

SAE
 Scientific Audio Electronics, Inc.

2900
Owner's Manual

CONGRATULATIONS!

You are now the proud owner of one of the finest pre-amplifiers available. Your 2900 is the result of many years of painstaking research and development by SAE's engineering and design team. The high caliber of our design staff and the dedication to the most precise engineering and production standards have made SAE products known around the world, as truly "state-of-the-art" components.

In order to achieve maximum performance from your 2900, please read this manual thoroughly before operation. If you have any questions concerning its use or maintenance, please contact your dealer or the SAE Customer Service Department, P.O. Box 60271, Terminal Annex, Los Angeles, 90060.

PRODUCT RECORD

Model: **SAE 2900 Preamplifier Equalizer**

Serial No. _____

Purchased From:

Name _____

Address _____

Date Purchased _____

Sales Invoice No. _____

Salesman _____

Date Service Contract Card Mailed _____

Service Contract No. _____

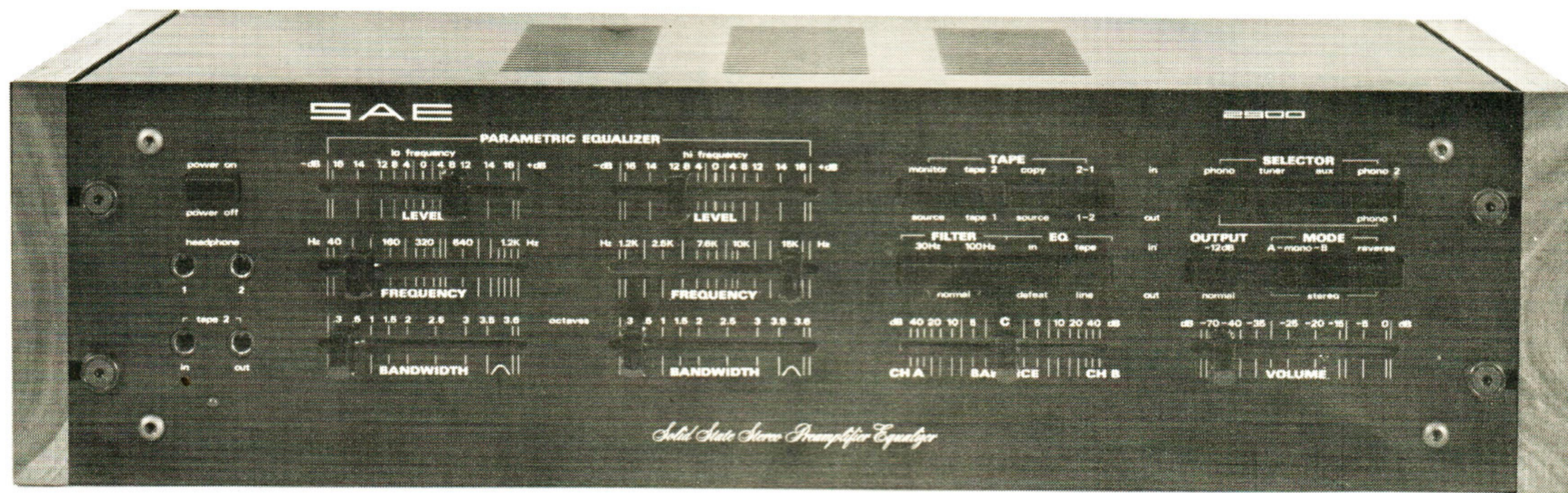
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2900 Stereo Preamplifier Equalizer

UNPACKING

Before leaving the factory, your unit was carefully inspected for physical imperfections as a routine part of our systematic quality control to ensure a flawless appearance.

After the pre-amplifier has been unpacked, inspect it for physical damage.

Save the shipping carton and all packaging materials, as they were carefully designed to reduce to a minimum the possibility of transportation damage.

In the unlikely event that damage has occurred, immediately notify your dealer and request the name of the carrier so that a written claim to cover the damages can be initiated.

THE RIGHT TO ANY CLAIM AGAINST A PUBLIC CARRIER CAN BE FORFEITED IF THE CARRIER IS NOT NOTIFIED PROMPTLY, AND IF THE SHIPPING CARTON AND PACKING MATERIALS ARE NOT AVAILABLE FOR INSPECTION BY THE CARRIER. SAVE ALL PACKING MATERIALS UNTIL THE CLAIM HAS BEEN SETTLED.

CAUTION: To prevent fire or shock hazard, do not expose this appliance to rain or moisture.

INSTALLATION

Adequate ventilation will extend the trouble free life of your pre-amplifier.

The 2900 may be mounted either horizontally or vertically. However, it should not be totally enclosed with other heat producing components.

The cut-out for custom panel mounting is 5 in. high by 17.5 in. wide. Allow enough space around the opening to clear adjacent panel-mounted components. The outside dimensions of the front panel are 5.25 in. by 19 in. If your cabinet has doors or a lid, the mounting panel should be a minimum of .75 in. behind the doors or lid when closed to clear knobs and switches. The mounting holes on the bottom are tapped for a #6-32 screw size and the screws used for mounting must not project more than .25 in. into the unit.

The 2900 is designed so that it may be used in a 19 in. rack mount installation. In this application it may be mounted by the front panel only. However, if extended shipping is planned, standard precautions should be practiced such as side ramps, tracks, or supports to protect the unit during rough handling.

If you intend to use the 2900 in a stand alone application, the C-4 or C-5 cabinet is available as an accessory. This handsome cabinet features solid walnut sides which complement the 2900 beautifully.

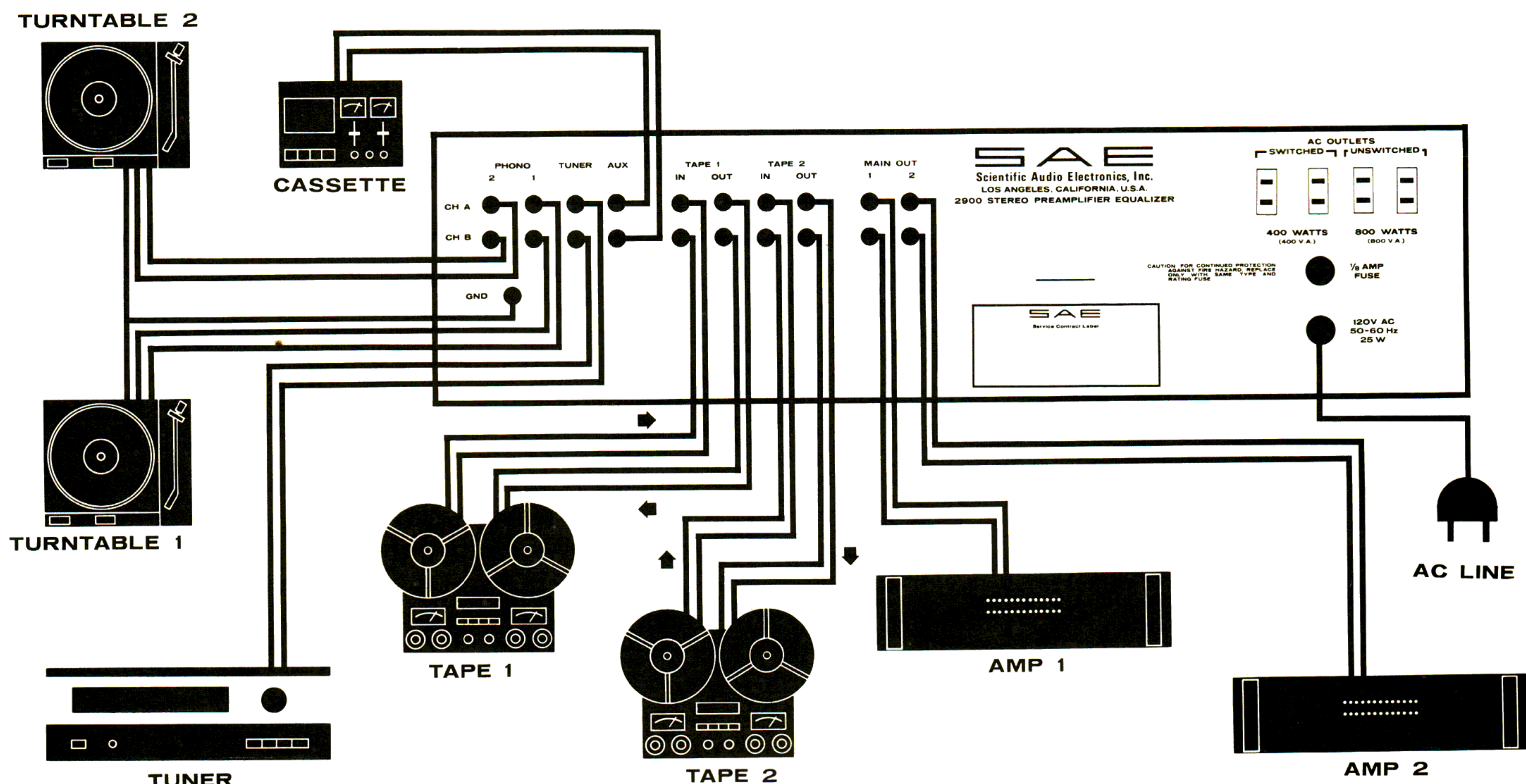


FIGURE 1. Typical Hookup

CONNECTIONS

All rear panel input and output signal connections should be made with high-quality co-axial audio cables (RCA phono type). On the 2900, left channel inputs and outputs are labeled “**CH A**”. Right channel inputs and outputs are labeled “**CH B**”.

Whenever rear panel connections are being made, the 2900 and the associated components should all be switched off.

REAR PANEL CONNECTIONS

PHONO 1 & PHONO 2— These inputs are for connecting turntable or changer outputs.

Connect the cable from Channel A of the turntable into the **PHONO 1 CH A** input jack. Connect the cable from Channel B of the turntable into the **PHONO 1 CH B** input jack. A second turntable is connected to **PHONO 2** in the same manner. Phono 1 and PHONO 2 inputs are terminated with an input resistance of 47,000 ohms and an input capacitance of 100 picofarads (approx.)

GND— Under certain conditions it may be necessary to provide a common “ground” between the 2900 and your associated equipment. This may be accomplished by using the special **GND** terminal located on the rear panel.

TUNER— Connect the cable from the left output of your tuner to the **TUNER CH A** input on the 2900.

Connect the cable from the right output of the tuner to the **TUNER CH B** input.

AUX— This high-level input is provided for items such as a second tuner, TV Sound, ceramic phono cartridge or a playback tape deck.

TAPE 1 & TAPE 2— Two full tape circuits are provided on the 2900. To connect a tape deck or other component to the **TAPE 1** circuit, use the following procedure. The left (A) and right (B) outputs of the tape deck or other component are connected by audio cables to the jacks on the back of the 2900 marked **TAPE 1 IN CH A** and **TAPE 1 IN CH B**. The inputs of the tape recorder are connected to the jacks on the

2900 marked **TAPE 1 OUT CH A** and **TAPE 1 OUT CH B**.

The same procedure is used for the connection of a tape deck or other component to the **TAPE 2** circuit.

Other components normally connected in these circuits are equalizers, noise reduction systems and decoders.

The control flexibility offered by these two circuits is discussed in the **OPERATION** section of this manual.

MAIN OUT 1 and MAIN OUT 2

The 2900 was designed specifically for operation with SAE Basic Power Amplifiers. However, it is eminently suited to drive any other stereo power amplifier, or a pair of monophonic power amplifiers. If two monophonic amplifiers are used for stereo, it is strongly suggested that they be a matched pair. **MAIN 1** and **MAIN 2** outputs are connected directly to the amplifier inputs. Connect the **MAIN OUT 1 CH A** to the left input on the stereo power amplifier. Connect the **MAIN OUT 1 CH B** to the right input on the stereo amplifier. An additional stereo power amplifier may be hooked up in the same manner to the **MAIN 2** outputs.

AC POWER CONNECTIONS

With the power switch in the OFF position, plug the line cord into any outlet furnishing 105-125 volts, 50 to 60 Hz.

AC OUTLETS — Four AC convenience receptacles are provided on the rear panel. These receptacles are designed to power your associated equipment. Two outlets are **SWITCHED**, and power is supplied to these when the 2900 is switched on, the other two are **UNSWITCHED** and power is always available at these outlets as long as the 2900 is plugged in. These unswitched outlets are usually for turntables and changers. The 2900 AC receptacles are two prong and are designed for 2 prong plugs **only**. Connecting amplifiers with 3 prong plugs by either removing the ground prong, or using a 3 to 2 adapter is not recommended and may be hazardous.

OPERATION OF CONTROLS

SELECTOR—These buttons select any desired input (**phono**, **tuner**, or **aux**) except for **tape 1** and **tape 2**. The **phono 1 / phono 2** button is used in conjunction with the **phono** selector button to choose phono 1 (out) or phono 2 (in), this **phono 1 / phono 2** button is ineffective without the **phono** selector button being depressed.

MODE—This selector functions in the following way:

stereo—With all mode buttons out, the CH A (left) input is connected to the CH A (left) output and the CH B (right) input is connected to the CH B (right) output.

A — When the **A** button is in, the CH A input is connected to the CH A and CH B outputs.

B — When the **B** button is in, the CH B input is connected to the CH A and CH B outputs.

A — mono — B — When both A and B buttons are in, the CH A and CH B signals are combined (A+B). This combined signal is then fed to CH A and CH B outputs.

reverse — With the A and B buttons out and the **reverse** in, the CH A input is fed to the CH B output and the CH B input is fed to the CH A output.

VOLUME and OUTPUT — The **VOLUME** control adjusts the volume level in both channels simultaneously. The **OUTPUT** switch will effectively extend the range of the volume control by 12 dB. When this switch is depressed the overall level of the preamp is reduced by 12 dB.

This **OUTPUT** switch is useful when using high efficiency speakers and at low listening levels to allow the volume control to be used over a broader range. The button is also useful in reducing level during phone calls and conversations without readjusting the **VOLUME** control.

