paragraph I).

NOTE: To analyze Ch. B (Right Ch.) of tape deck (Step 5), the cable connected to Ch. A (Left Ch.) line output must be switched to Ch. B (Right Ch.) line output of tape deck.

This process should be repeated for different types of tape used in recording. A Computone-Chart may be used to keep a record of equalization for each brand of tape used.

#### IV. ANALYZATION OF RELATED SYSTEM COMPONENTS

The Frequency Response of system components, such as preamplifiers, power amplifiers, etc., may be analyzed with the AE2420-R if the equipment to be tested is connected between the "LINE OUT" and "HI LEVEL INPUT" as shown in Diagram IV.

Note again that the "HI LEVEL INPUT" jack is a mono input and hence the outputs of the unit under test must be switched to the appropriate channel.

The procedure is the same as in Paragraph III, except naturally there is no recording involved. If the unit under test has a volume or gain control, it should be set at its normal position or slightly above. When both channels have been analyzed, the curve on the Scan-Alyzer, (which may be permanently recorded on the Computone-Charts provided) represents the INVERSE frequency response of the unit under test.

You may wish to retain the Computone-Chart for a period of time, for re-analyzing whenever any question relating to system performance arises, and comparing the new curve with the original curve to verify consistent frequency response characteristics, or to indicate possible deficiencies.

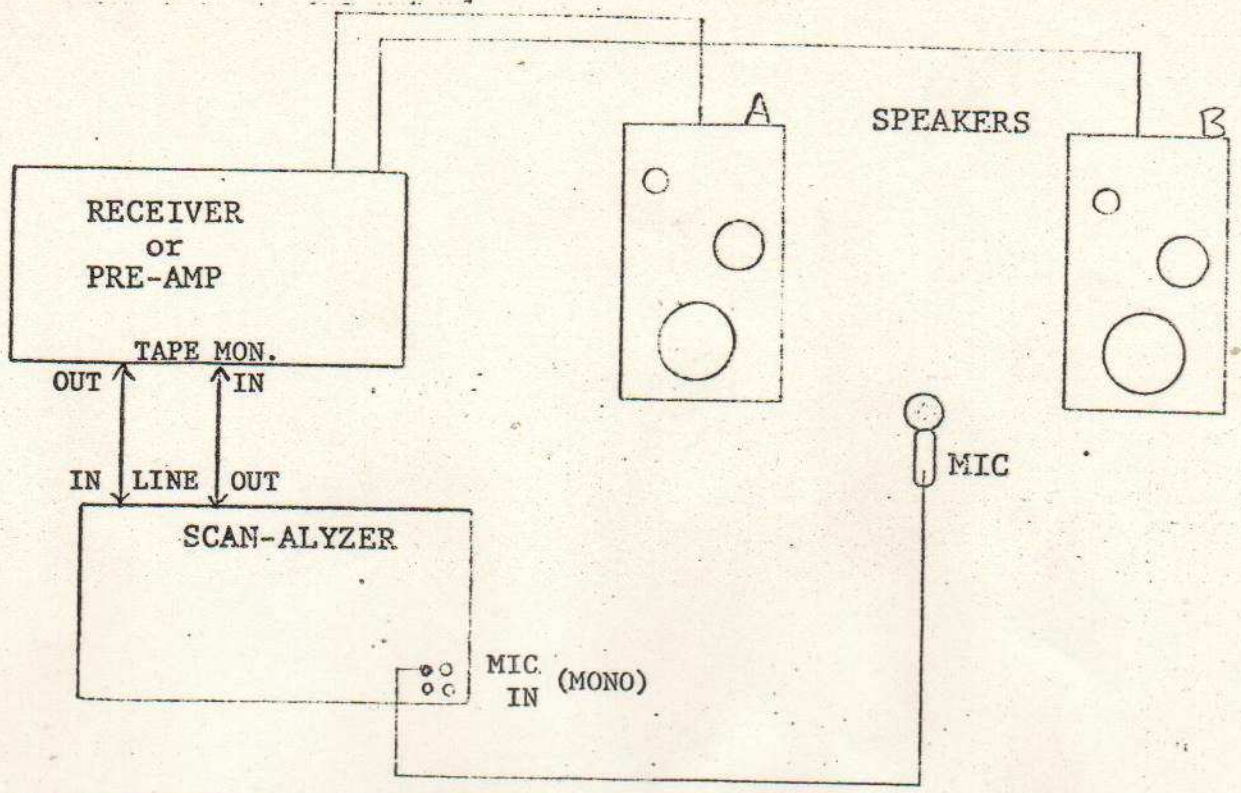
#### V. PROFESSIONAL SOUND REINFORCEMENT:

