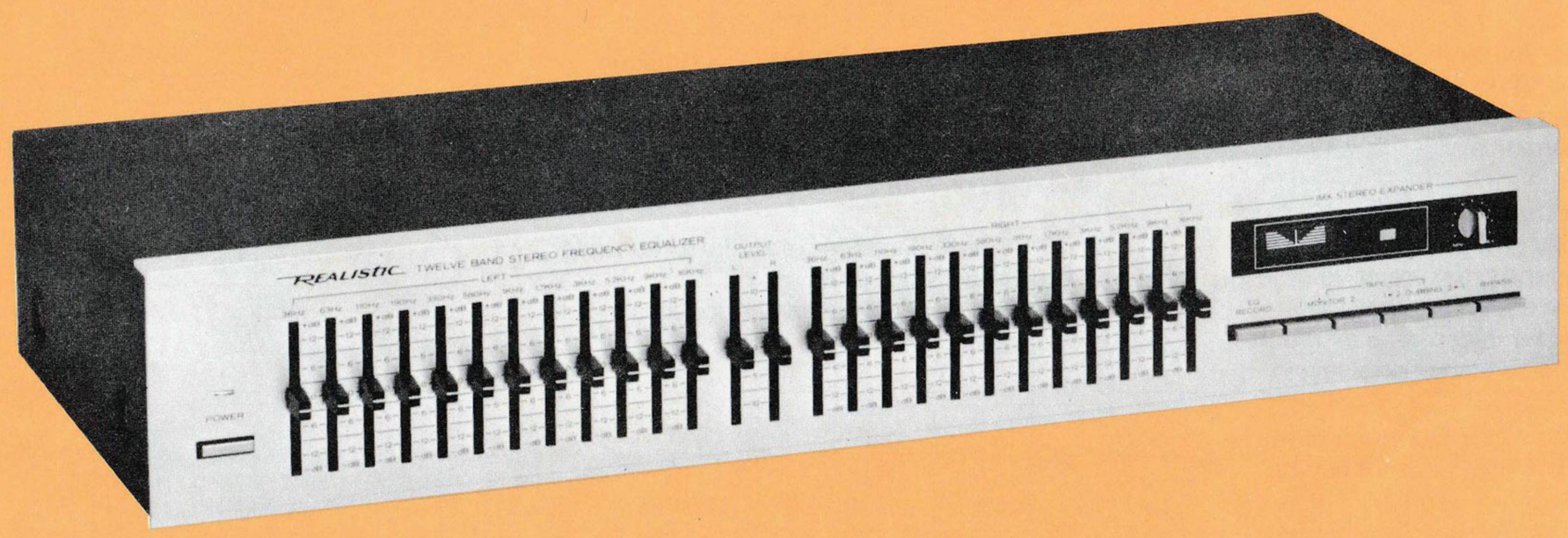
OWNER'S MANUAL

Cat. No. 31-2010

TWELVE BAND STEREO FREQUENCY EQUALIZER

PLEASE READ BEFORE USING THIS EQUIPMENT



REALISTIC®

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Your **REALISTIC Twelve Band Stereo Frequency Equalizer** is designed to tailor the frequency response of your stereo system. Since it has separate controls for each channel, it gives you an almost infinite combination of control variations. The controls each have a range of approximately 24 dB (±12 dB) and are marked in 3 dB increments.

There are many reasons why you need such a specialized component. The speakers, the room, your ears and our personal preferences vary greatly. For example, if a speaker is moved 6" to 8" (15 to 20 cm) away from the wall, the bass response at 50 Hz could drop as much as 8 to 10 dB.

The furnishings in the room, such as stuffed chairs, draperies and floor covering can affect the high and middle frequency response very dramatically.

It is a known fact that our hearing changes with age and varies greatly from person to person or if the sound pressure or volume is decreased. The ear's low frequency response at low volume can drop as much as 15 dB at normal conversational levels.

Normal tone controls vary too much of the audio spectrum. The effect is similar with the treble control.

Your Frequency Equalizer with its 12 frequency bands can give almost an infinite number of possible frequency response variations. It will allow you to match your speakers to your room and the music to your ears - without adding distortion, hum or hiss.

The Equalizer can also be used when making recordings of old LPs or 78s without losing the main portion of the music. It can get rid of the scratchy top, add a little needed bass . . . and really make some of those old 78s sound alive again.

Tape dubbing and monitoring features enable you to record, monitor, and dub equalized sound from tape deck to tape deck. With these features, you can record like the pros.

The Equalizer uses a new type of tone control circuit with extremely low distortion. The components used are of the highest quality and should provide many years of good sound!

The *IMX STEREO EXPANDER function offers you more special stereophonic sound. Without moving your speaker, you can enjoy super dynamic stereo sound from your speakers or with a pair of headphones.

*IMX Stereo Expander manufactured under license by SCI Acoustics Inc.
IMX is a trademark of SCI Acoustics Inc.

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SPECIFICATIONS

Number of Channels	: Two (left & right) with separate controls for each
Frequency Response (Flat Setting)	: 5 to 50,000 Hz +0.5 dB −1.0 dB
Tone Control Ranges	: ±12 dB @36, 63, 110, 190, 330, 580, 1K, 1.7K, 3K, 5.2K, 9K, 16K
Intermodulation Distortion	: 0.02% at 1 volt output (70 Hz ~ 7,000 Hz @1/4 ratio)
Harmonic Distortion	: 0.018% at 1 volt output (20 Hz ~ 20,000 Hz)
Hum and Noise (Shorted input)	: 85 dB (0.775 volts input)
Hum and Noise (All controls are Max, Input 4.7 Kohms terminated)	: 1 mV
Channel Separation at 1 kHz (Input 0.775V and 4.7 Kohms terminated)	: 62 dB
Crosstalk between Tape 1,2 and Main In Input 0.775V and 4.7 Kohms terminated)	: 80 dB
Crosstalk between Main in and Tape 1,2 (Input 0.775V and 4.7 Kohms terminated	: 70 dB
Level Ratio Main Ch. at Expander VR Max.	: 7.0 dB
Level Ratio Main Ch. at Expander VR Min.	: 4.5 dB
Level Ratio Opposite Ch. at Expander VR Max.	: 5.5 dB
Level Ratio Opposite Ch. at Expander VR Max.	: 0 dB
Expander Noise Level at Expander VR Max (Input 4.7 Kohm terminated)	: 1.5 dB

Dynamic Range (flat setting)	: Up to 10 volts RMS
Total Gain (flat setting)	: 0 dB
Input Impedance	: 50 Kohms
Output Impedance	: 1 Kohms
Inputs	: MAIN IN, TAPE 1 Monitor, TAPE 2 Monitor
Outputs	: MAIN OUT, TAPE 1 OUT, TAPE 2 OUT
Controls	: Power Switch (Indicated with LED), 24 Linear Sliding Frequency Controls (12 each channel), OUTPUT LEVEL (Left and Right), BYPASS, EQ REC, TAPE MONitor (1 & 2), DUBBING (1 to 2 & 2 to 1), Expander
Power Requirements	: 120 Volts AC, 60 Hz 12 Watts for U.S.A. & CANADA (240 Volts AC, 11 Watts 50 Hz for the units purchased in UK & Australia)

For your own protection, we urge you to record the serial number of this unit in the space provided. You'll find the serial number on the bottom cabinet of the unit.

Serial number _____

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



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.