BALANCE—The **BALANCE** control adjusts for unequal volume level in either channel.

Moving the control to the left will diminish the volume of CH B (right). Moving the control to the right will diminish the volume of CH A (left).

TAPE

monitor—The output of **TAPE 1** or **TAPE 2** can be monitored by using the **source/monitor** and **tape 1/tape 2** buttons. To monitor, depress the **source/monitor** button and then select **tape 1** (out) or **tape 2** (in).

copy—For recording from one tape machine onto another (copy), use the following procedure. Depress the **copy/source** button. Then with the **2-1/1-2** button in the out (1-2) position, the output of Tape 1 is fed to the input of Tape 2 and the source (determined by the selector switch) is fed to Tape 1. When the **2-1/1-2** button is in (2-1), the output of Tape 2 is fed to the input of Tape 1 and the selected source is fed to Tape 2. With the 2900 it is possible to simultaneously listen to a selected input and also copy tape to tape.

tape 2 (front)—These front panel jacks parallel the **TAPE 2** jacks on the back of the 2900. Three conductor phone cables are required for these front panel inputs and outputs. The phone jacks use a tip-ring-sleeve configuration. On the 2900 the tip is CH A, the ring is CH B and the sleeve is common.

The **tape 2 out** (front) parallels the rear and both are always on. However, when a plug is inserted into the **tape 2 in** (front) jack, this jack will disconnect the **TAPE 2 IN** jacks on the rear. You will now be able to monitor the signal present at the front jack. To monitor **TAPE 2** rear, the plug must be removed from the **tape 2 in** (front) jack.

EQ (Equalization)—The parametric equalizer in the 2900 is activated by depressing the **in/defeat** switch. This unique equalizer can be used after any input (**line**) including tape, or before the tape outputs (**tape**) to make modified tape recordings.

Following is a discussion of the parametric equalizer tone control system.

The parametric control philosophy is the result of some years of extensive research into the field of tone modification. The parametric approach may seem slightly more complicated at first, but in actual use it is found to be a much more flexible and responsive system.

The primary controls of the 2900's equalizer are grouped in two vertical sections, each section consists of a **LEVEL**, **FREQUENCY** and **BANDWIDTH** controls of a will be referred to as a "control group."

These control groups are designated as low frequency, and high frequency to indicate their primary area of use.

The **LEVEL**, **FREQUENCY**, and **BANDWIDTH** controls in a control group are interdependent. Any sonic effect you wish to create will require that you adjust not only the **LEVEL** control, but also the **FREQUENCY** and **BANDWIDTH** controls of a particular control group. Adjusting these controls for a desired effect will be discussed in the section under "EQ Adjustment." Here we will discuss the purpose of each control in a control group and its effect on the control group.

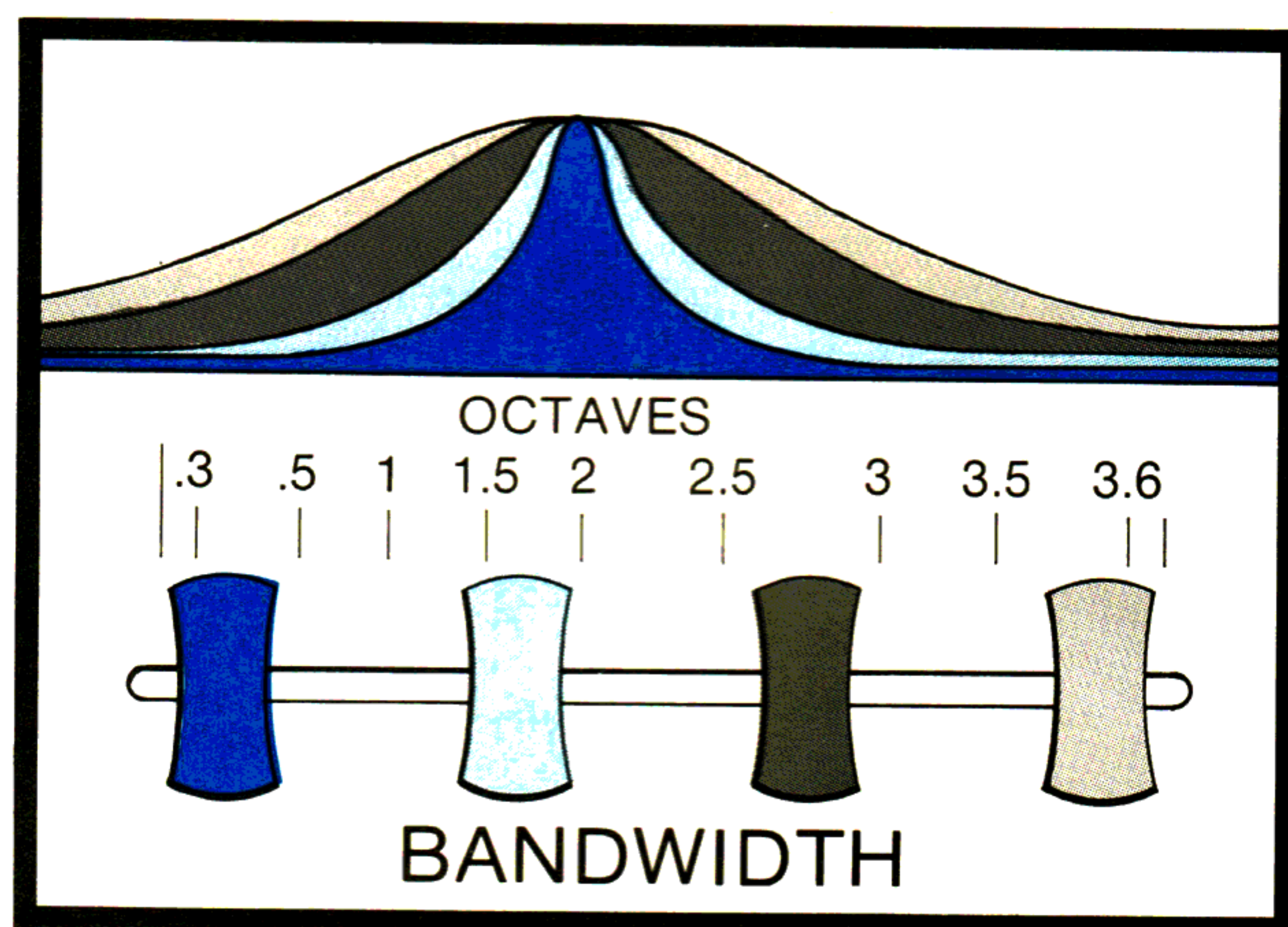


FIGURE 2. Bandwidth Control

BANDWIDTH

The control is calibrated in octaves and is adjustable from .3 octaves to over 3.6 octaves. An octave is defined as the range from an initial frequency to twice that frequency (example: 440Hz to 880Hz is one octave). A fundamental part of music, the octave is used because of its direct relationship to the purpose of the bandwidth control.

The setting of the bandwidth control determines how broad the range over which that particular control group will operate, whether it is .3 octave (commonly used for

notch filtering to correct room resonances) or 3.6 octaves (used for broadband tone modification) or anywhere in between.

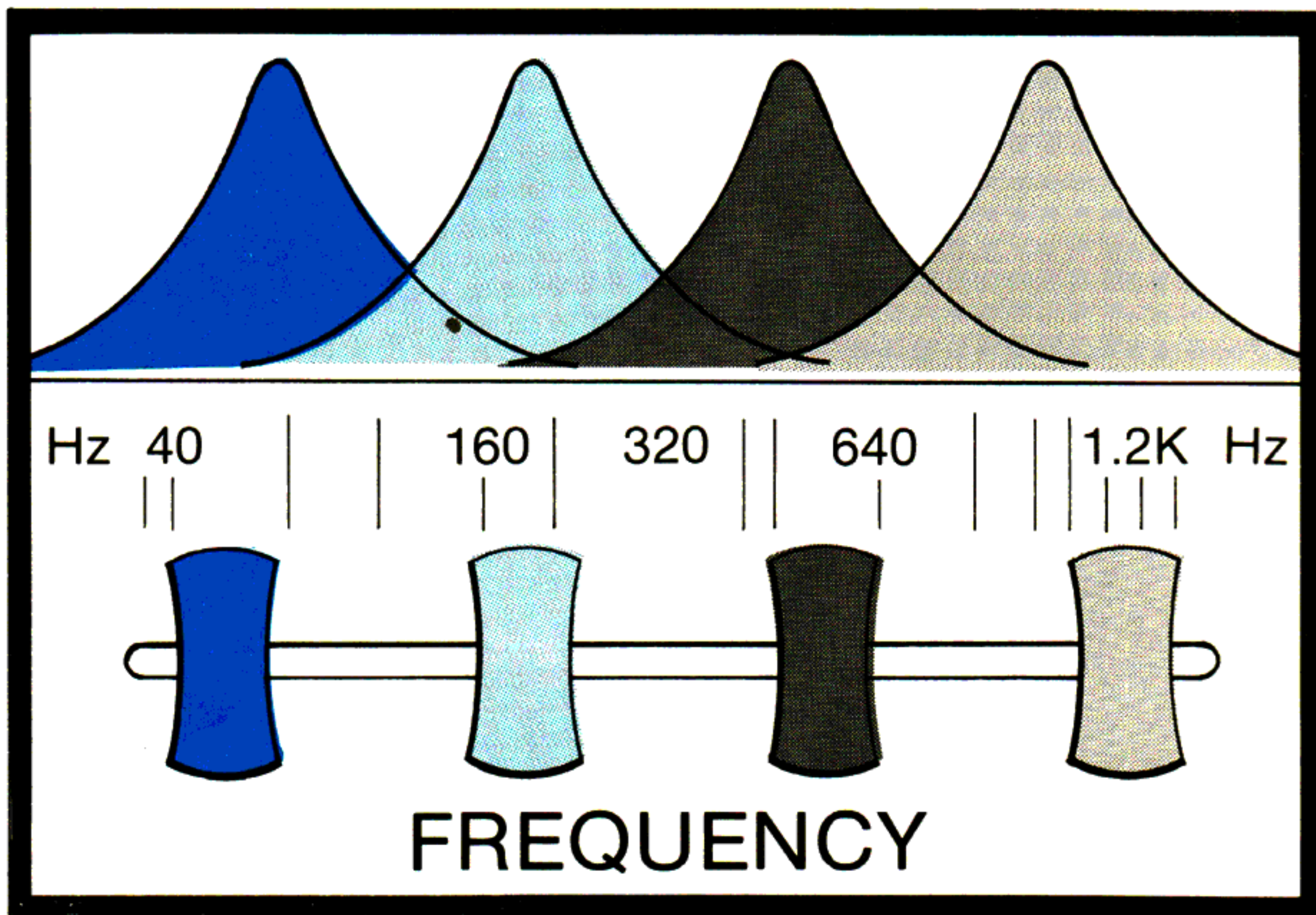


FIGURE 3. Frequency Control

FREQUENCY

This control is used in conjunction with the **BANDWIDTH** control, by setting its center frequency and thus determining the exact frequency range over which that particular control group will operate. For example, you want a particular control group to be effective for one octave centered around 440Hz. First the **BANDWIDTH** control is adjusted to one octave and then the **FREQUENCY** control is moved to 440Hz. Now the range from 330Hz ($\frac{1}{2}$ octave below 440Hz) to 660Hz ($\frac{1}{2}$ octave above 440Hz) will be modified by the setting of the level control in this control group.

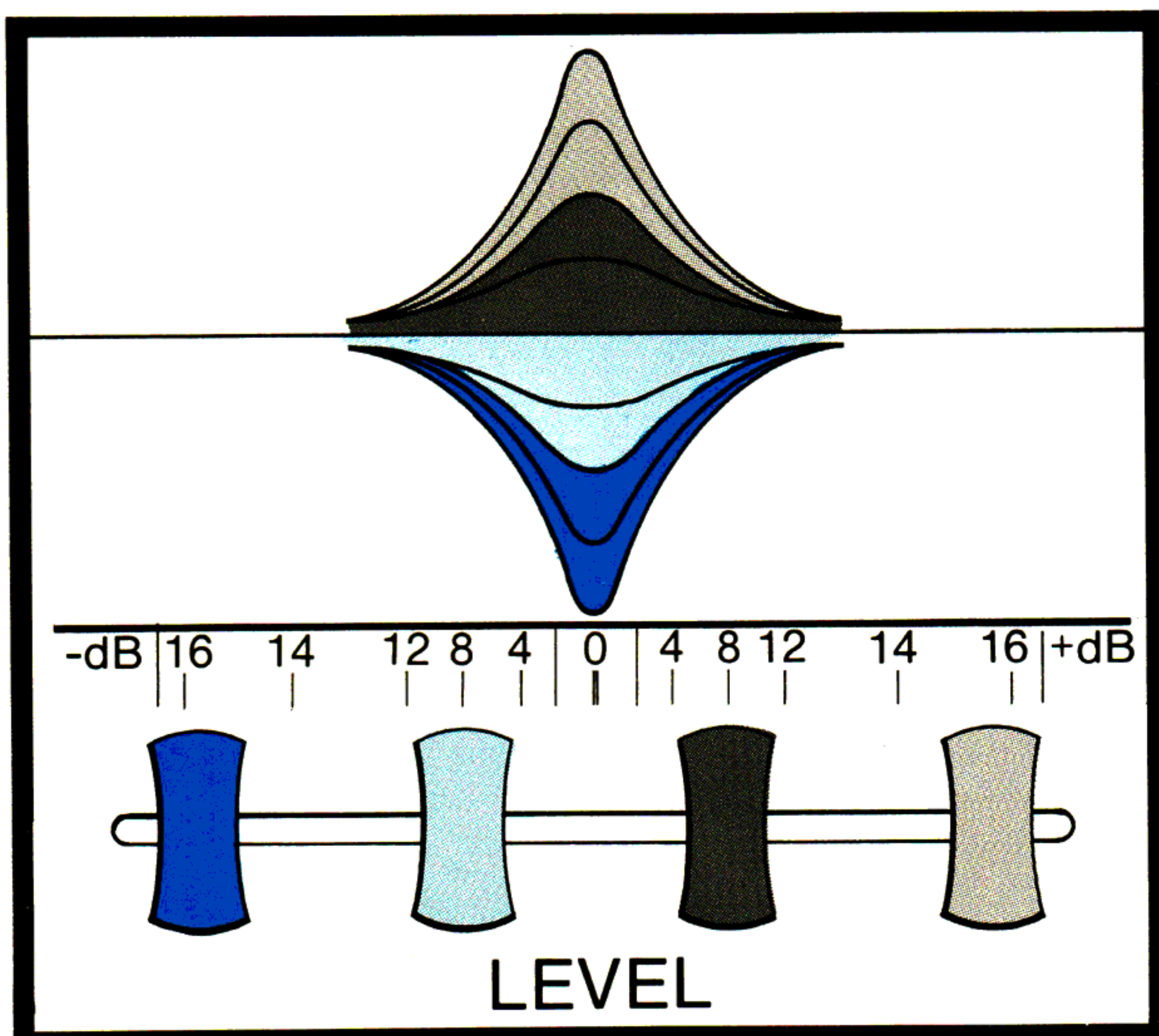


FIGURE 4. Level Control

LEVEL

As indicated in the previous example, once the **FREQUENCY** and **BANDWIDTH** have been selected (by their respective controls), the **LEVEL** control is used to determine the amount of boost or cut the control group will provide. The **LEVEL** control can provide a maximum cut or boost of 16dB.