The SCAN-ALYZER is an extremely useful tool in the Sound Reinforcement/Public Address field. If the SCAN-ALYZER is connected between the MIXER and the AMPLIFIER, THE AMP MUST HAVE GAIN CONTROLS to allow you to control the level of the Pink Noise. Without Gain Controls, the level of the Pink Noise MAY DAMAGE THE SPEAKERS. If Gain Controls are not available on the amp, the SCAN-ALYZER should be connected in the EFFECTS BUSS OF THE MIXER. Then the Pink Noise level can be controlled AT THE MIXER. The operating instructions are the same as in I (ROOM ANALYZATION).

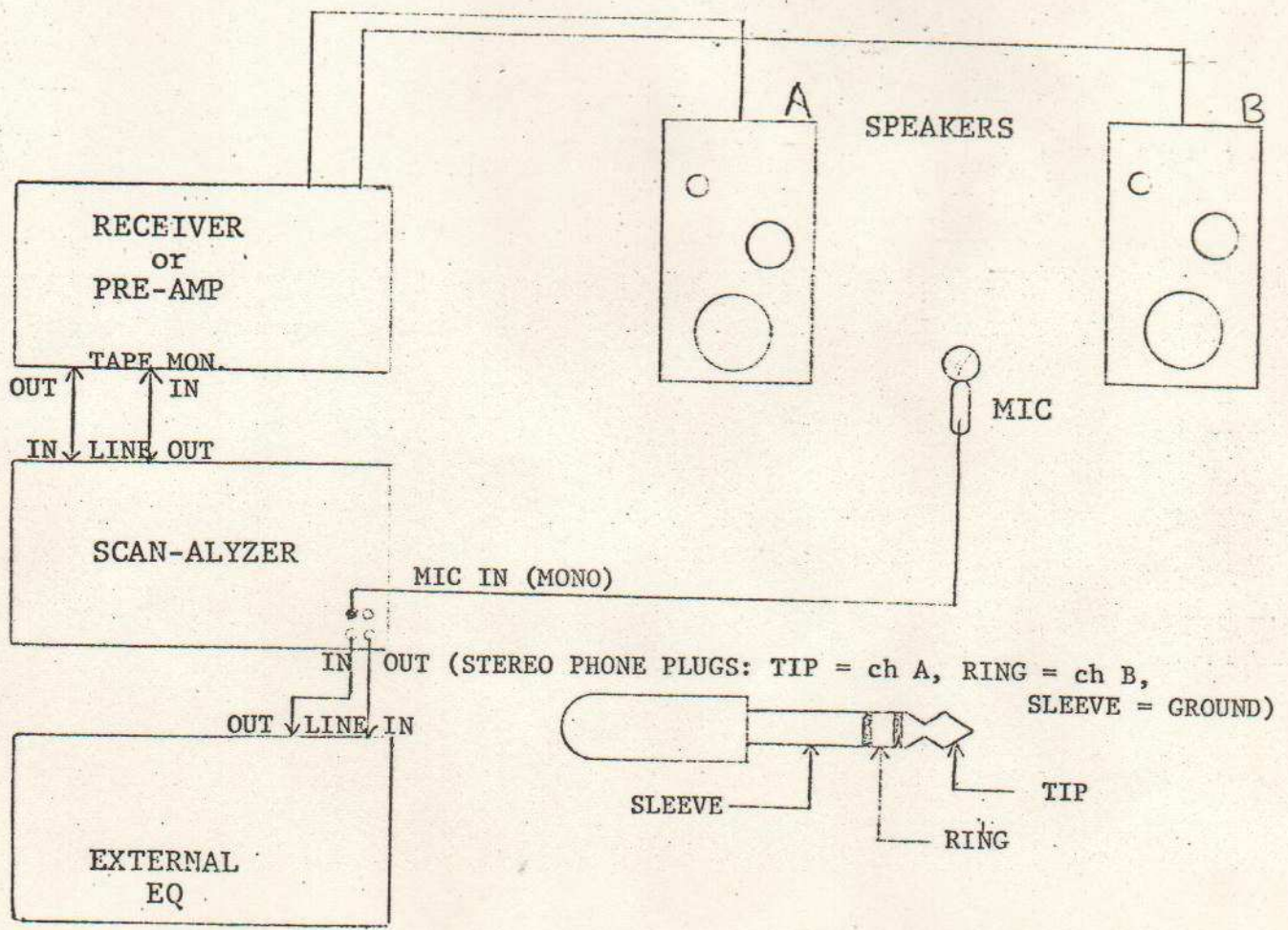
After Analyzation, the Scan-Alyzer may be connected in line so that the EFFECTS BUSS may be used for other effects.