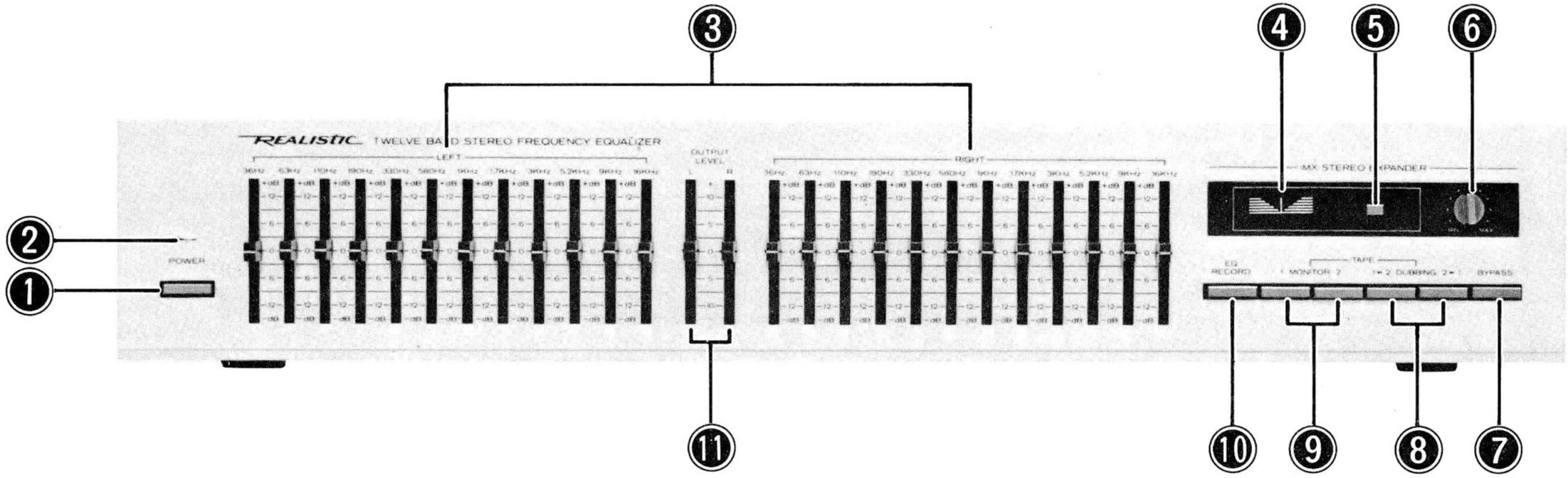
The lightning flash with arrowhead symbol within an equilateral triangle, is intended to alert the user to the presence of uninsulated "dangerous voltage" within the product's enclosure.



The exclamation point within an equilateral triangle is intended to alert the user to the presence of important operating and maintenance (servicing) instructions in the literature accompanying the appliance.

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CONTROL LOCATIONS AND FUNCTION



1 POWER
Push in to turn on; the LED will light. Press again to turn off.

2 Power Indicator LED
Lights when power is on.

3 Frequency Slide Controls
Control the frequency response. Permit a boost or cut of up to 12 dB around the center frequencies shown above each control.

4 EXPANDER Indicator
Lights when expander switch is on.

5 IMX Stereo Expander
6
Expands the stereo dimensional effect without moving speaker. Push the button in to activate the IMX Stereo Expander circuit. Then, use the knob to vary the range of the stereo sound field. Rotate clockwise to expand the stereo effect range. Rotate it counterclockwise to reduce.

Note: The output signal at the TAPE OUT jacks is not affected by the IMX Stereo Expander circuit.

7 BYPASS Button
Press to bypass the Equalizer circuit.

8 Tape DUBBING Buttons (1 → 2 & 2 → 1)
Press to record from one tape deck to another. With this function, you can accomplish dubbing without changing the rear panel connections.
Press "1 → 2" when you want to record from the tape deck connected to TAPE 1 to the tape deck connected to TAPE 2; press "2 → 1" to record from TAPE 2 to TAPE 1.

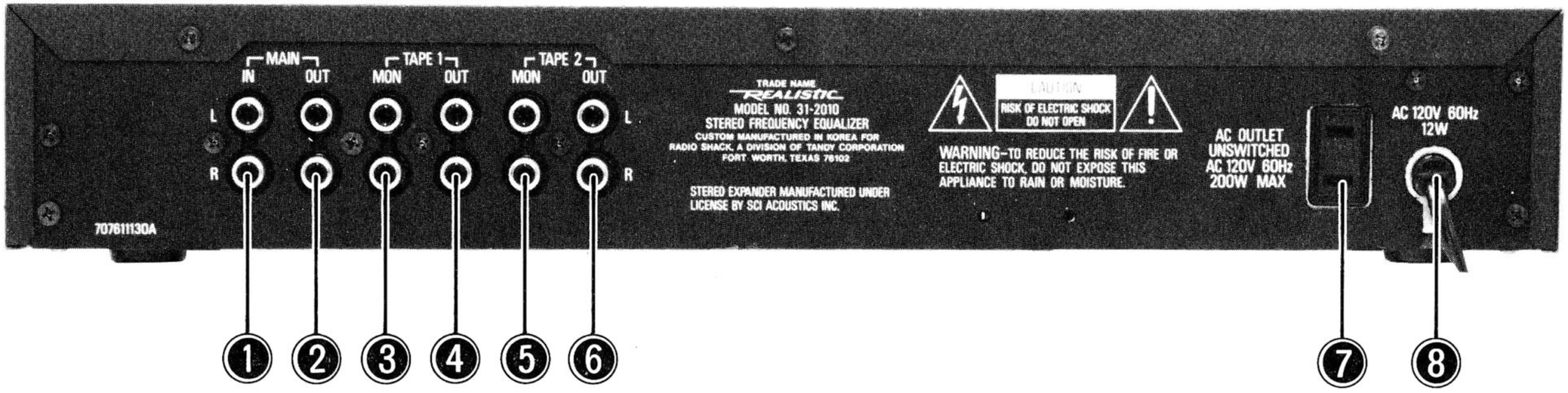
9 TAPE MONITOR Buttons (1 & 2)
Press to listen to the output from the tape deck. Use this to hear recordings as they are being made on a 3-head tape deck or when playing back tapes. Press TAPE MONITOR 1 to hear the main tape deck playback, and TAPE MONITOR 2 to hear the second tape deck playback. When you want to hear the source sound, leave both buttons out.

10 EQualization RECORD Button
Press in to record the equalized sound. If not recording, leave the button out.

11 OUTPUT LEVEL Controls (Left & Right)
Use these controls to match the equalized and unequalized levels of your system. For further information, see "Before Operating Your Equalizer" on page 7.

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Rear Panel



1 MAIN IN Jack
Connect to the tape out or pre-amp out of your amplifier/receiver.

2 MAIN OUT Jack
Connect to the tape in or main in jacks of your amplifier/receiver.

3 TAPE 1 MONitor Jack
Connect to the main tape deck's output jacks for tape playback or record monitor with a 3-head deck). To activate these jacks, press in TAPE MONITOR 1.

4 TAPE 1 OUT Jack
Connect to the main deck's auxiliary input for recording.

5 TAPE 2 MONitor Jack
Connect to the second the deck's output jacks for tape playback (or record monitor with a 3-head deck). To activate these jacks, press in TAPE monitor 2.

6 TAPE 2 OUT Jack
Connect to the second tape deck's auxiliary input for recording.

7 UNSWITCHED AC Convenience OUTLET
Powers any audio accessory up to 200 watts. The POWER switch does not affect this receptacle. (Not available for UK models.)