EQ adjustment — in order to equalize program material properly for your listening preference, you must first determine the problem you wish to correct, whether it's an overbearing vocalist or a paling tuba. Once you have localized the problem areas, then refer to the chart marked "THE FREQUENCY RANGE OF MUSIC" and the discussion at the end of this section on characteristics of specific frequency ranges. With the help of this information you can pinpoint the approximate frequency region you wish to correct.

Once localized, choose the appropriate control group and use the following suggested procedure to tune the parametric equalized precisely. In the particular control group you have selected, adjust the **BANDWIDTH** control to one (1) octave and the **LEVEL** to approximately +6dB. Now move the **FREQUENCY** control until you have emphasized the region you wish to correct. Adjust the **FREQUENCY** control until you have emphasized the region you wish to correct. Then the **BANDWIDTH** and **LEVEL** controls may be adjusted to precisely correct the problem.

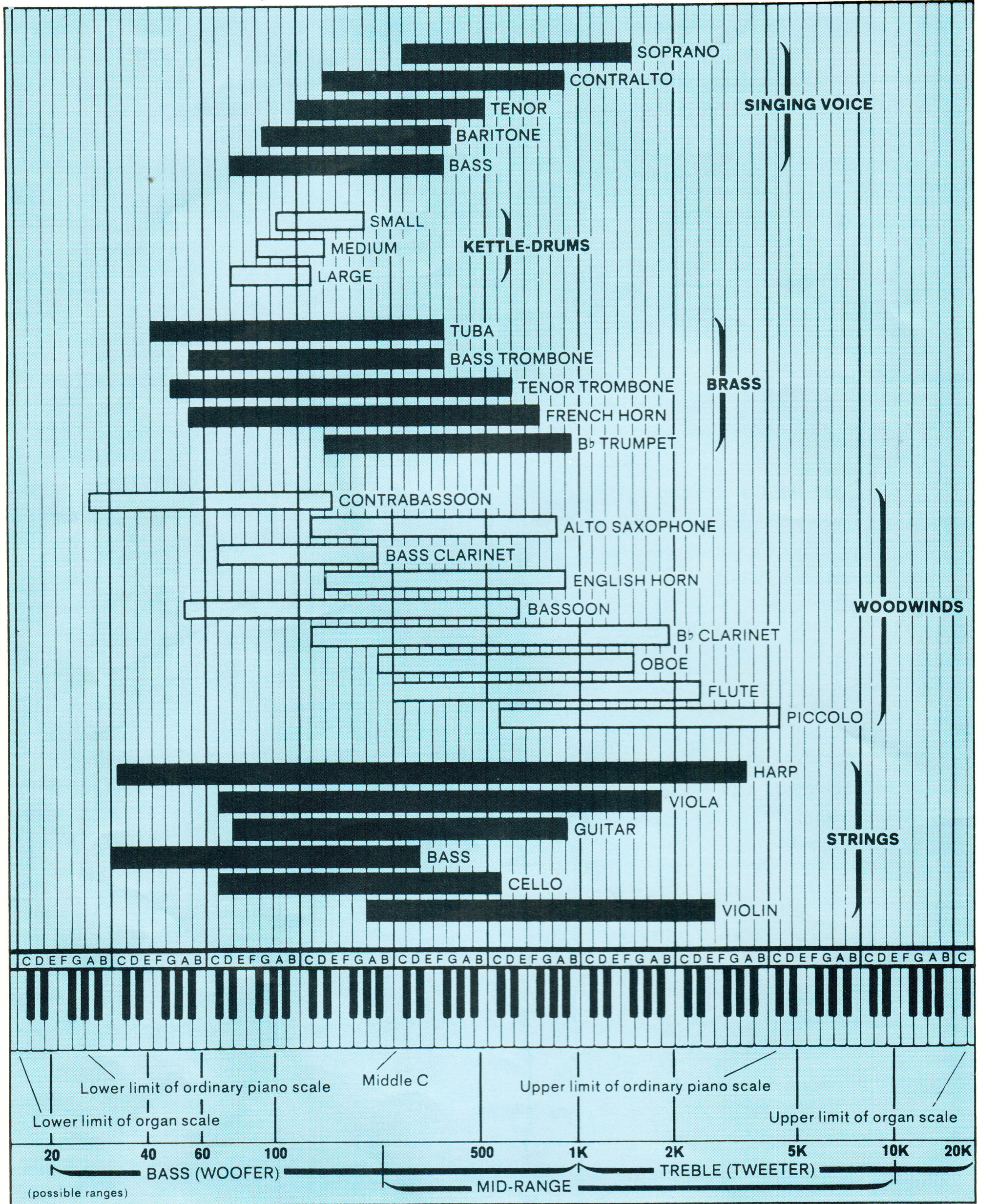
The degree of flexibility the 2900 possesses is almost infinite. The possibilities for room equalization, speaker correction and the infinite possibility in program modification are now at your finger tips.

SPECIFIC FREQUENCY RANGE CHARACTERISTICS

The following discussion localizes common problematic conditions into specific frequency ranges. Use this information and the chart on the "Frequency Range of Music" to assist you in setting your parametric equalizer.

THE FREQUENCY RANGE OF MUSIC

(Fundamental ranges for the principal instruments and voices)



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FIGURE 5. Frequency Range of Music

20Hz to 80Hz—This range is primarily low frequency instrument fundamentals (bass, drum, and pipe organ). By increasing this range, the bass will take on a deep rich “sock” without booming or blurring the sound. Decreasing the controls will weaken and muddy the bass.

120Hz to 320Hz—This area is the major harmonic range of low frequency material. Increasing this range results in muddy bass sound lacking definition and clean-transient response. However, some material in recording may lack these overtones: and therefore, sound extremely tight to the point of being strident. Proper use of controls in this range can offer good bass warmth without sacrificing definition.

320Hz to 1280Hz—The majority of fundamental notes exists in this frequency band. Therefore, this range can result in the most dramatic changes in overall program energy.

Increasing this range can give the sound more impact. However, if the material has too much impact, you can balance it out by decreasing the controls for smoother overall quality. The human ear is very sensitive to this range. You will find only a minor change is required to have major effects on the program material.

1280Hz to 5000Hz—This region controls those instruments that we generally consider to be high in frequency. These high frequencies can offer brightness to these instruments and clarity to the sound. The human ear has added sensitivity to this region: therefore, care must be taken since over-zealous use of controls in this range can introduce a brittle or dry sound. This characteristic occurs because the harmonic structure of these instruments is not being affected, and only the fundamentals are being changed. Therefore, an instrument inner-imbalance can occur. This region is also the common crossover range for loudspeakers: and therefore, many “peaks” and “valleys” can occur because of crossover characteristics which could be exaggerated by different program material. The flexibility of the 2900 is very useful in this situation. By proper adjust-

ment, these frequency aberrations can be compensated for.

5000Hz to 20,000Hz—This region is composed almost entirely of the harmonic structures that give instruments their unique sounds. This range offers proper balance to many of the percussion instruments, since they are very rich in harmonic content. This area can also add to the sparkle and brilliance that many audiophiles seek, especially from high frequency string and woodwind instruments. Use of the controls in the 15kHz and 20kHz area is also very effective in compensating for the common roll-off of high frequency drivers in the speakers.

The above information offers a guideline in the use of the 2900. Only through experimentation and use will you become aware of the full flexibility.

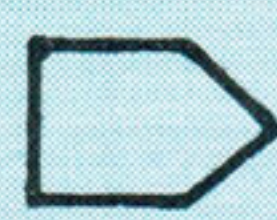
FILTERS—The 2900 provides two low frequency filters which are part of the EQ group and are activated by depressing the EQ **in/defeat** switch. The **30Hz** filter is designed to remove subsonic components (i.e.,: rumble, record warp), which could reduce the sonic clarity of the music and even damage speakers. This filter is also effective when making tape recordings from records, since these subsonic components can cause tape saturation and ruin otherwise excellent recordings. The **100Hz** filter is designed to reduce the pronounced bass encountered in certain recordings and room/speaker combinations.

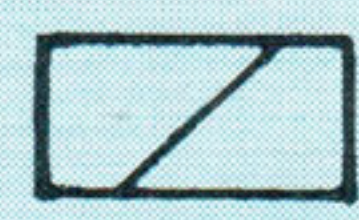
The following diagram shows the possible combinations of the TAPE 1, TAPE 2, and EQ circuits in the 2900. Remember that the filters are part of the EQ circuits.

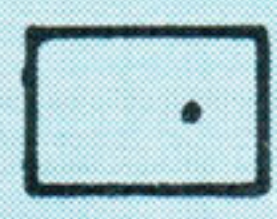
This interconnect flowchart has been provided to assist you in using the 2900’s tape monitor, copy, and EQ/filter systems. These flowcharts indicate what signals are present and where in the 2900, and at the TAPE OUT 1, TAPE OUT 2 and MAIN OUT. Determine which flowchart and remarks fit your particular situation and then use the SWITCH POSITION chart for the proper tape monitor, EQ/filter and copy configuration.

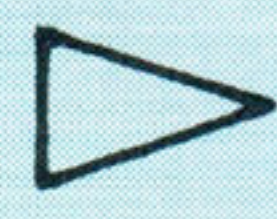
2900 TAPE, EQ/FILTER, COPY INTERCONNECT

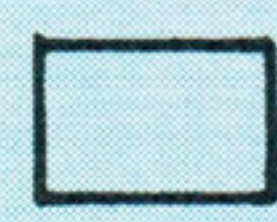
KEY

 —This block represents the SELECTOR switch. Any source selected by this switch (phono, tuner, aux.) will follow the path indicated by the signal flowchart.