PLEASE REFER TO THE "OWNER'S INSTRUCTION MANUAL" PRINTED ON THE INSIDE OF YOUR TEST RECORD JACKET FOR CHARTS, TECHNICAL DETAIL AND TROUBLE-SHOOTING HINTS.

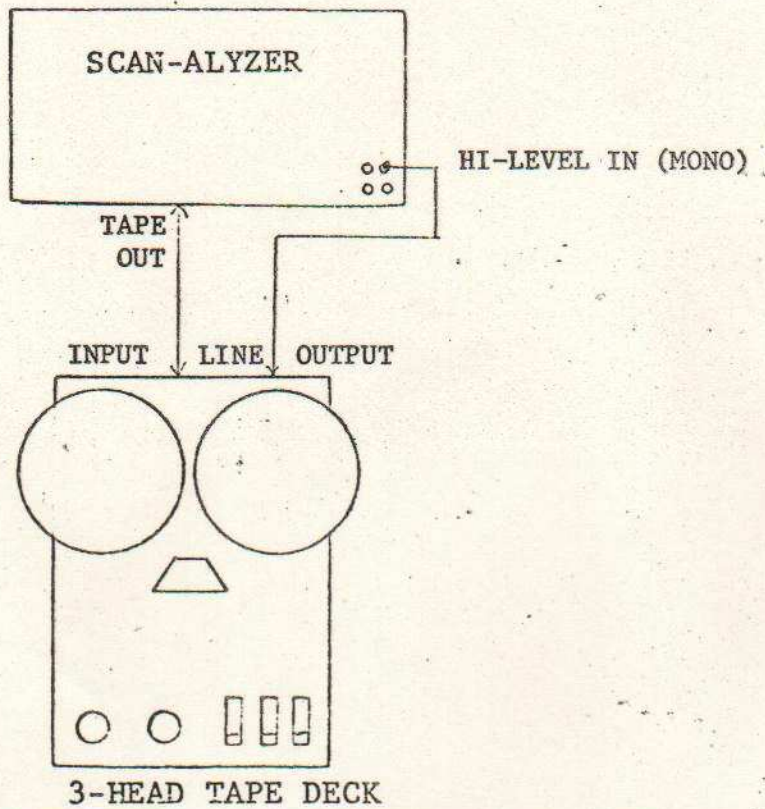
I. ROOM ANALYZATION:



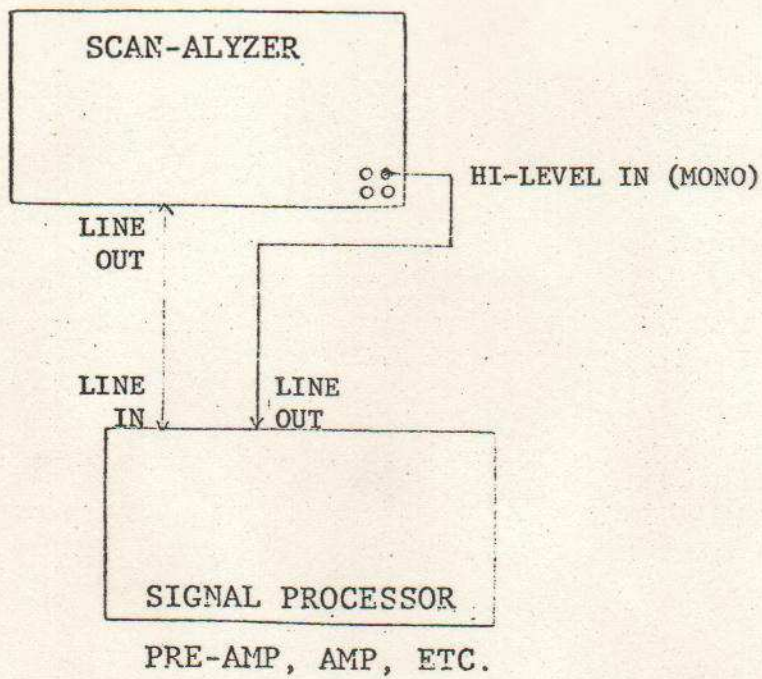
II. ROOM ANALYZATION WITH EXTERNAL EQUALIZER:

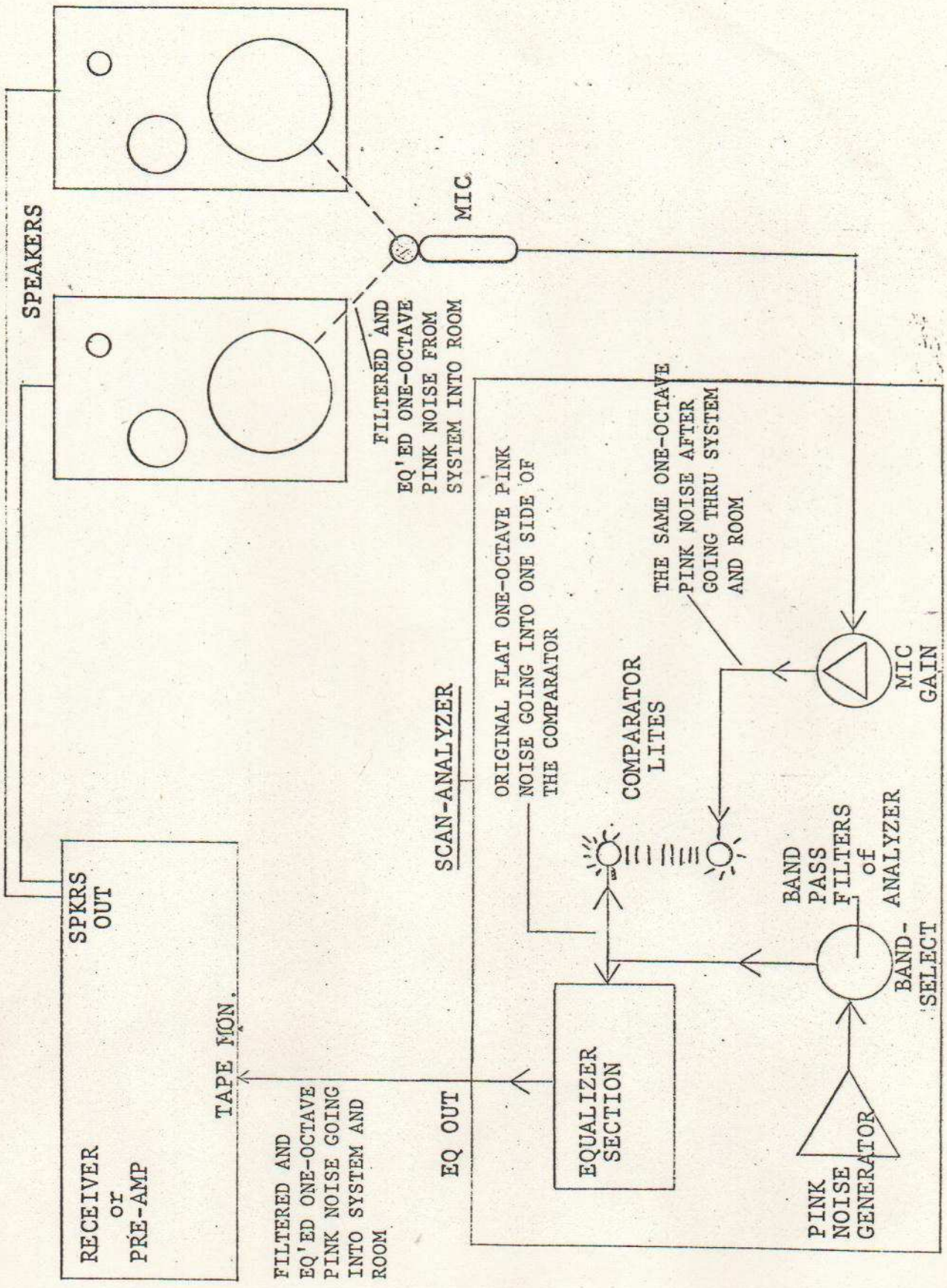


### III. ANALYZATION OF THREE HEAD TAPE DECK:



### IV. ANALYZATION OF ANY SIGNAL PROCESSOR:





BLOCK DIAGRAM SHOWING SIMPLICITY AND SIGNAL PATH OF

# GAIN VS FREQUENCY

SOUNDCRAFTSMEN SCAN-ALYZER SYN. V. 943165  
DATA TAKEN 10-24-79, BY JOHN HOLYOAKE  
EQUIPMENT: GENERAL RADIO SOUND VIBRATION  
ANALYZER MODEL 1564A

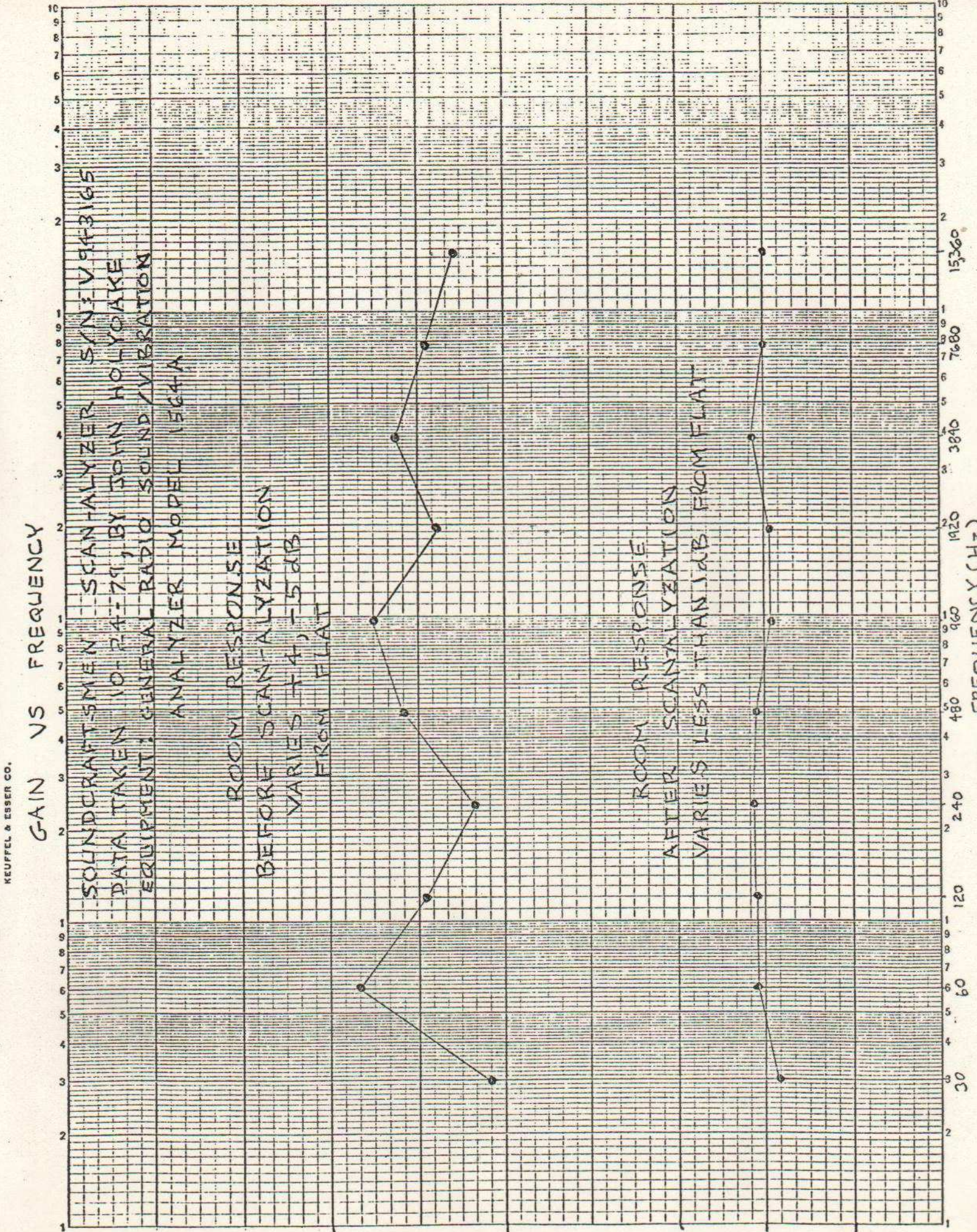
ROOM RESPONSE  
BEFORE SCAN-ALYZATION  
VARIES  $\pm 4$ ,  $-5$  dB  
FROM FLAT