8 AC Cord
Connect any standard AC outlet.

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CONNECTIONS

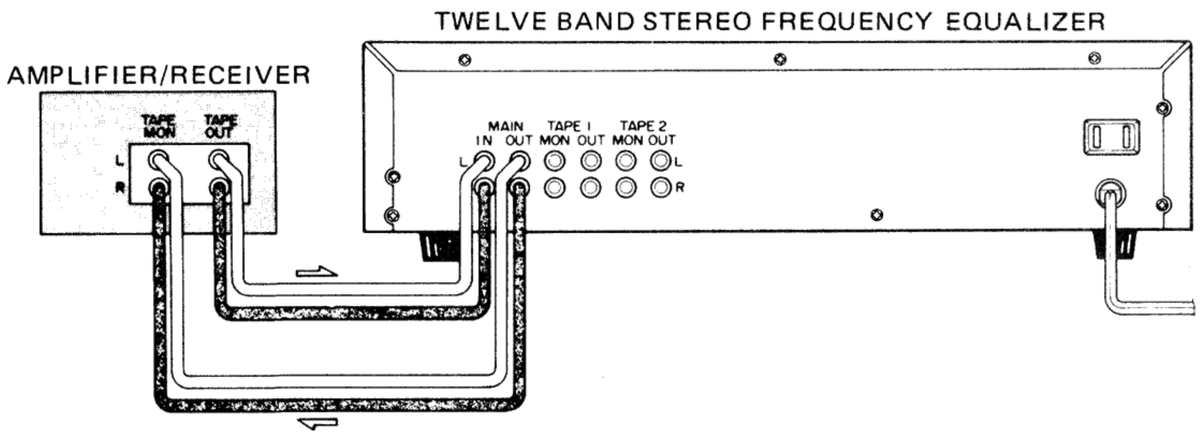


Figure 1

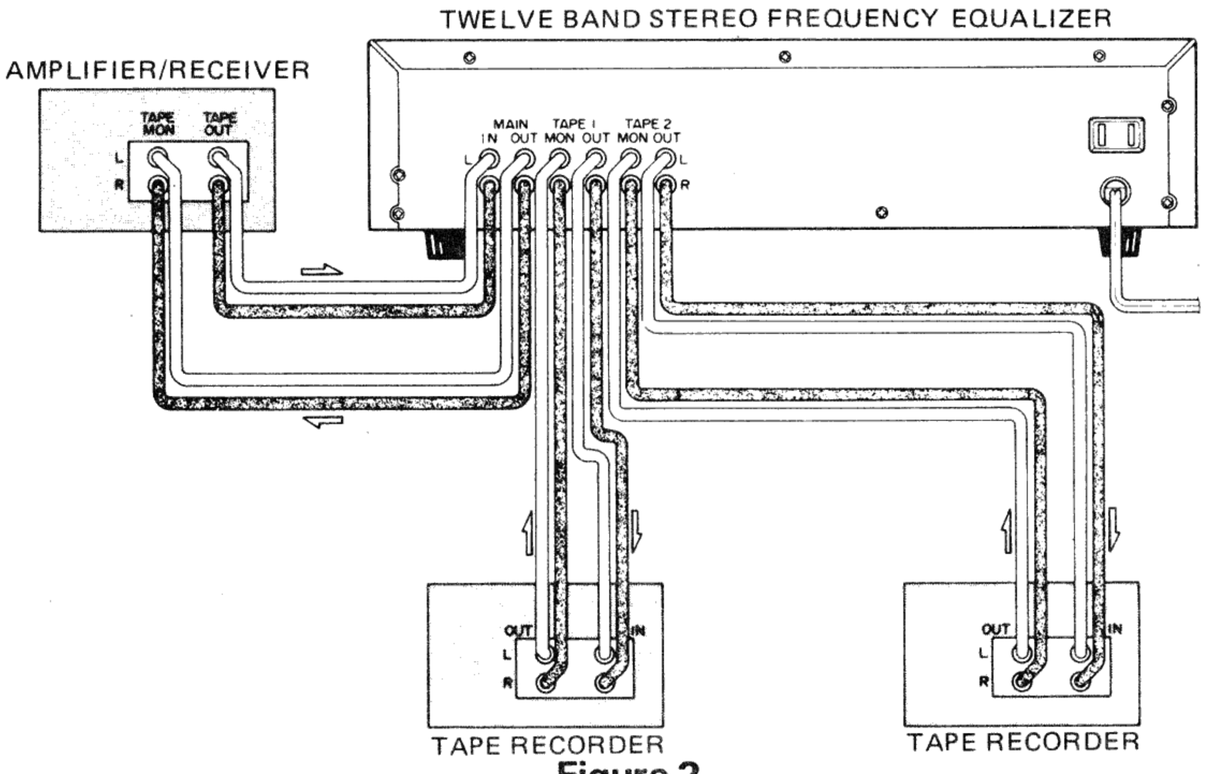


Figure 2

Amplifier/Receiver or pre-Amp to Equalizer

Connect the tape out and tape in jacks on your amplifier/receiver or pre-amp to the MAIN IN and OUT jacks on the Equalizer, as shown in Figure 1. With the tape monitor switch on the amplifier/receiver or pre-amp at the IN or MONITOR position, the Equalizer is a functioning part of your system. If the tape monitor switch on the amplifier/receiver is OUT, the Equalizer is removed from the system (electrically).

Note: With this connection, the tape monitor switch on the amplifier/receiver will not be performing its original function (to monitor tape recordings). Therefore, we've added a monitor function to the Equalizer (with switches and jacks).

Equalizer to Tape Decks

To use the tape monitor of your Equalizer, connect your tape recorders as shown in Figure 2. If your tape recorder has a monitor function (a 3-head deck), press the Equalizer's TAPE MONITOR button to hear the recording after it has been made (also, for normal playback of tape from your recorder).

For monitoring, both the amplifier/receiver's monitor button and the Equalizer's TAPE MONITOR switch must be in. If you don't need monitoring, the Equalizer's TAPE MONITOR switches can be set to either position. If you want to process the source signal through the Equalizer, leave the amplifier/receiver's monitor switch in. Use Equalizer's TAPE MONITOR 1 when you want to monitor tape deck 1 playback, and press TAPE MONITOR 2 when you want to hear tape deck 2 playback. **Use either button but not both.**

Important Note: When you monitor the recording using connections as illustrated in Figure 2, the recording will have been processed by the Equalizer and will not be an accurate monitor signal. For accurate monitoring under these conditions, press BYPASS.

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BEFORE OPERATING YOUR EQUALIZER

Important: Wait 8 ~ 10 seconds after turning on the Equalizer before operating the function switches. This allows its circuits to stabilize and eliminates popping noises when function switches are actuated. Be sure to set the volume control on your receiver/amplifier to minimum.

CAUTION: Failure to match the equalized and unequalized sound levels, as instructed below, can result in damage to your amplifier/receiver, speakers, and Equalizer.

The sliding frequency controls will change the average level of the program material (signal) as they are moved up or down from the 0 dB (flat) position. After having equalized your system, the average signal level to each channel of your amplifier/receiver may be higher or lower than that of the original input signal to the Equalizer (i.e. the level which your amplifier/receiver would receive if you didn't use the Equalizer). These two levels must be equalized to protect your equipment.

To restore the output level from the Equalizer to the original input level, the OUTPUT LEVEL controls must be adjusted. This ensures that you don't over-drive your amplifier/receiver or speakers (which can result in distortion) and that the signal levels of left and right channels are the same.

Here is the procedure for setting the OUTPUT LEVEL controls.

1. Adjust the LEFT and RIGHT Channel OUTPUT LEVEL controls to the center position.
2. With the Equalizer push-buttons in the out position (buttons extended), adjust the LEFT and RIGHT channels sliding frequency controls to achieve the tonal quality you desire.
3. Press the BYPASS button and note the difference in output level from your system.
4. Adjust the OUTPUT LEVEL control setting of each channel until the equalized and unequalized levels are approximately the same when the BYPASS button is switched on and off.

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OPERATION

This part of the manual will begin with a detailed description of each of the function buttons and its effect on the system when in or out. Then we will give a list of different possible recording/playback results and the button settings necessary for each. In this section, a non-equalized signal will be referred to as "flat" and an equalized signal will be called "EQed".
All of these explanations assume that the Equalizer is connected to the tape in/out jacks on your receiver/amplifier or pre-amp (as described earlier), and that the tape monitor function is on.

Important Note: See "Frequency Controls" for tips on how to adjust your Equalizer.

BYPASS Button

This button, as the name implies, bypasses the equalizer circuit completely. You may neither play back nor record with equalization when this button is in. When this button is out, the signal connected to the MAIN IN jacks passes through the Equalizer circuit. Where it goes after that is determined by the settings of the other buttons.

EQ RECord Button

When this button is out, the signal connected to the MAIN IN jacks goes to both TAPE OUT jacks without equalization; when in, the MAIN IN signal is EQed and then sent to the TAPE OUT jacks. When this button is in, the signal at the MAIN OUT jacks (the one you listen to) will be flat, unless you use the TAPE MONITOR buttons.

TAPE MONITOR 1/2 Buttons

When these buttons are out, no signal is connected to the TAPE MONitor jacks of the Equalizer. The sound you hear from the speakers is passed through the Equalizer (flat or EQed) without going to the tape recorders.
With one of these buttons in, the signal coming from the tape out jacks of the selected tape recorder (1 or 2) is supplied to the MAIN OUT jacks of the equalizer. **Do not press both TAPE MONITOR buttons at the same time.** All the signals are cut off if you do. With two-head recorders, this signal is a direct pass-through of the signal coming from the TAPE OUT jacks on the equalizer. With three-head decks you may choose to listen to the direct pass-through (the source setting on the tape deck) or the actual recorded sound (tape monitor setting on the tape deck).
In either case, the sound you hear will be the same (flat or EQed) as the one that you are recording.

DUBBING 1 → 2/2 → 1 Buttons

These buttons allow you to record from one tape recorder to another, once the proper connections have been made. (See page 6.) You may listen to another source from your amplifier/receiver (phono, FM,etc.) or monitor the recording process while dubbing. Either the dubbed recording or the separate listening source may be equalized, but not both.
Do not press both DUBBING buttons at the same time. If you do, there will be no output to both TAPE OUT jacks.