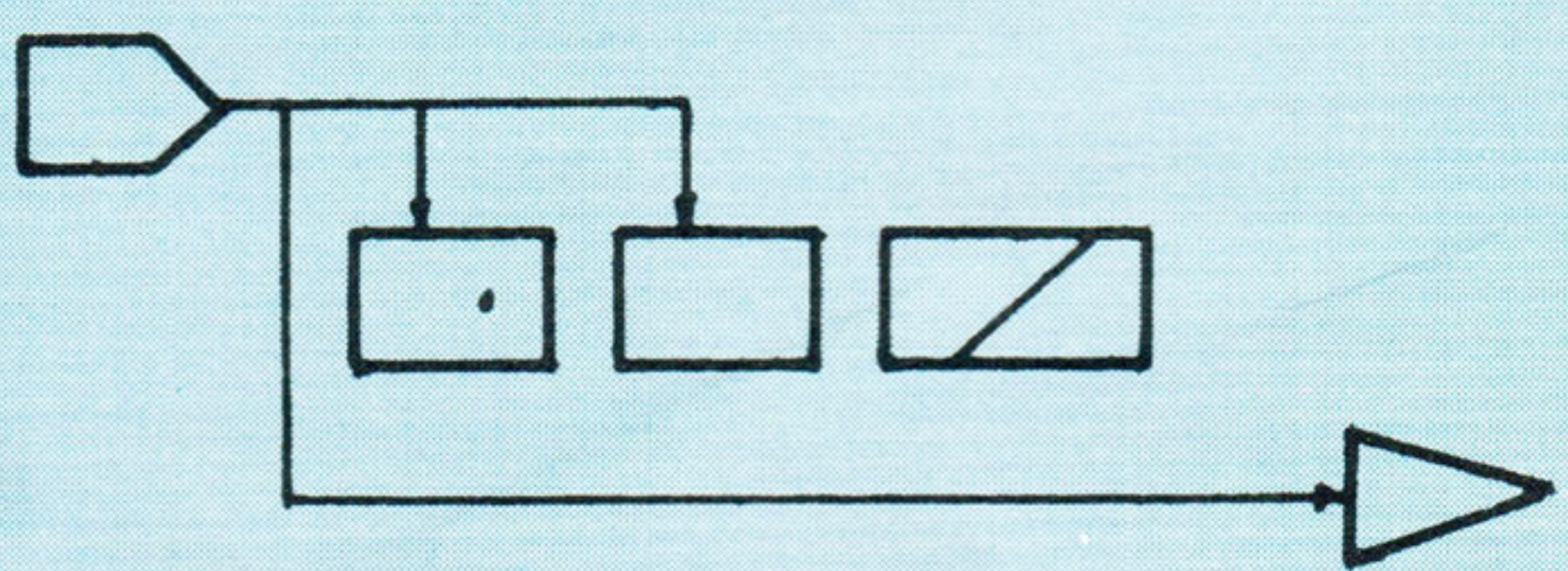
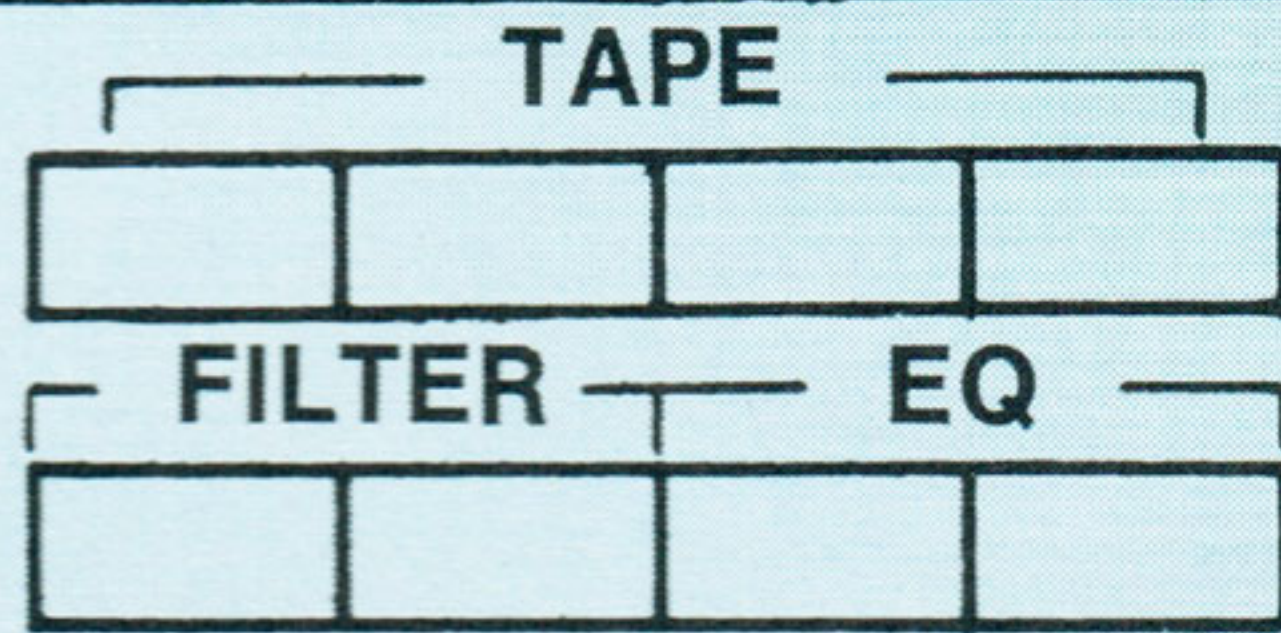
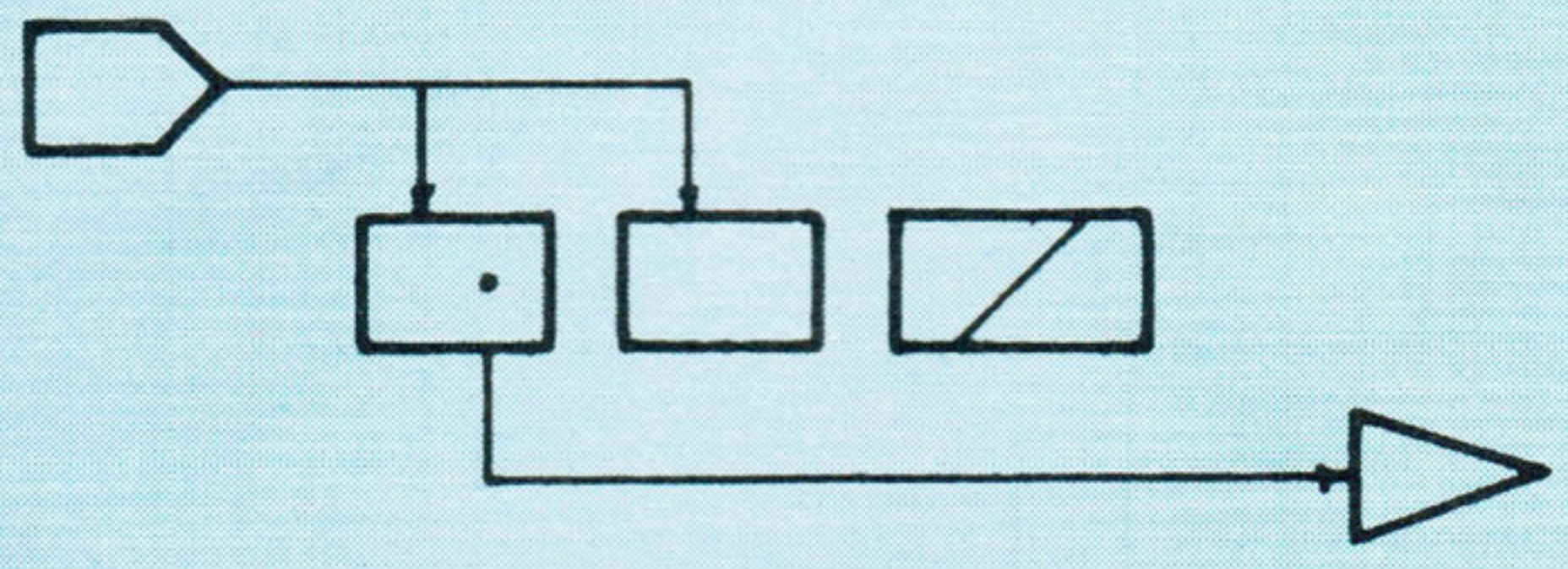
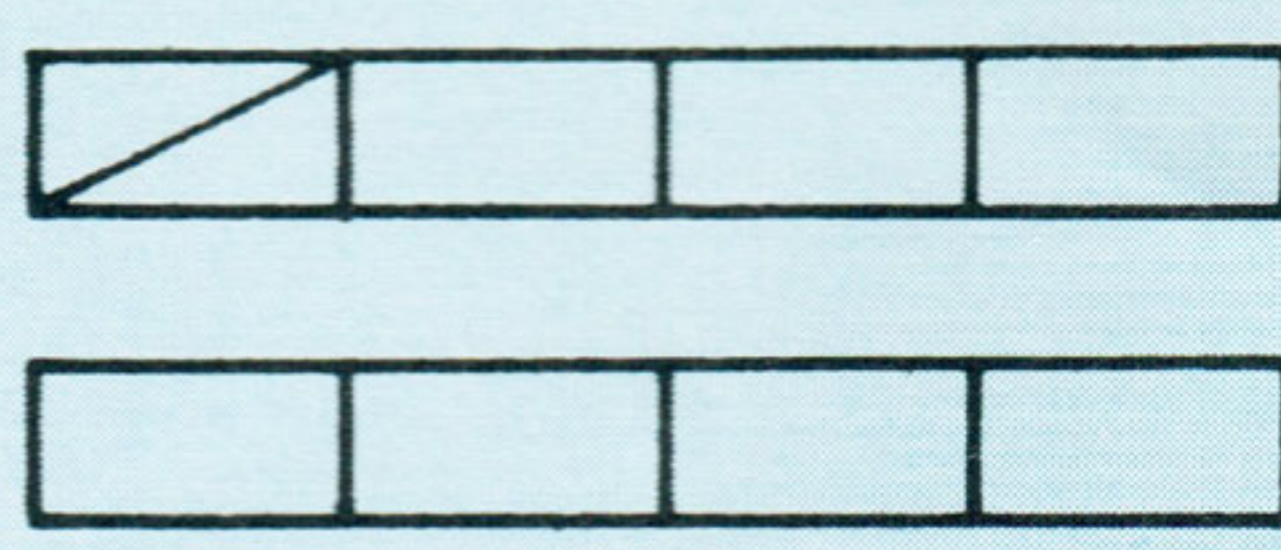
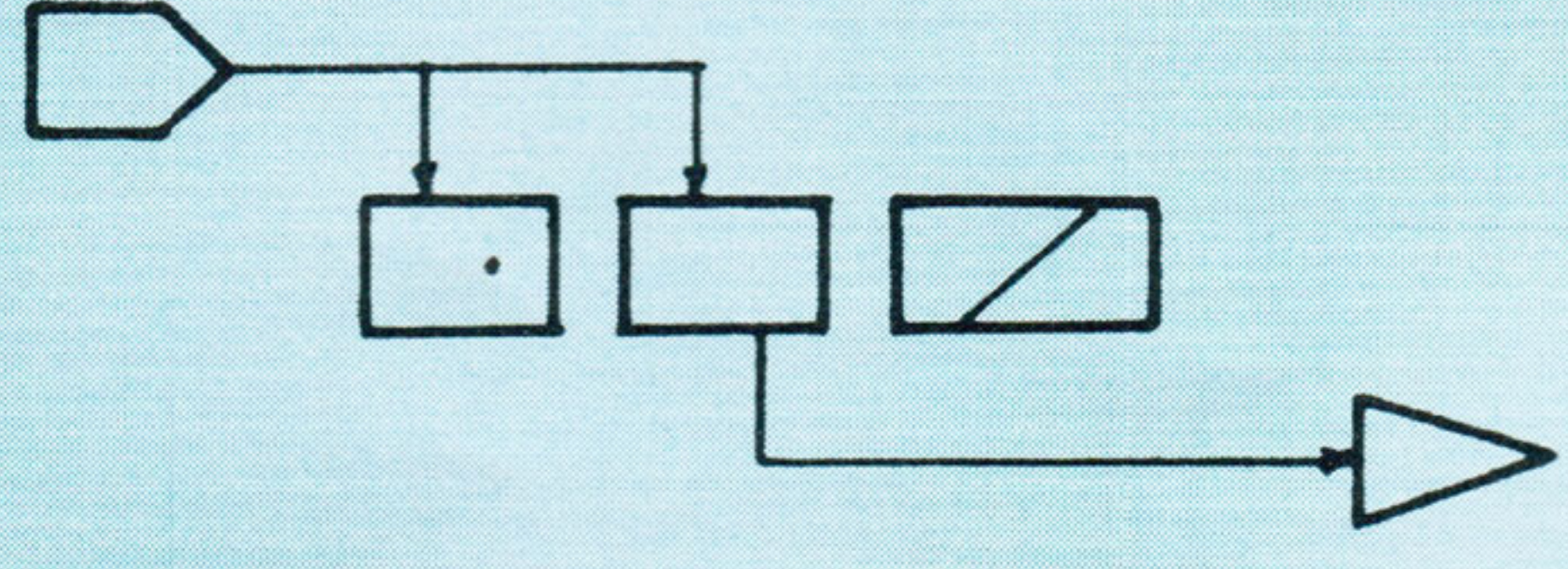
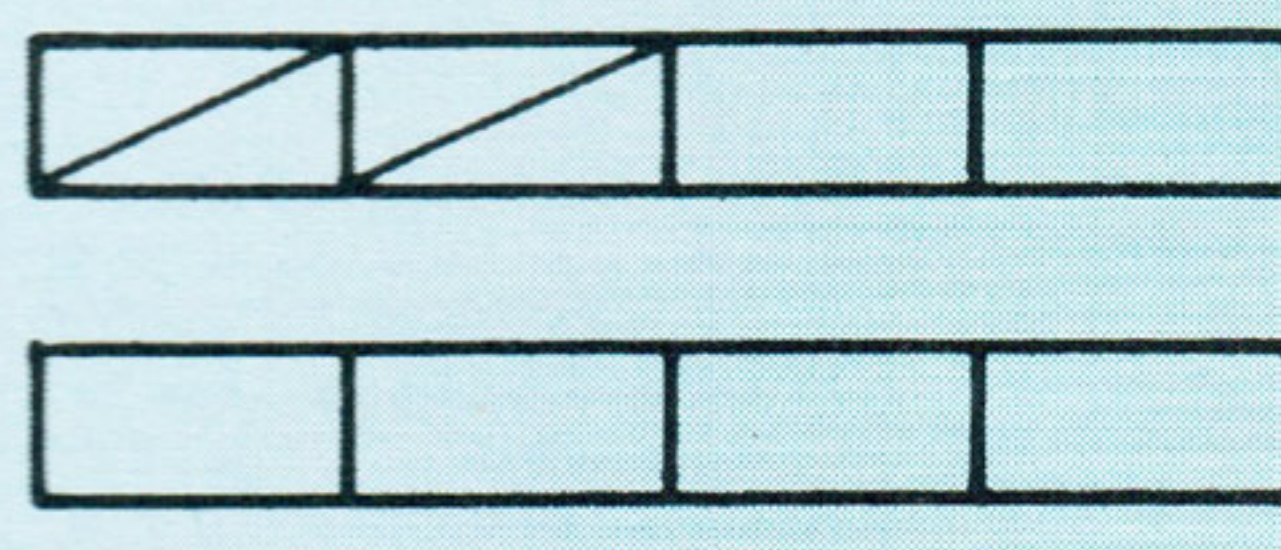
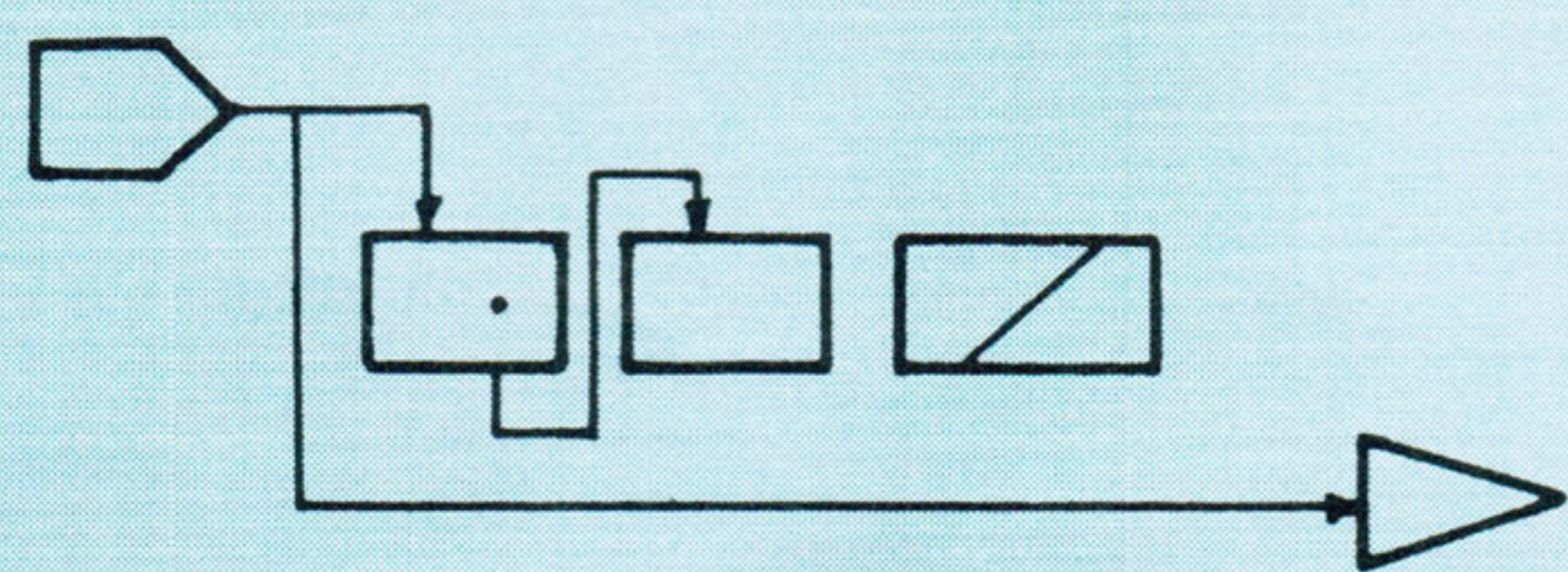