ROOM RESPONSE  
AFTER SCAN-ALYZATION  
VARIES LESS THAN  $\pm 1$  dB  
FROM FLAT

+6  
GAIN (Db)  
0  
-6

+6  
0  
-6

10  
9  
8  
7  
6  
5  
4  
3  
2  
1  
0  
1  
2  
3  
4  
5  
6  
7  
8  
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10  
FREQUENCY (HZ)



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## MODEL AE2420-R "SCAN-ALYZER"/EQUALIZER

### SPECIFICATIONS

#### ANALYZER SECTION

- DIFFERENTIAL COMPARATOR: Minimum input: 75 millivolts  
Differential measurement accuracy:  $\pm 0.1$ dB
- HI LEVEL INPUT: Input impedance: 47K ohms  
Gain: adjustable; 30dB max.  
Freq. Response:  $\pm 0.1$ dB 20Hz to 20KHz
- MIC PREAMP: Input impedance: 200 ohms or 20K ohms (Switchable Lo. or Hi Z)  
Gain: 80dB max.  
Freq. Response:  $\pm 0.1$ dB 20Hz to 20KHz
- PINK NOISE SOURCE: Internal Generator  
Level: approx. 300 millivolts
- BANDPASS FILTER: Center Frequencies: 30, 60, 120, 240, 480, 960, Hz  
1.92, 3.84, 7.68, 15.36, KHz
- SELECTABILITY: 11-position switch for selecting each of the 10 individual Bandpass Filters, or All pass, for initial LED balancing.

#### EQUALIZER SECTION

- HARMONIC DISTORTION: Less than .01% at 2V
- IM DISTORTION: Less than .01% at 2V
- SIGNAL-TO-NOISE: 105dB at 10V output  
100dB at 2V output
- OCTAVE CONTROLS:  $\pm 16$ dB boost or cut-each octave (all octaves set at max)  
 $\pm 12$ dB boost or cut-each octave (all octaves set at zero)
- GAIN CUT CAPABILITY:  $+22$ dB/ $-28$ dB-all controls at maximum
- ZERO GAIN CONTROLS: 18dB range
- FILTER TYPE: Op-Amp synthesized inductors
- DIMENSIONS:  $5\frac{1}{4}$ " X 19" X  $11\frac{1}{4}$ "
- WEIGHT: 21 lbs.