IMX STEREO EXPANDER

With normal stereo, the apparent positions of all the sounds are spread between the two speakers. The IMX circuit used in your 31-2010's IMX Stereo Expander system helps capture and bring out the hidden musical detail. The overall effect is a "live" sound, comparable to that in a theater or concert hall. This is a super feature, especially when listening to headphones, or if space is limited and you must place your speakers closer together than you would like.
The IMX Stereo Expander requires a stereo source for the best result. Also, the speaker placement affects the expander sound great deal.
Refer to POSITIONING YOUR SPEAKERS (page 13) to check your speaker arrangement. When you use IMX Stereo Expander, adjust BASS and TREBLE controls to create natural tone balance. Now, press IMX STEREO EXPANDER button in to activate this function. Then rotate the IMX Stereo Expander control knob to increase and decrease the effect.

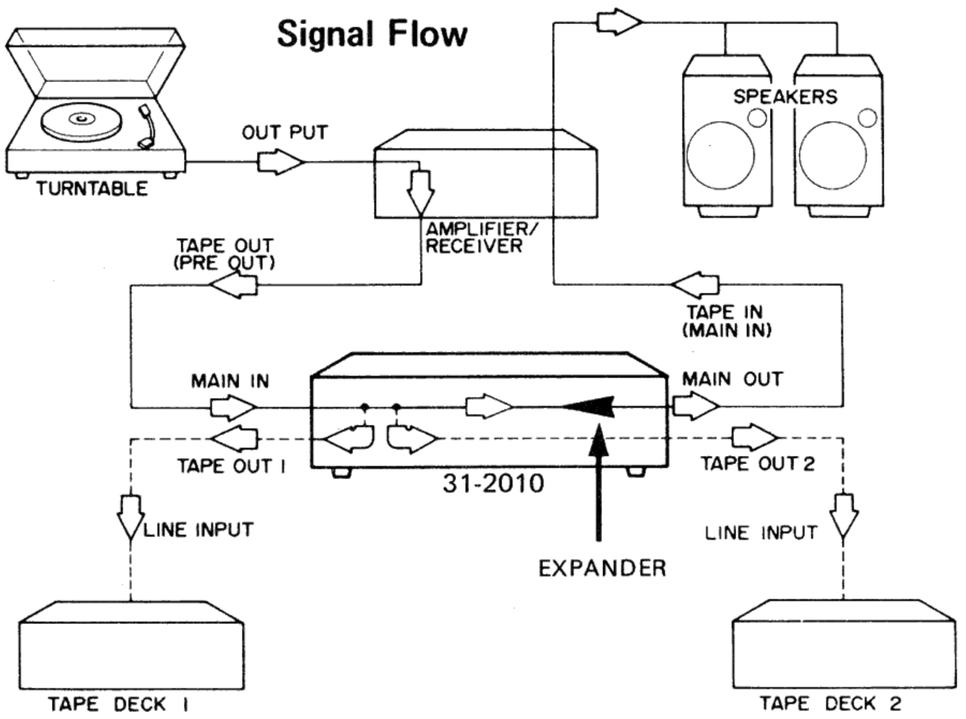
Note: The output signal at the TAPE OUT terminals is not affected by the IMX Stereo Expander circuit.

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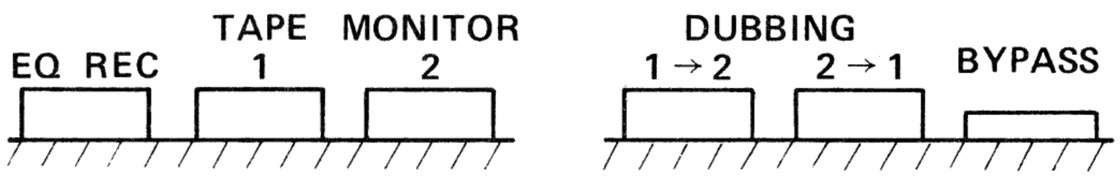
Suggested Settings for the Buttons

SIGNAL PATH
EQUALIZED SIGNAL PATH

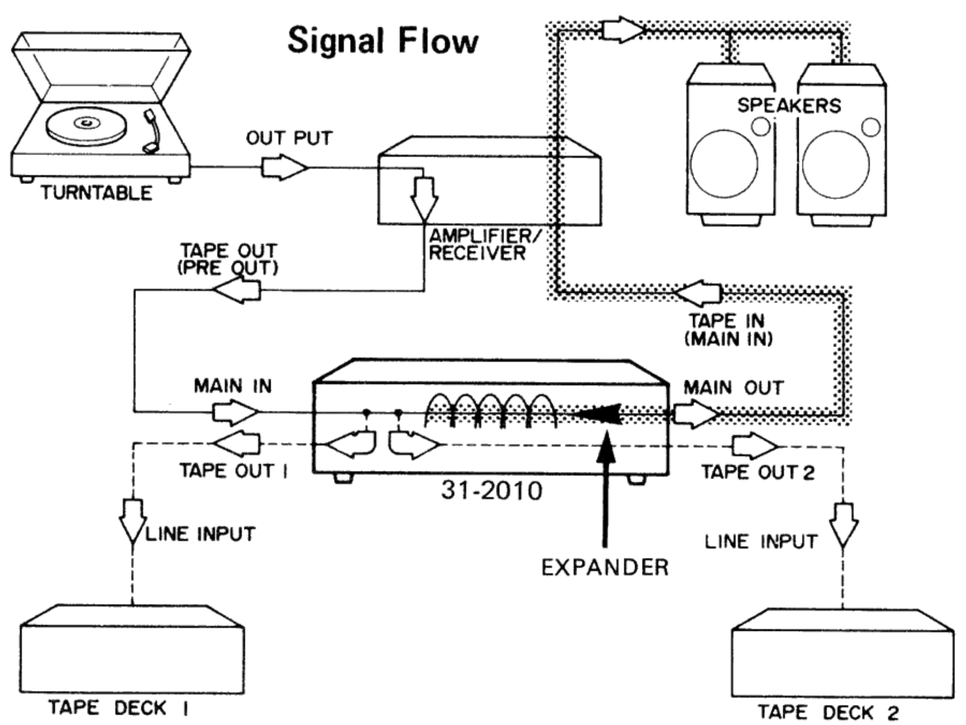
Recording a Flat Signal — Listening to a Flat Signal



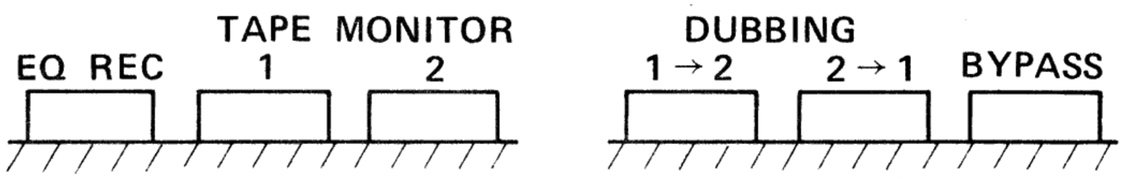
Button Positions



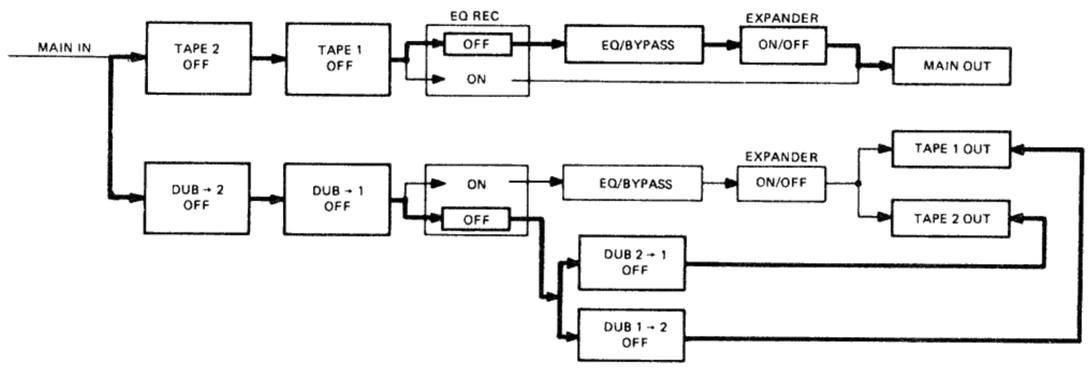
Recording a Flat Signal — Listening to an EQed Signal