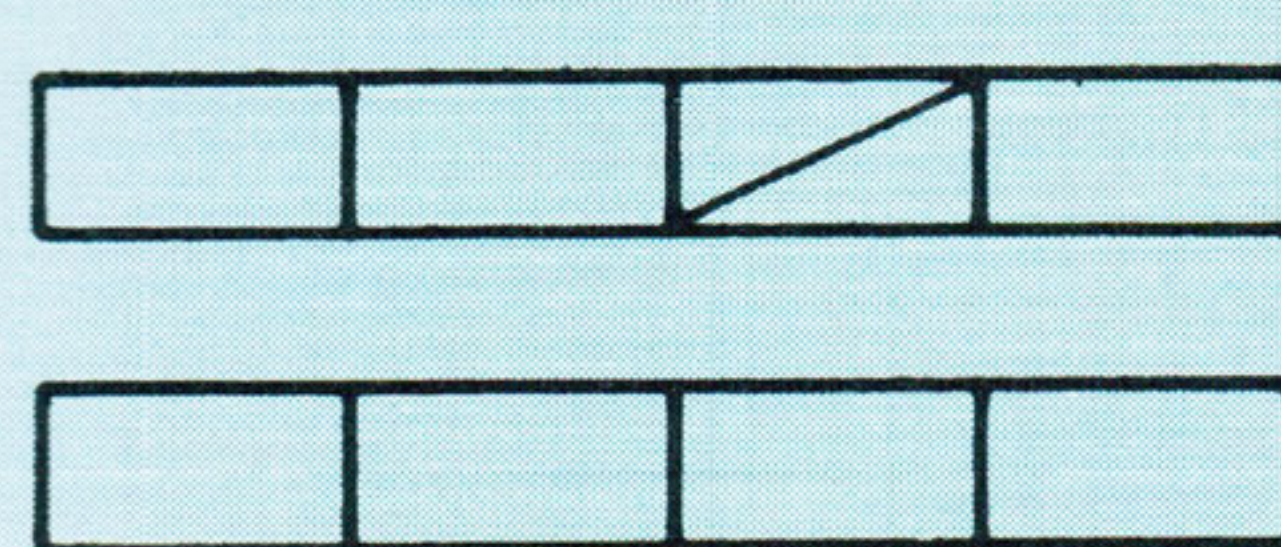
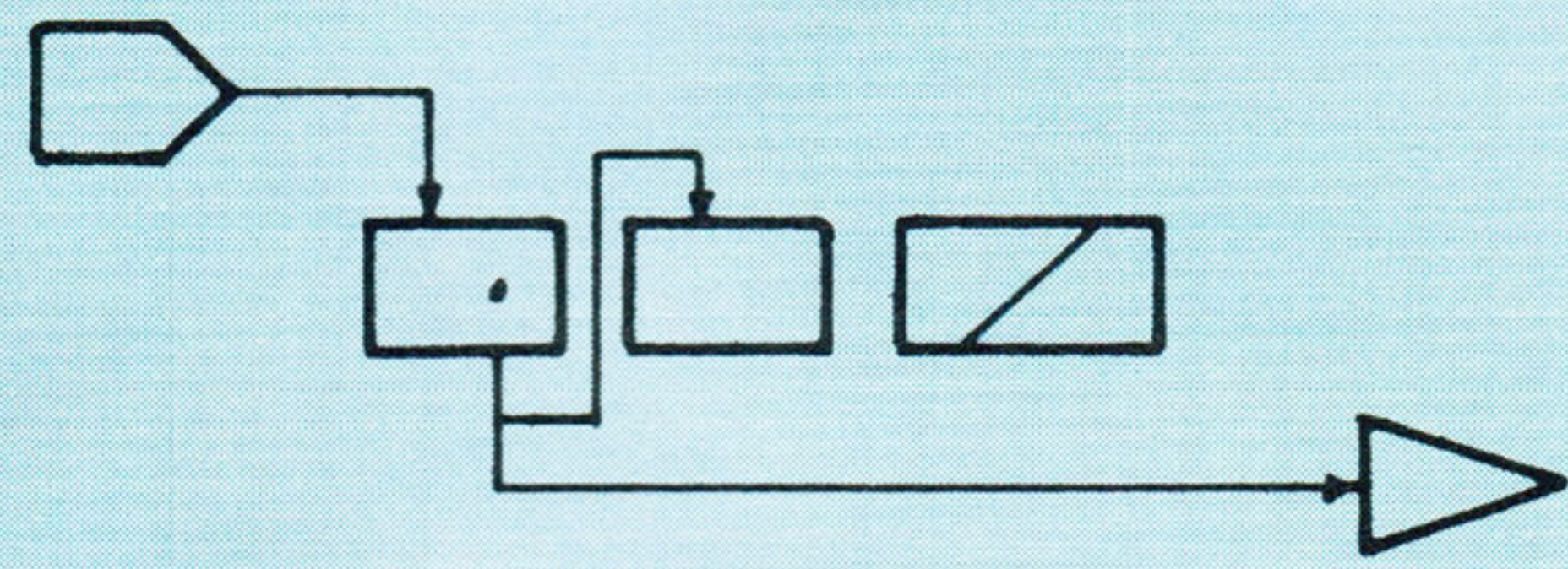
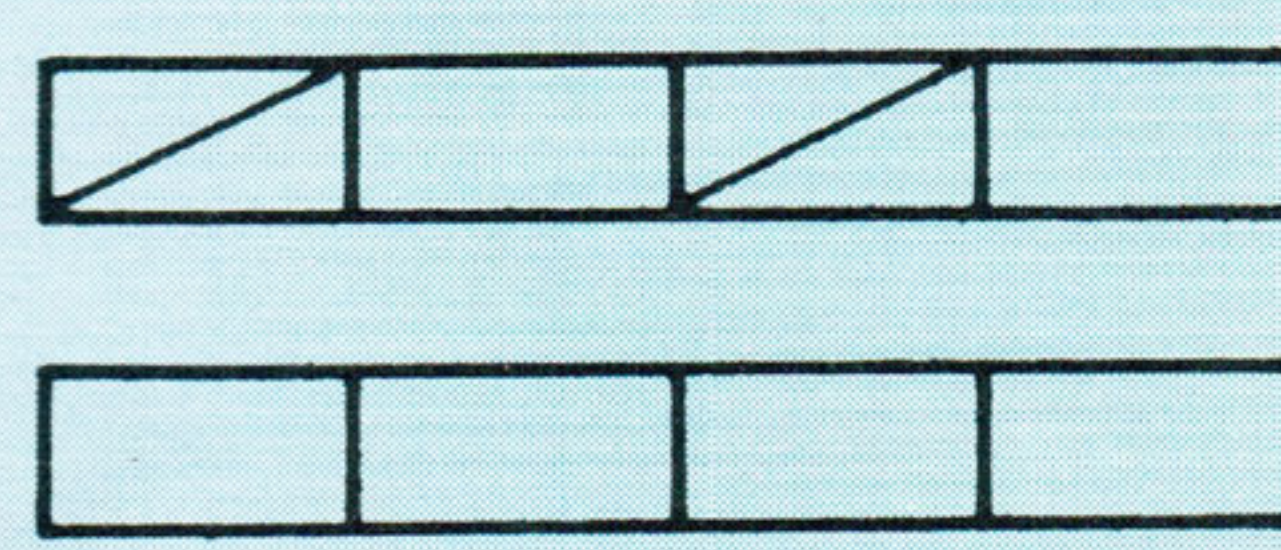
 —This block represents the equalizer and filter circuits of the 2900. Whatever signal flows through the EQ circuit will also be affected by the filters when they are activated.

 —This block represents the tape deck or other device connected to the TAPE 1 jacks on the rear panel.

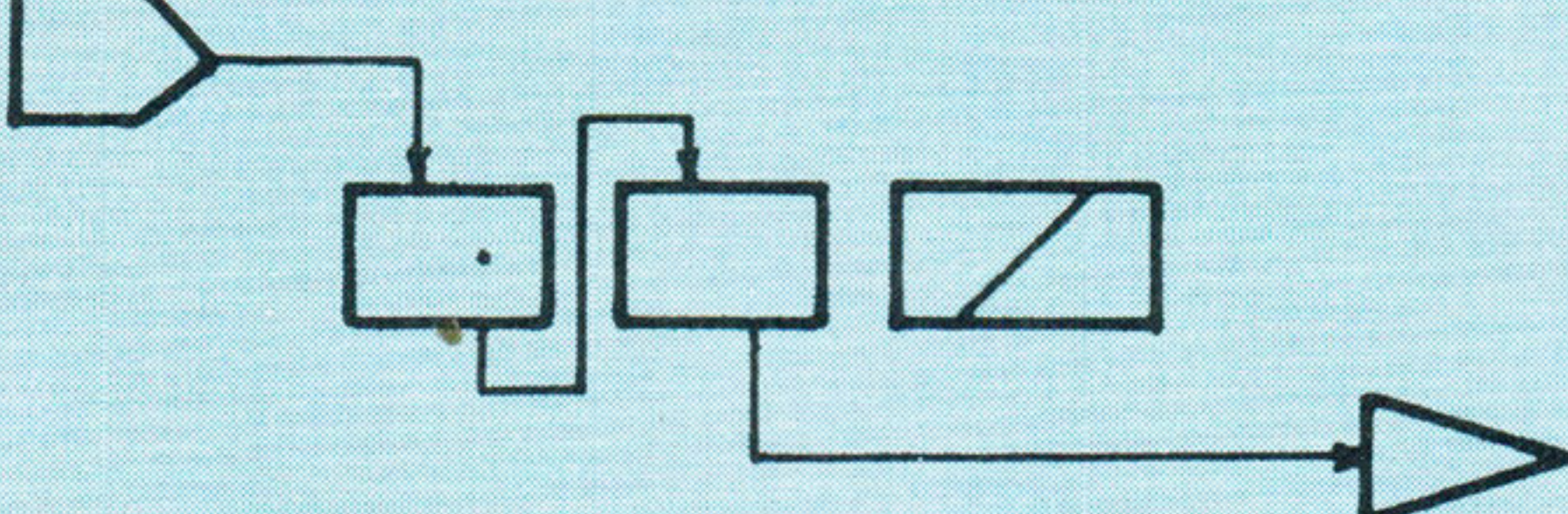
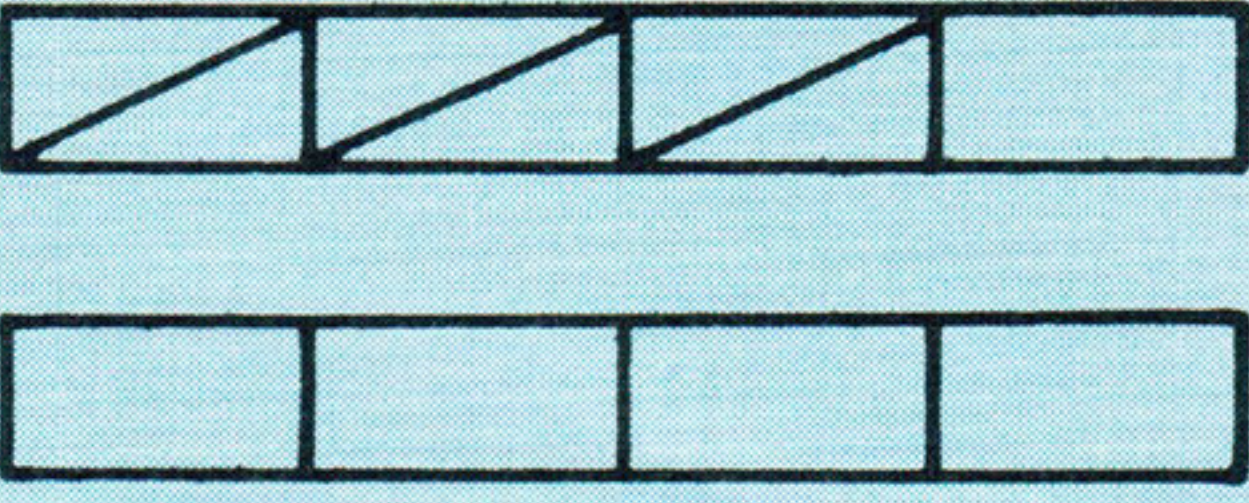
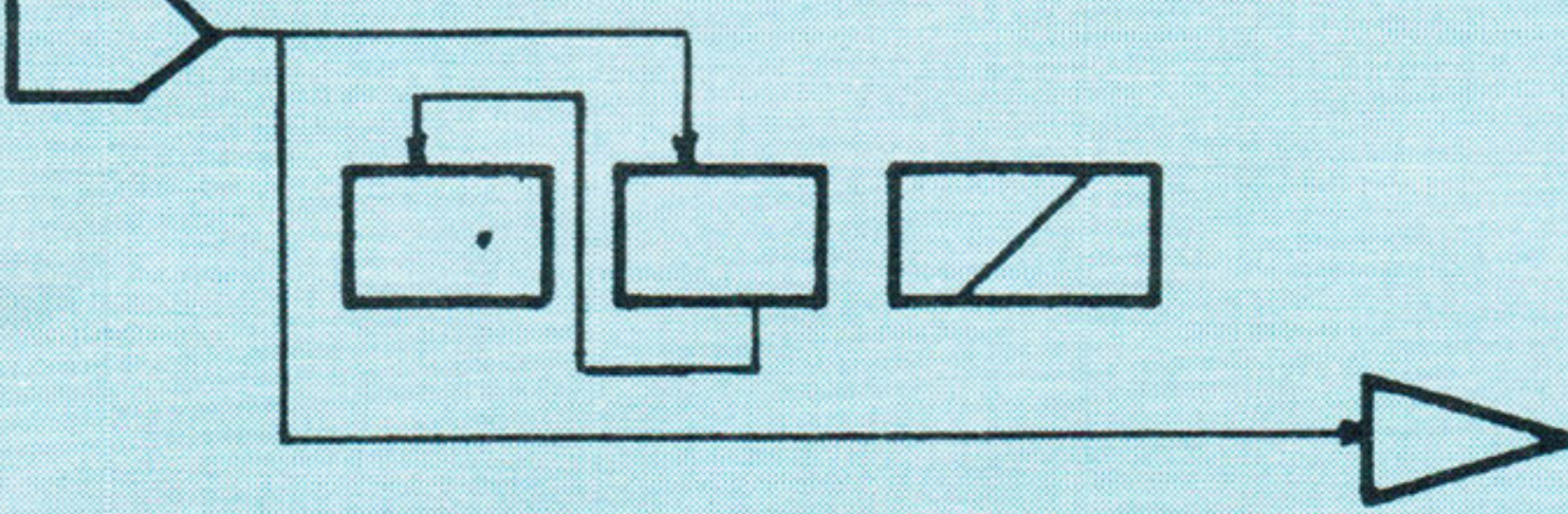
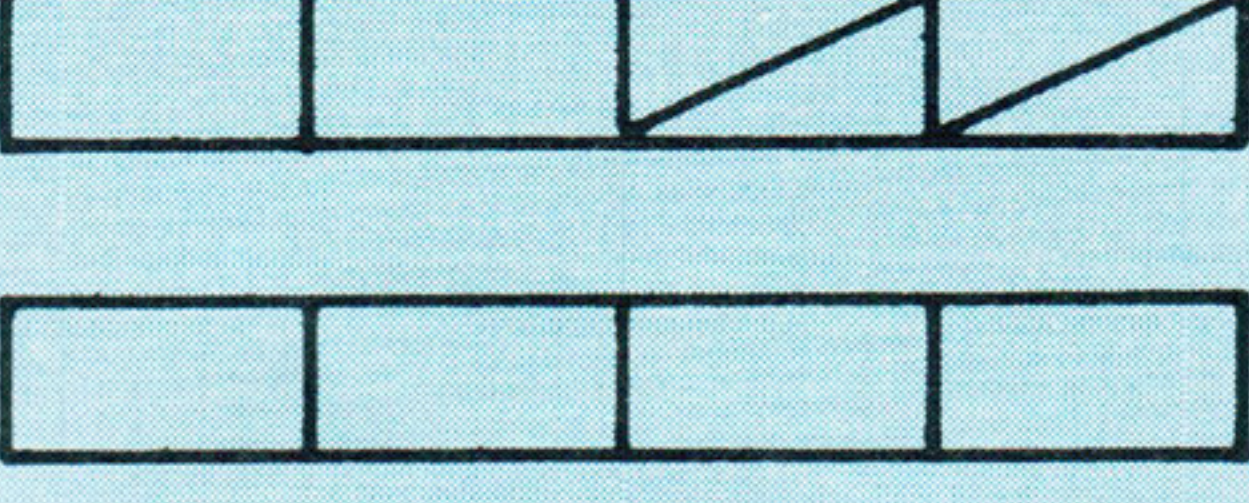
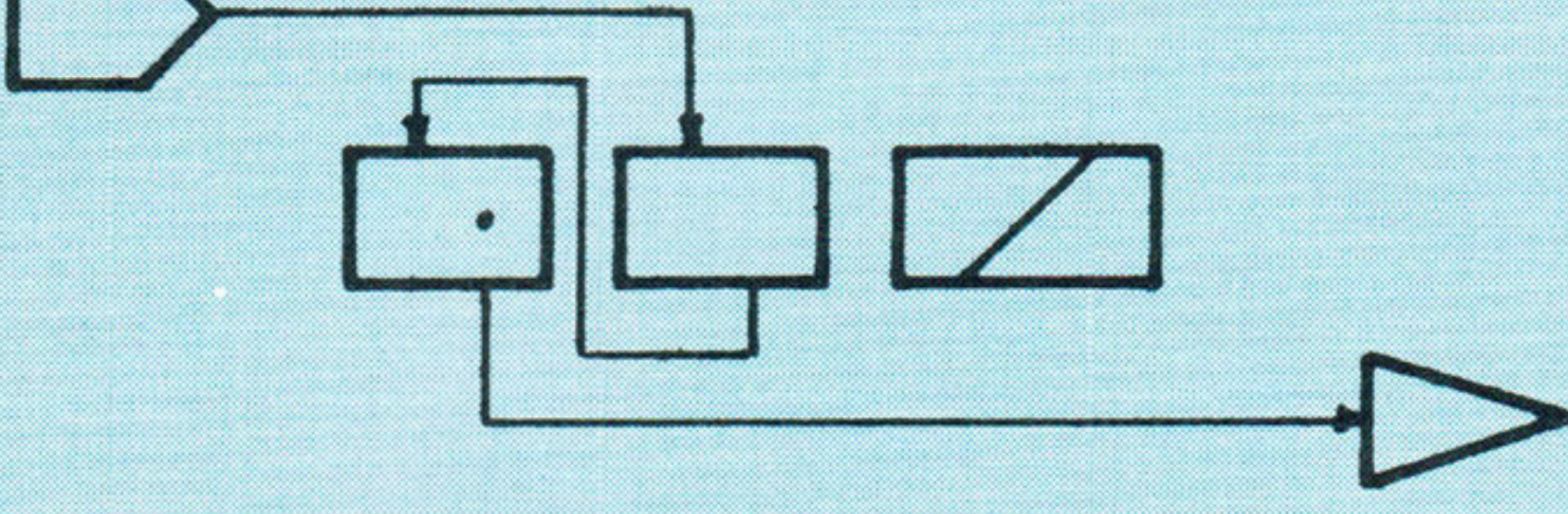
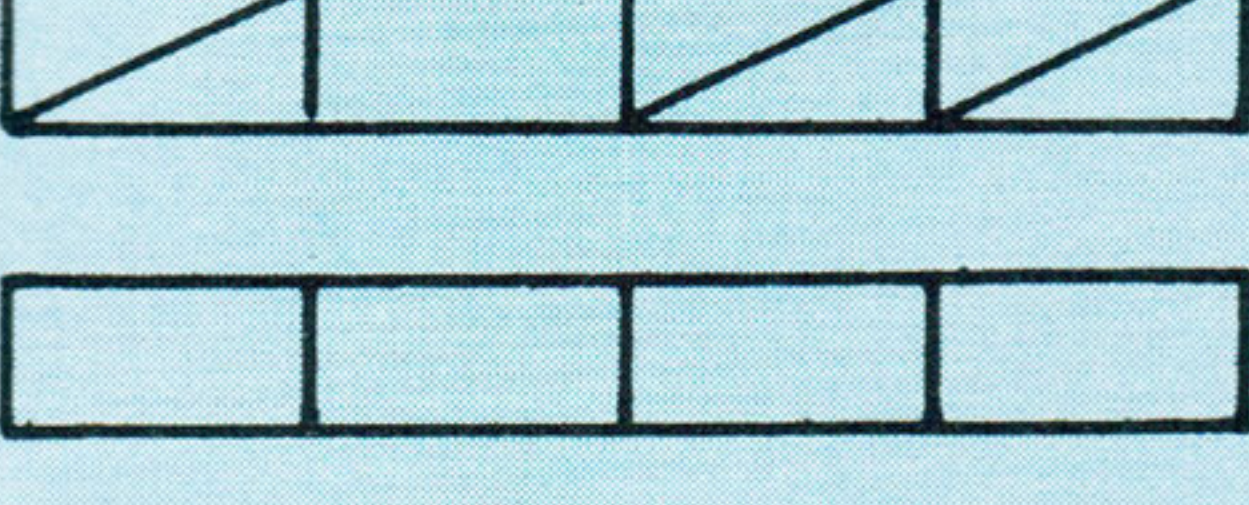
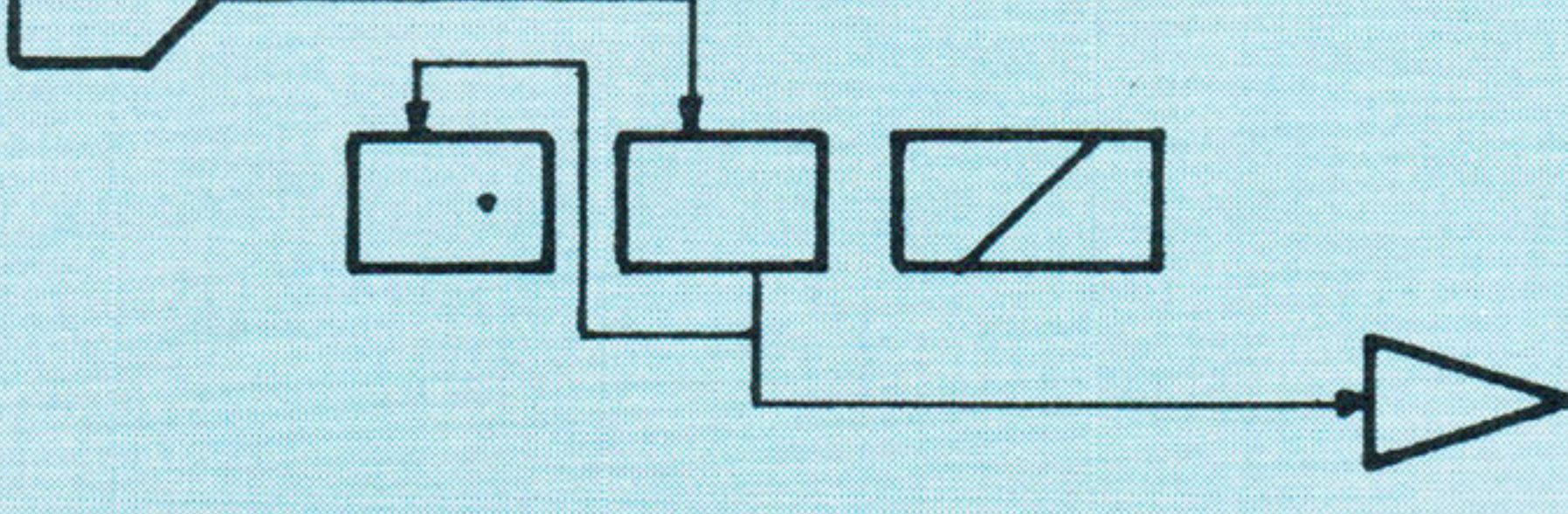
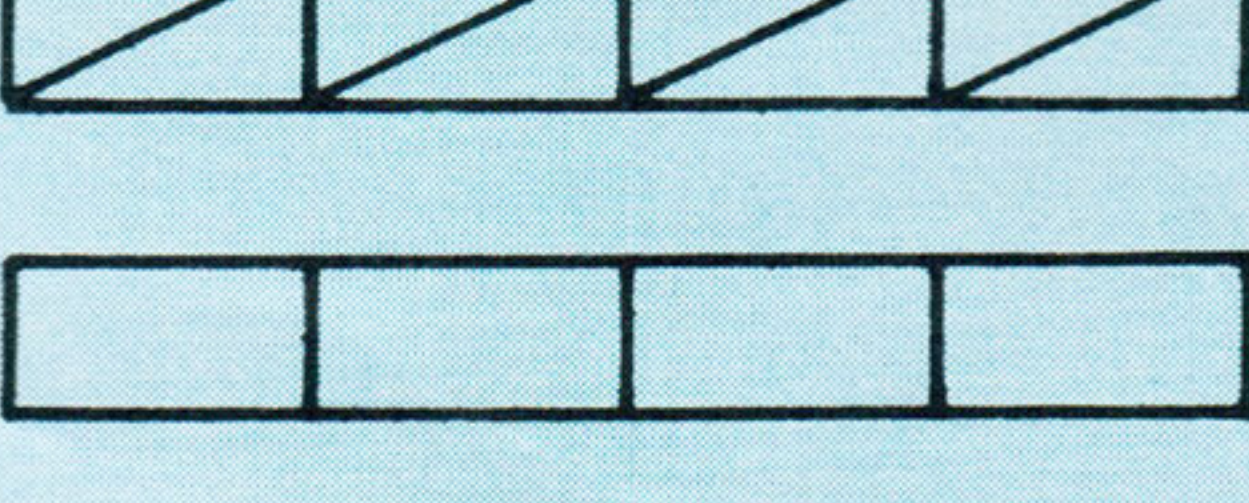