Button Positions



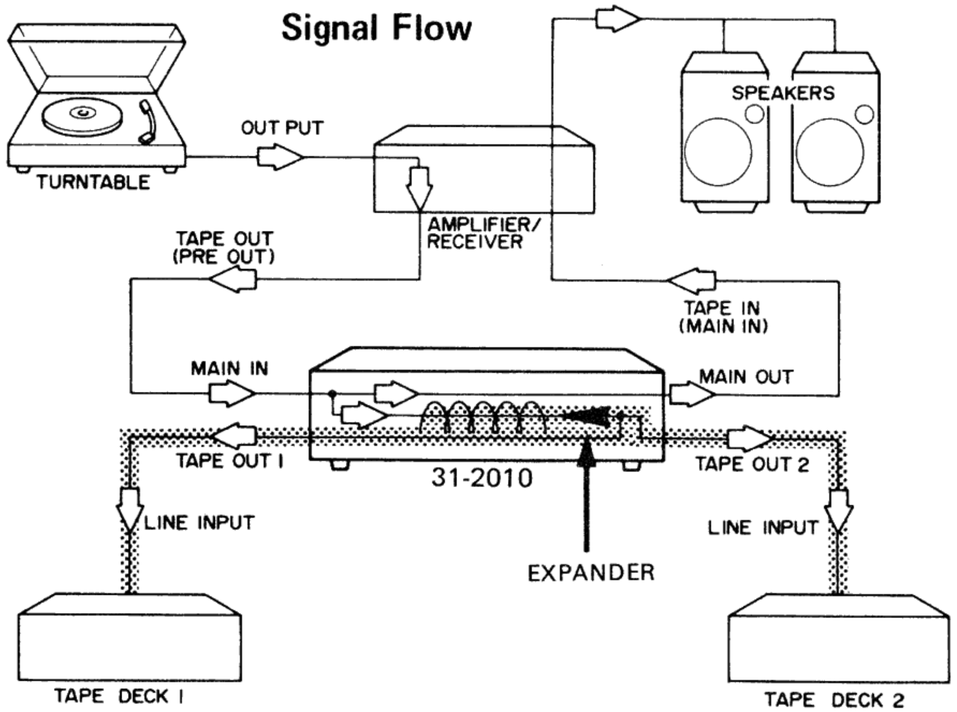
Signal Path



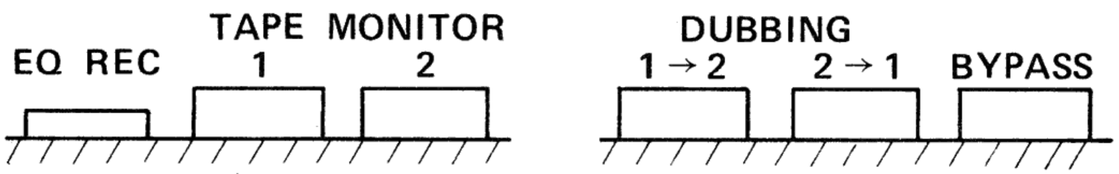
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Recording an EQed Signal — Listening to a Flat Signal

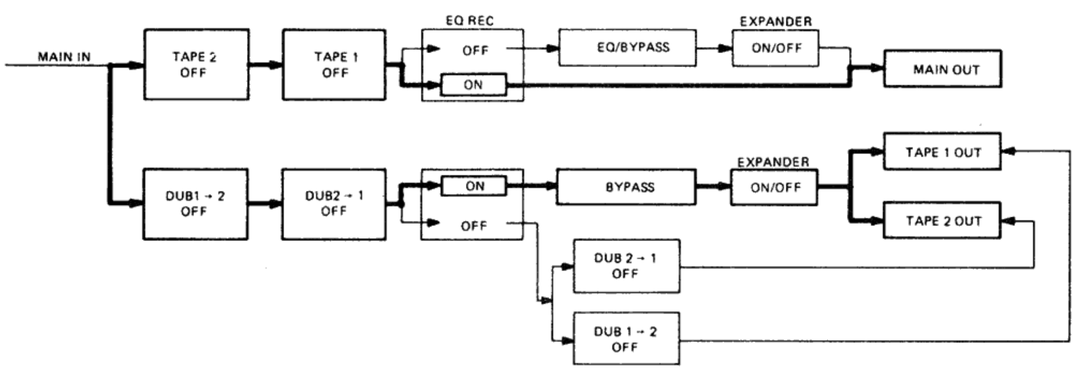
Signal Flow



Button Positions

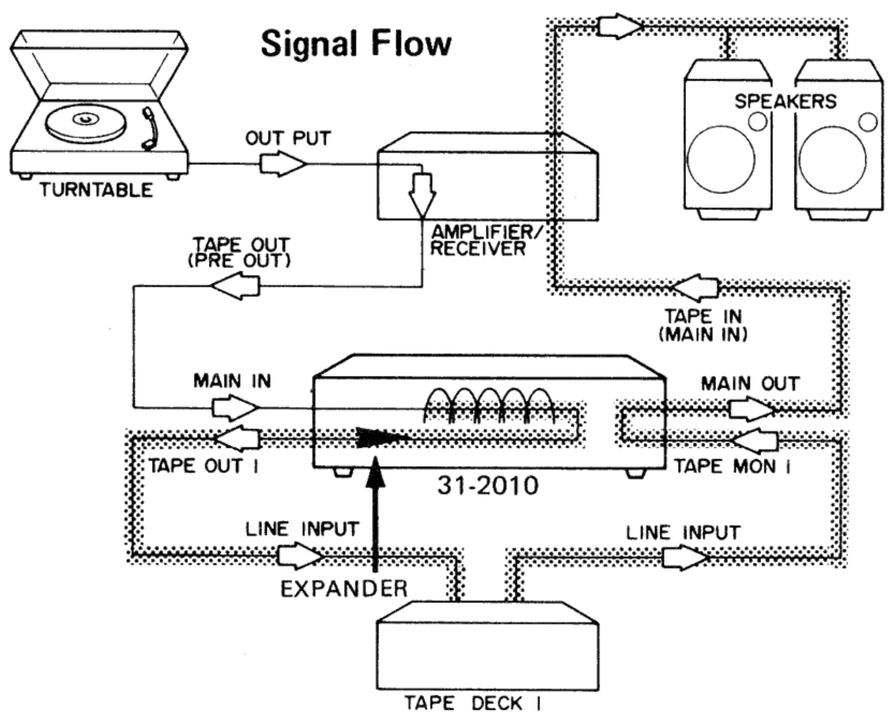


Signal Path

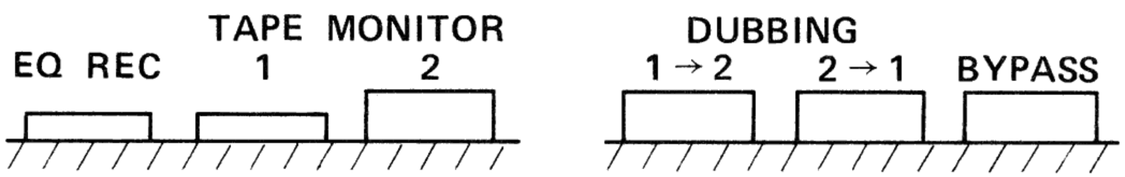


Recording an EQed Signal on Tape 1 — Listening to an EQed Signal

Signal Flow

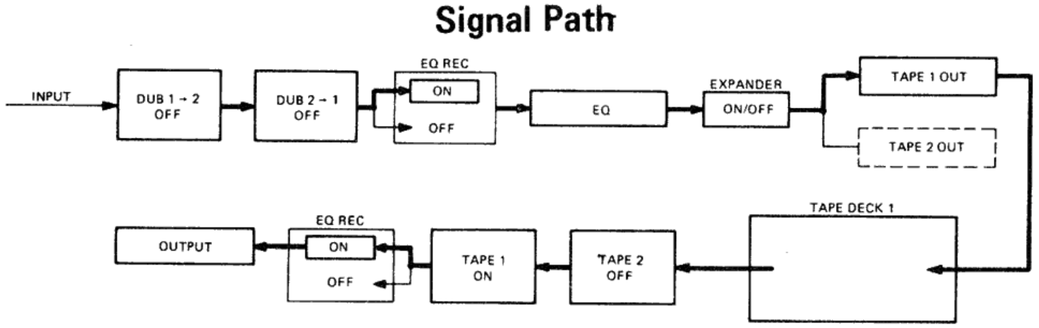


Button Positions



To record on tape 2, reverse the settings of TAPE MONITOR 1 and 2.

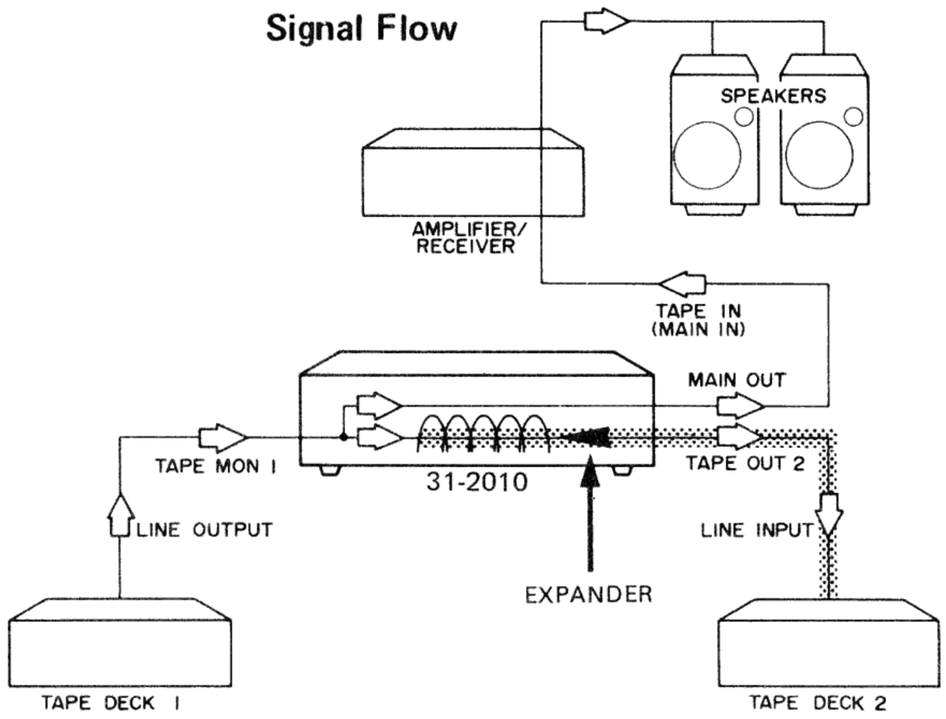
Signal Path



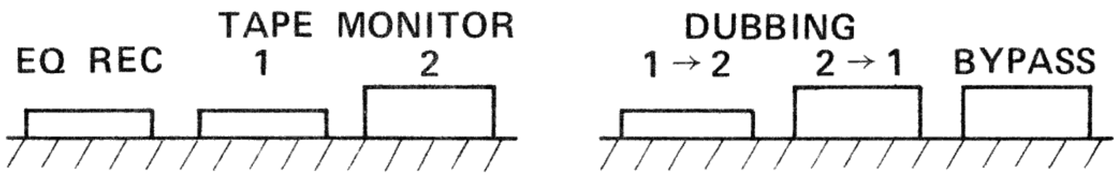
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Dubbing from Tape 1 to Tape 2 EQed — Monitoring Flat

Signal Flow

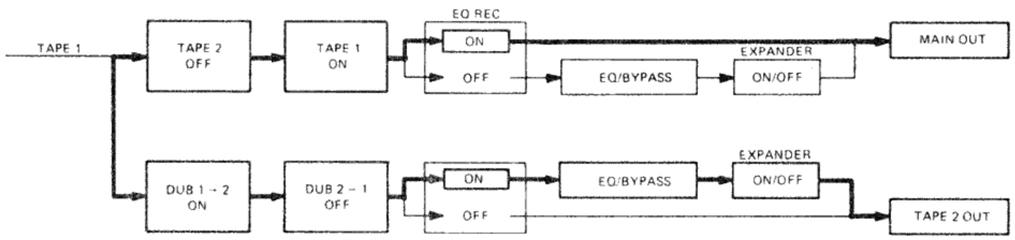


Button Positions



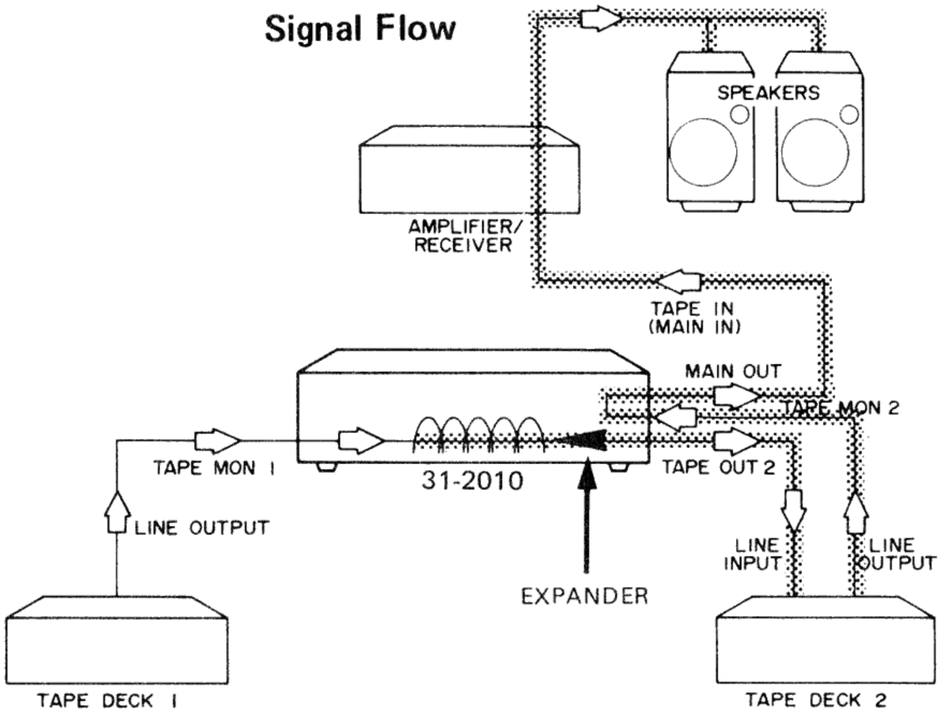
To dub from tape 2 to tape 1 and monitor flat, reverse the settings of TAPE MONITOR 1/2, and DUBBING 1–2/2–1.

Signal Path

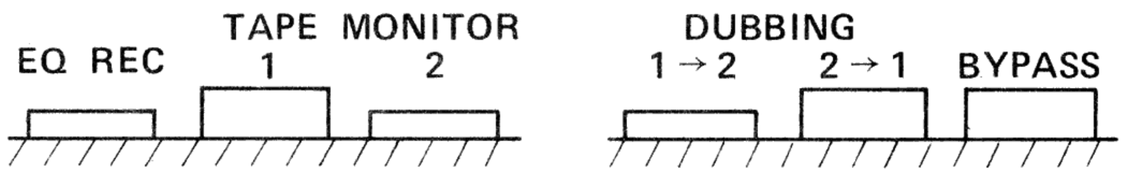


Dubbing from Tape 1 to Tape 2 EQed — Monitoring EQed.