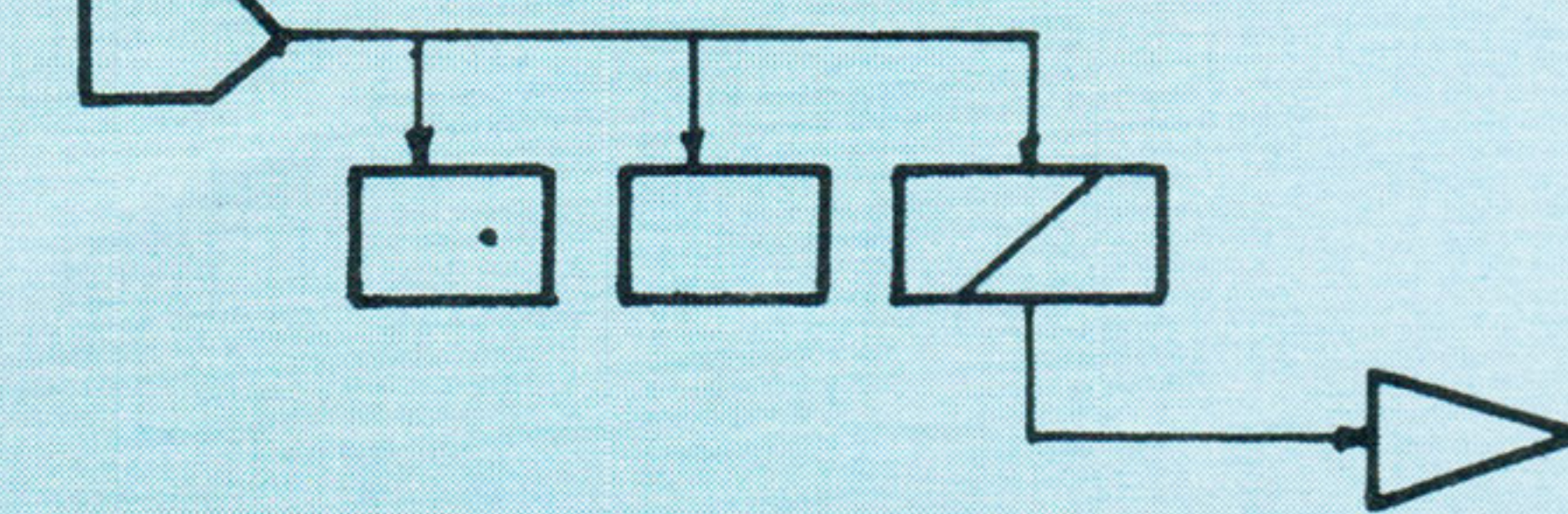
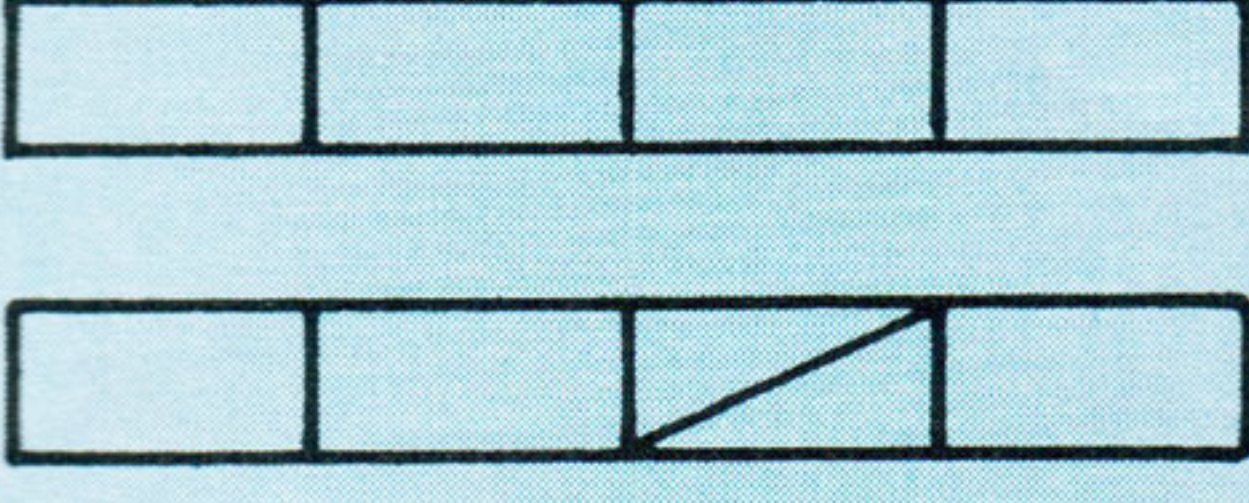
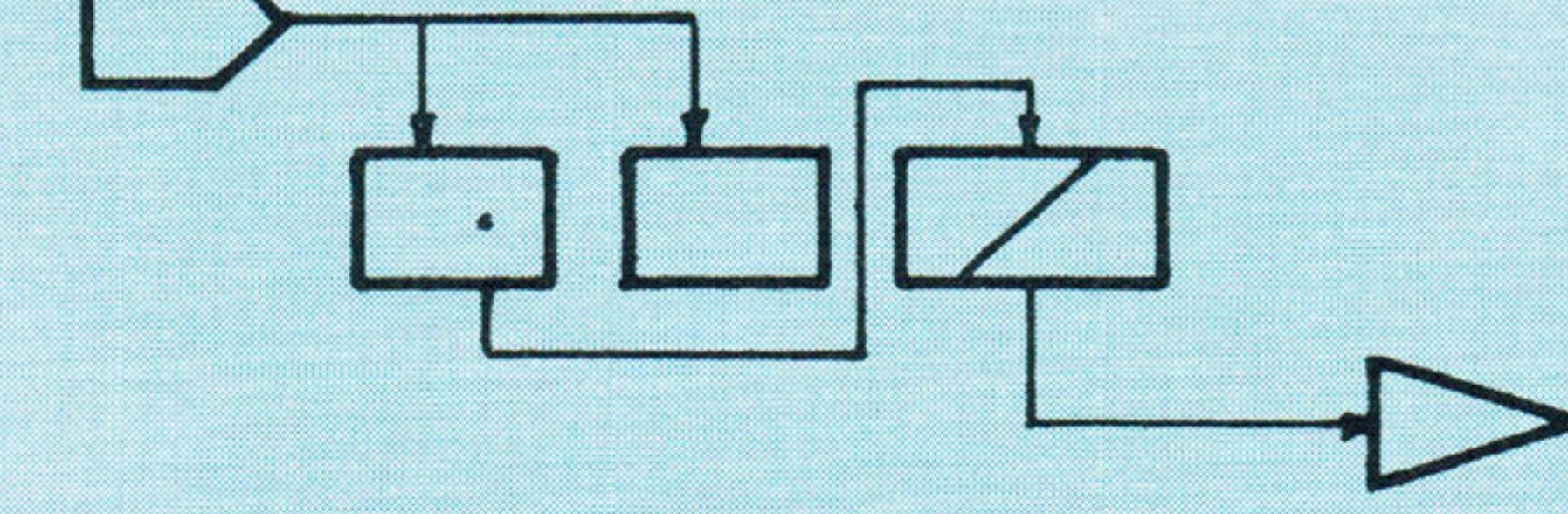
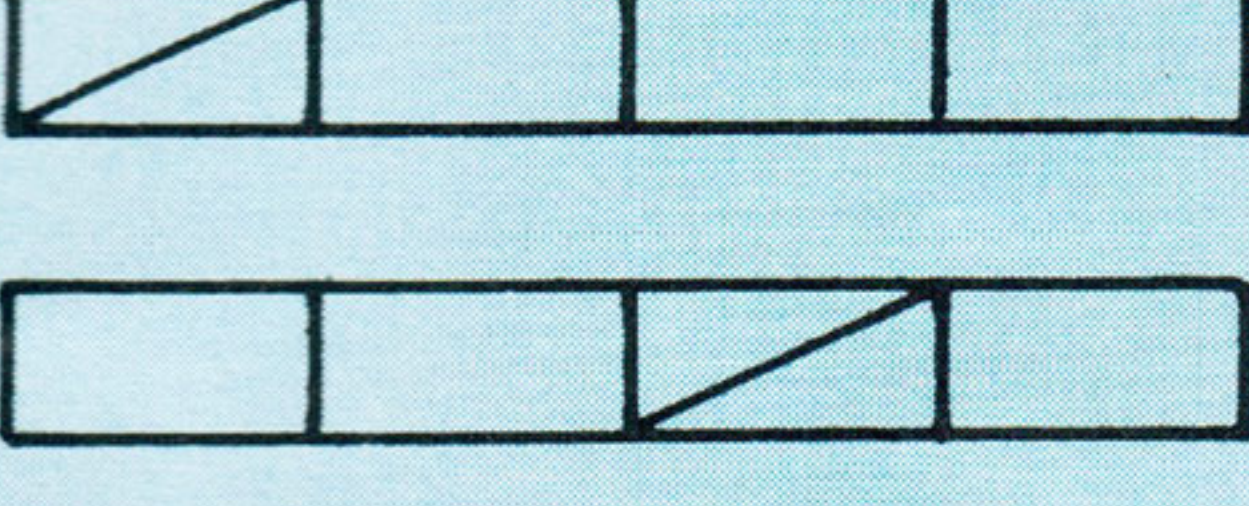
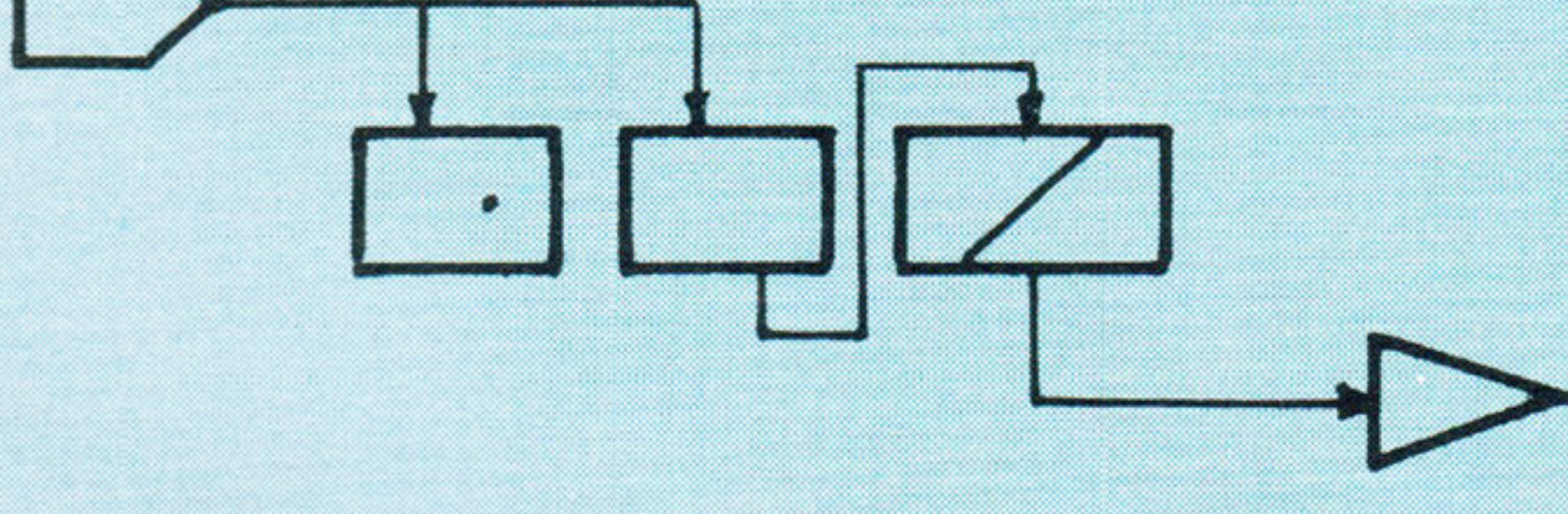
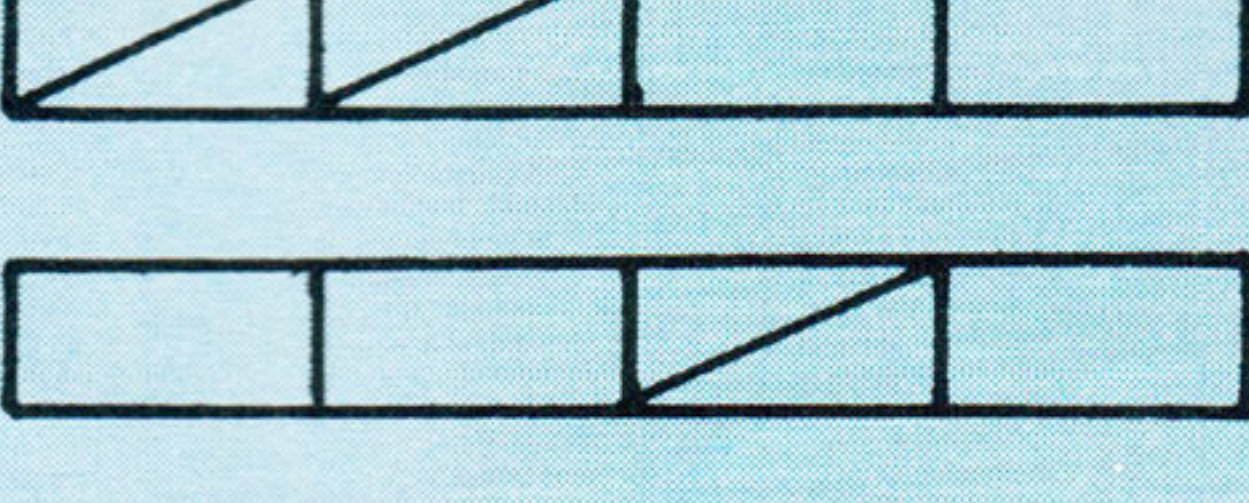
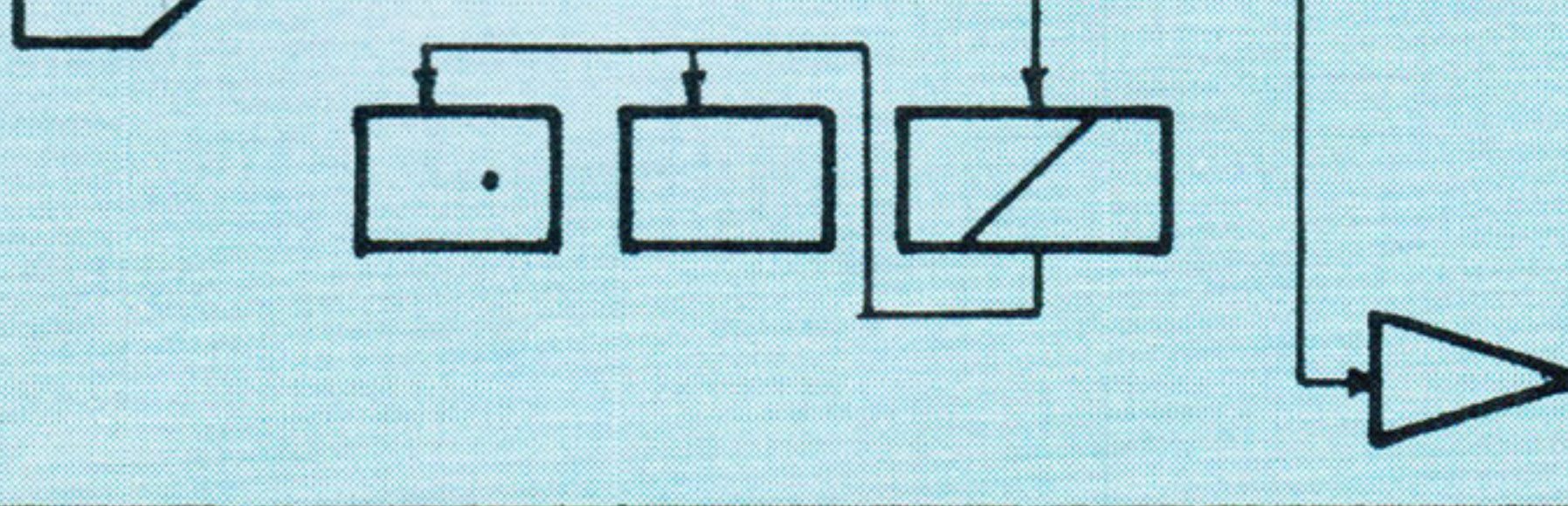
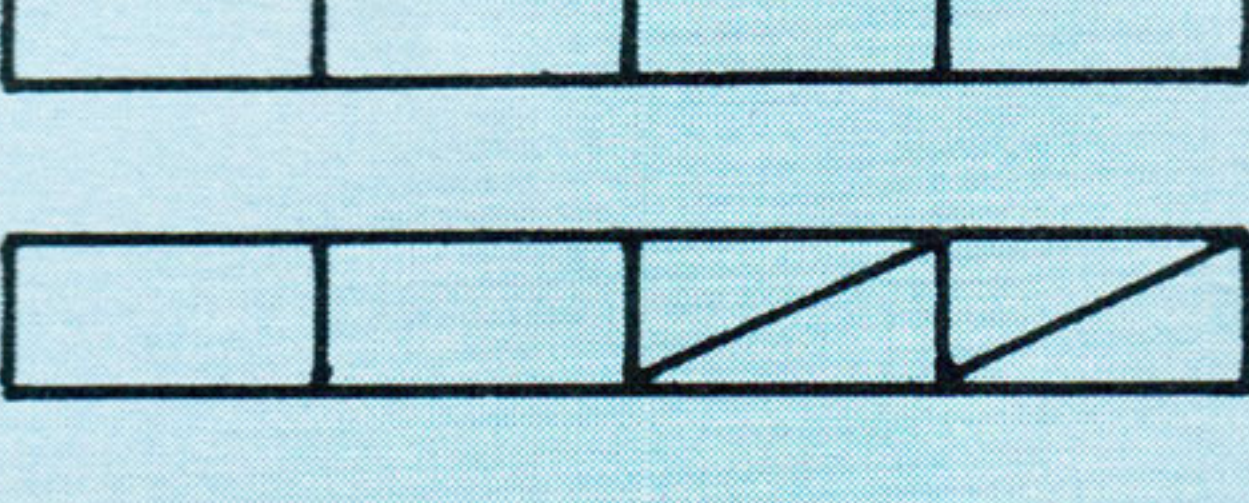
 —This block represents the volume, balance and mode controls plus the signal appearing at the MAIN OUT of the 2900.

 —This block represents the tape deck or other device connected to the TAPE 2 jacks on the rear (or front) panel.

 OUT  IN

FLOWCHART	REMARKS	SWITCH POSITION
	SELECTOR to TAPE OUT 1 & 2 (SELECTOR at output)	
	SELECTOR to TAPE OUT 1 & 2 (TAPE 1 at output)	
	SELECTOR to TAPE OUT 1 & 2 (TAPE 2 at output)	
COPY and MONITOR		
	SELECTOR to TAPE 1 to TAPE 2 (SELECTOR at output)	
	SELECTOR to TAPE 1 to TAPE 2 (TAPE 1 at output)	

2900 TAPE, EQ/FILTER, COPY INTERCONNECT

FLOWCHART	REMARKS	SWITCH POSITION
	SELECTOR to TAPE 1 to TAPE 2 (TAPE 2 at output)	
	SELECTOR to TAPE 2 to TAPE 1 (SELECTOR at output)	
	SELECTOR to TAPE 2 to TAPE 1 (TAPE 1 at output)	
	SELECTOR to TAPE 2 to TAPE 1 (TAPE 2 at output)	
COPY, EQ/FILTER and MONITOR		
	line EQ (equalized SELECTOR at output)	
	line EQ (equalized TAPE 1 at output)	
	line EQ (equalized TAPE 2 at output)	
	SELECTOR to EQ to TAPE 1 & 2 (SELECTOR at output)	

2900 TAPE, EQ/FILTER, COPY INTERCONNECT

FLOWCHART	REMARKS	SWITCH POSITION
	SELECTOR to EQ to TAPE 1 & 2 (TAPE 1 at output)	
	SELECTOR to EQ to TAPE 1 & 2 (TAPE 2 at output)	
	TAPE 1 to EQ to TAPE 2 (SELECTOR at output)	
	TAPE 1 to EQ to TAPE 2 (TAPE 1 at output)	
	TAPE 1 to EQ to TAPE 2 (TAPE 2 at output)	
	TAPE 2 to EQ to TAPE 1 (SELECTOR at output)	
	TAPE 2 to EQ to TAPE 1 (TAPE 1 at output)	
	TAPE 2 to EQ to TAPE 1 (TAPE 2 at output)	

HEADPHONE — These phone jacks are designed to drive any medium to high impedance headphones. When a headphone plug is inserted into **headphone 1, MAIN 1** and **MAIN 2** outputs are muted. BE SURE to lower the volume control to a safe level before removing this headphone plug. **Headphone 2** does not mute the **MAIN 1** and **MAIN 2** output for convenient listening to both headphones and speakers.

Power on — The power switch supplies power to the 2900 and the two **SWITCHED** convenience outlets. The LED must come on when this switch is depressed. If it does not, power is not being supplied to the 2900.

IMPORTANT — The 2900 incorporates a relay muting circuit to offer you quiet turn-on and turn-off. As part of this feature, there is a 2-3 second delay in audio after turn-on.

GENERAL MAINTENANCE

Great care has been taken by the staff of SAE to assure that your pre-amplifier is as flawless in appearance as it is electronically. The panel is finished with a high-grade black anodizing process (MIL Specification 8625-A-Type 2) for durability as well as beauty. If it should become fingerprinted, it can best be cleaned by using a soft cloth dampened with a solution of LIQUID detergent and water. **UNDER NO CIRCUMSTANCES SHOULD A LYE SOLUTION OR AN ABRASIVE CLEANER SUCH AS SCOURING POWDER BE USED ON ANY PART OF THE PRE-AMPLIFIER.**

FUSE

The pre-amplifier is protected by a line fuse on the rear panel. When power is applied to the pre-amplifier and the LED does not illuminate, check the line fuse. If the fuse is faulty, replace it **ONLY** with a fuse of equal value.

Replacement with a fuse of a higher current rating will not protect the pre-amplifier and will void the Service Contract.

If after replacing the fuse, it blows immediately, an electronic component failure might be suspected. No further attempts to replace the fuse should be made.

SERVICE

SAE has a Customer Service Department to answer all questions pertinent to the installation and operation of your unit. Please feel free to write us at any time and we shall endeavor to offer prompt and complete advice regarding your installation. If a problem arises which cannot be resolved through our combined efforts, we may wish to refer you to a local authorized repair agency or factory. To aid us in selecting a service station convenient to you, it would be helpful if you would indicate which major city is closest to your home.

Please address inquiry to:

Customer Service Department
SAE, Inc.,
P.O. BOX 60271 TERMINAL ANNEX
LOS ANGELES, CALIFORNIA 90060

Be sure to include the model number and the serial number of your unit.

In the event your unit must be returned, an authorization **MUST BE REQUESTED** from SAE prior to its return.

UNDER NO CIRCUMSTANCES SHOULD YOUR UNIT BE SHIPPED TO THE FACTORY WITHOUT PRIOR AUTHORIZATION.

If the original shipping carton has been lost or discarded, or if the carton is not in good condition, a duplicate carton may be obtained from our Service Department for a minimal charge.

Always ship via recognized freight carriers. Suggested carriers will be given in SAE's Customer Service Department reply. Do not ship via Parcel Post. **ALL PARCEL POST SHIPMENTS WILL BE REFUSED.**

SERVICE COVERAGE

U.S. (ONLY)

SAE is proud to offer you an unprecedented free Five-Year Service Contract on your component. In order to receive this valuable protection, the enclosed Service Contract Registration Card must be completed and mailed to SAE within one hundred-twenty (120) days of purchase. If you

do not receive your Service Contract Label within thirty (30) days after the Registration Card has been mailed, please contact SAE immediately.

While waiting for the Service Contract Label, your sales receipt will serve as proof of purchase and must be presented to the Service Station in the event servicing is required within one hundred-twenty (120) days of purchase.

INTERNATIONAL

As stated above, the SAE 5 year service contract is valid only in the United States. Service in other countries will be provided

by the exclusive SAE representative or his agents. Because of varying governmental regulations and conditions, the service period may differ from country to country. However, in every instance, the service agreement can only be honored in the country where the unit was purchased. In the event that there is no SAE representative in your country please contact SAE or in

CANADA:

The Pringle Group
30 Scarsdale Road
Don Mills, Ontario
Canada, M3B2R7

TROUBLE SHOOTING GUIDE

SYMPTOM	PROBABLE CAUSE	POSSIBLE REMEDY
1. Unit will not turn on	A. Not plugged into AC outlet. B. Blown Fuse.	A. Connect AC line cord to outlet or try different outlet. B. Refer to General Maintenance section and replace fuse.
2. Unit turns on but no sound is heard.	A. Switches in wrong position. B. Cables not connected properly. C. Tape Monitor switch in Monitor position not allowing normal operation of phono, tuner or aux.	A. Check positions. B. Check cable connections. C. Move switch to "Out" position.
3. One or both channels inoperative.	A. Bad cables.	A. Try other cables (or interchange).
4. Unit hums.	A. Unit too close to power transformer of amplifier. B. Lack of shielding between units. C. Phono Cartridge.	A. Isolate the input function associated with the problem. If phono, reorient the preamp. in relation to the power amplifier. B. Insert MU metal shield between units if reorientation is impossible. C. Check cartridge ground connections, then move tone arm while operating to see if hum level varies. If so, reorient turntable.
5. RF Interference. Radio: radio program heard. TV: rasping buzz.	A. Poor cable shielding.	A. Shorten cables or obtain cable with better shielding.
6. Tape recorders will not record phono, tuner or Aux.	A. Tape copy switch in wrong position.	A. Refer to section on Tape Copy Switch.

SPECIFICATIONS

PREAMP

T.H.D. (Total Harmonic Distortion)

At any level to rated output from 20Hz to 20kHz is less than 0.01%

I.M. (Intermodulation Distortion) At any level

to rated output with any two mixed frequencies

between 20Hz and 20kHz at a 4-to-1 voltage ratio is less than 0.01%

Rated Output 2.5V RMS

PHONO

Frequency Response (RIAA Equalized) from 20Hz to 20kHz ± 0.25 dB

S/N (reference 10mV input at 1kHz) 20Hz to 20kHz is greater than 75dB

A-Weighted 90dB

Separation at 1kHz 55dB

Input overload at 1kHz is greater than 150mV

Input Termination 47k Ohms

Input Capacitance 100 Picofarads (approx.)

Gain 35dB to tape out 60dB to pre out

LINE

Frequency response from 20Hz to 20kHz ± 0.25 dB

S/N (reference 2.5V RMS out) 20Hz to 20kHz is greater than 95dB

A-Weighted 110dB

Separation at 1kHz is greater than 55dB

Maximum output (10k Ohms load) 9V RMS

Minimum load 600 Ohms

Gain 25dB

Power consumption 110-125 VAC, 50Hz to 60Hz, 25 Watts

Weight 9 Lbs. (4.08kg)

Shipping Weight 10.5 Lbs. (4.76kg)

Dimensions Front Panel: 19 in. (48.3cm)W x 5.25 in. (13.3cm)H
Chassis 3.5 in. (8.89cm) (excluding knobs & connectors)

Cabinet (not included) C-4* (10 in. D.)
or C-5* (4.5 in. D.)

*Assembly required