Signal Flow

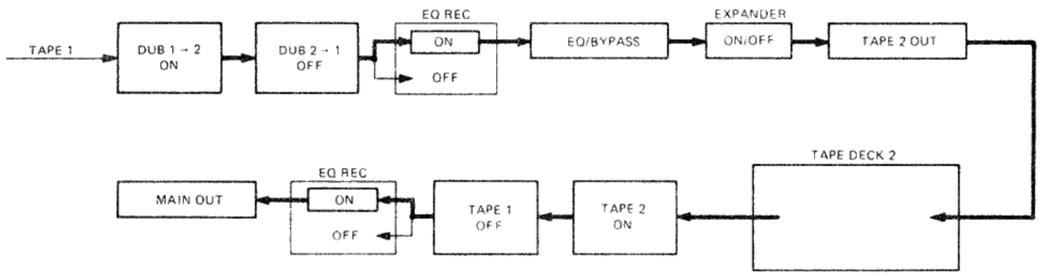


Button Positions



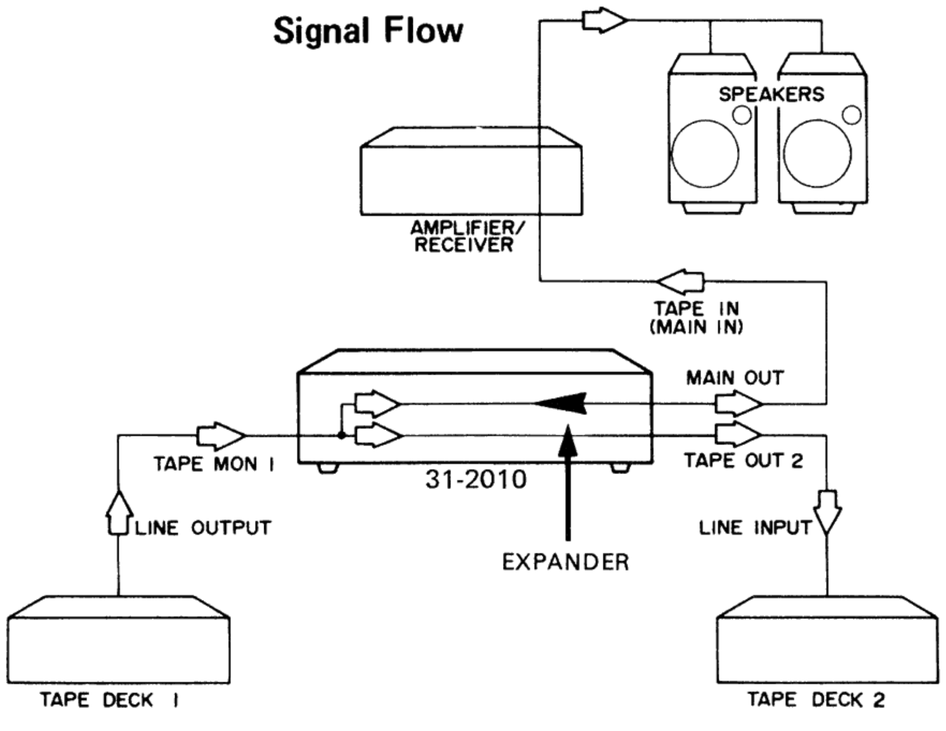
To dub from tape 2 to tape 1 and monitor EQed, reverse the settings of TAPE MONITOR 1/2, and DUBBING 1–2/2–1.

Signal Path

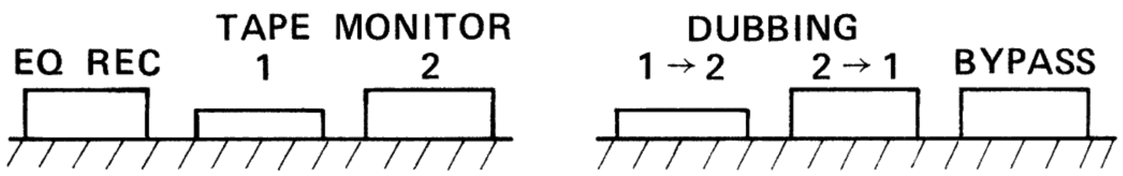


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Dubbing from Tape 1 to Tape 2 Flat — Monitoring Flat



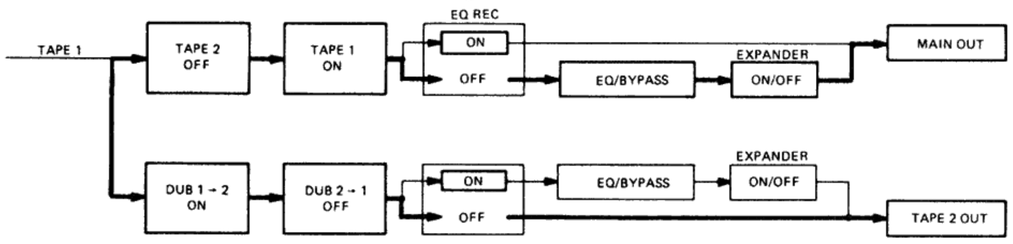
Button Positions



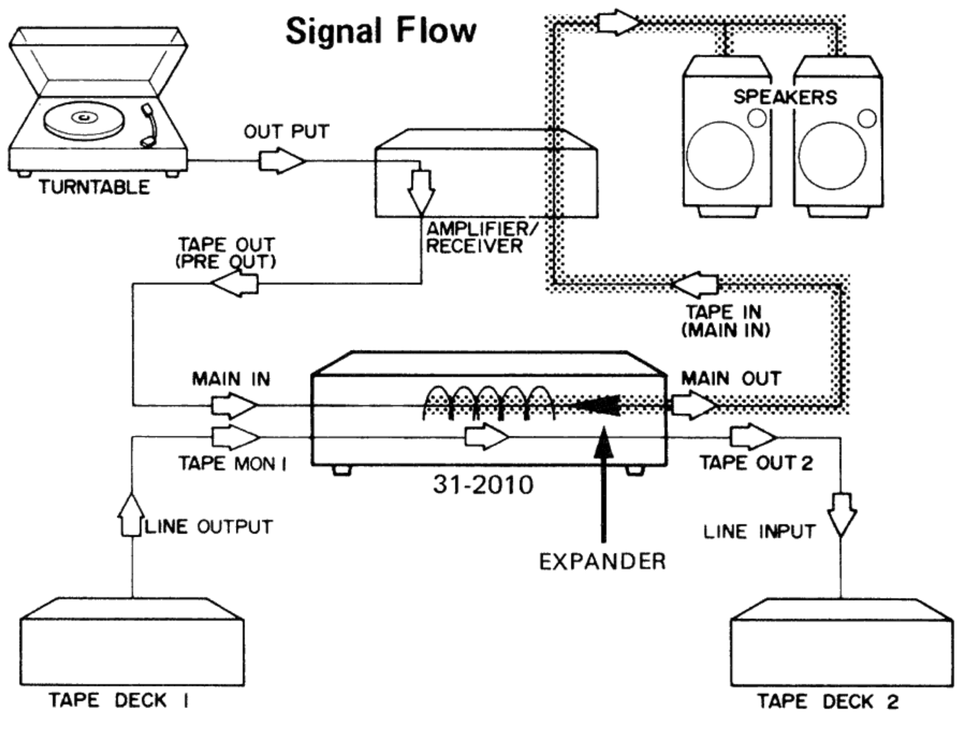
For EQed monitoring, set BYPASS out.

To dub from tape 2 to tape 1 flat, reverse the settings of DUBBING 1–2/2–1.

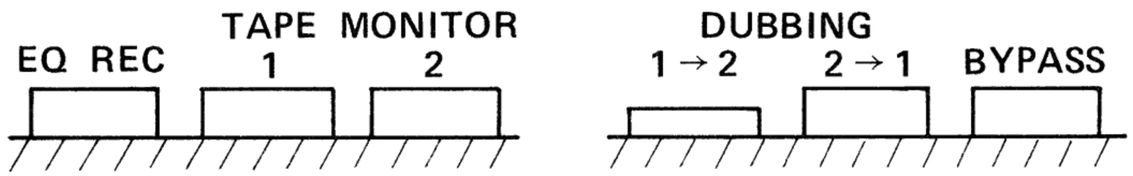
Signal Path



Dubbing from Tape 1 to Tape 2 Flat — Listening to Another Source (FM, Phono, etc) EQed



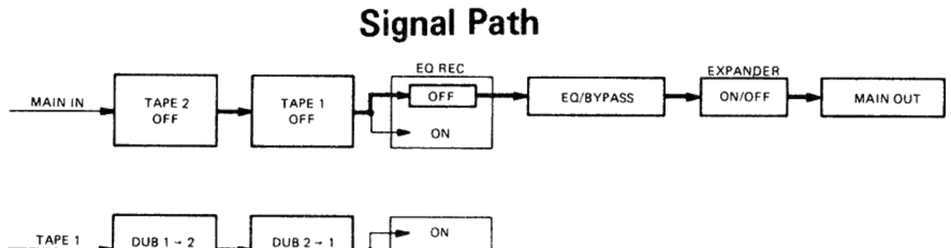
Button Positions



The setting of the BYPASS button will control only the source signal. TAPE MONITOR 1/2 must not be in.

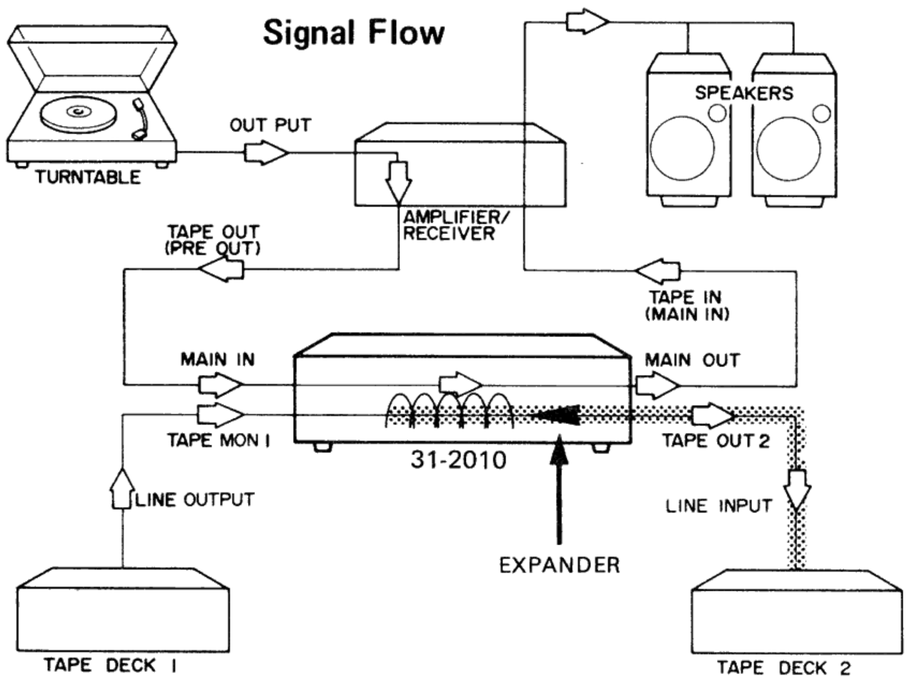
To dub from tape 2 to tape 1 flat while listening to another source, reverse the settings of DUBBING 1–2/2–1.

Signal Path

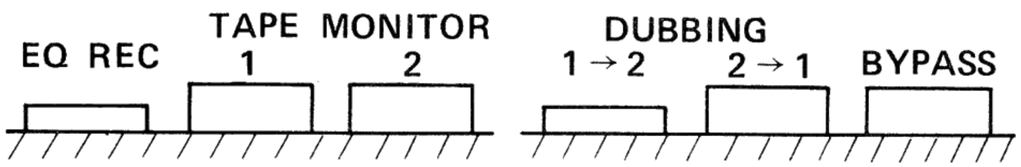


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Dubbing from Tape 1 to Tape 2 EQed —
Listening to Another Source (FM, Phono, etc) Flat Only

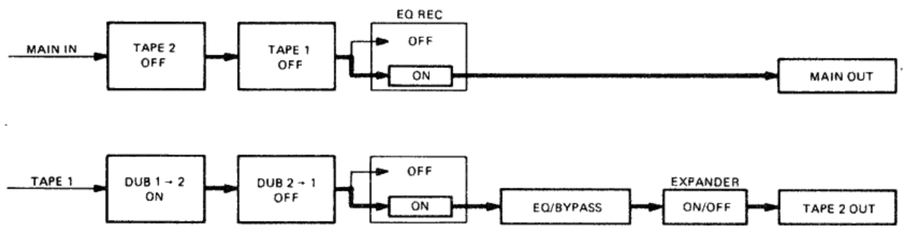


Button Positions



BYPASS and TAPE MONITOR 1/2 must not be in.

To dub from tape 2 to tape 1 EQed while listening to another source flat, reverse the settings of DUBBING 1–2/2–1.

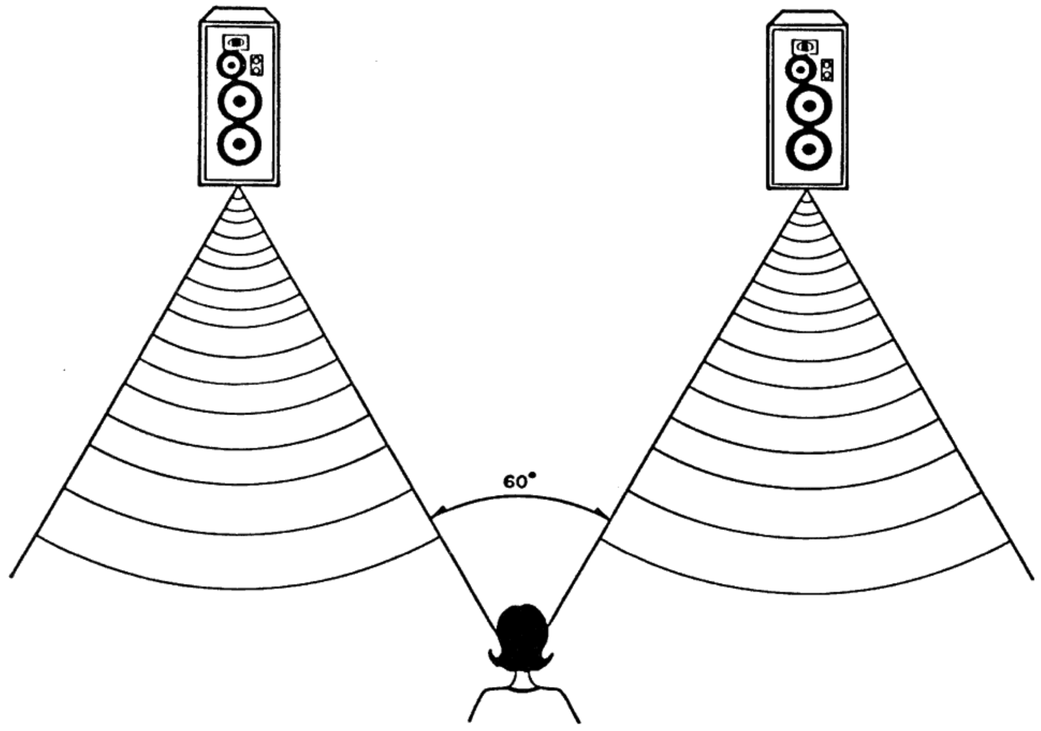


POSITIONING YOUR SPEAKERS

Where you put your speakers does make a difference in how your system will sound. So before settling on a final arrangement, try several locations.

Bass response is highly dependent on speaker location. For maximum bass, place the speakers in the corners of your room. Putting the speakers directly on the floor will make the bass even stronger. If the bass sounds boomy and exaggerated, move the speakers away from the corner slightly , pull them out from the wall a little, or raise them 6 to 18 inches (15 ~ 45 cm) off the floor. A Radio Shack speaker stand can be found at your nearest Radio Shack store.

To achieve maximum stereo effect, stereo speakers should be 6 to 8 feet (1.8 ~ 2.4m) apart in an average room. Putting them too close together reduces the stereo effect, while placing them too far apart reduces bass response and creates a "hole in the middle".



To optimize Expander capability, speakers should be:

- the standard "forwarding-facing" type. Reflecting type speakers are not appropriate for use with IMX Stereo Expander.
- phased properly.
- placed straight forward (do not angle them toward you.)
  Usually, the best listening position is in the overlap area of L and R speaker, dispersion angle (60°). On the contrary, to enjoy Expander sound, you have to sit out of this overlap area.
- away from the wall and raise them to your ear level, if necessary.

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FREQUENCY CONTROLS

When setting these controls for a signal that will be recorded, use a high-quality pair of headphones (such as our 33-999) to eliminate the effect of the room's acoustics.

The front panel has 24 controls, 12 per channel. Each control varies, by ±12 dB, the level of a small range of audio frequencies which are 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 580 Hz left channel control will affect the 1 kHz left channel control. The net effect of such controls set in the same direction (both in boost or cut position) will be greater than the panel marking indicates. The effect of such controls set in opposite directions (one in boost and one in cut) will be less than indicated. Refer to Figure 3 through 7 for typical slide control effect.

NOTES:

1. Set the amplifier/receiver's tone controls to their flat position (or use tone flat/defeat switch if you have such a switch).
2. Depending on the location of the Equalizer, you may notice some hum pickup (this would be from magnetic lines of flux from nearby power transformers). If this happens, try repositioning the Equalizer - as far away as possible from such sources of magnetism.

TYPICAL FREQUENCY RESPONSE CURVES

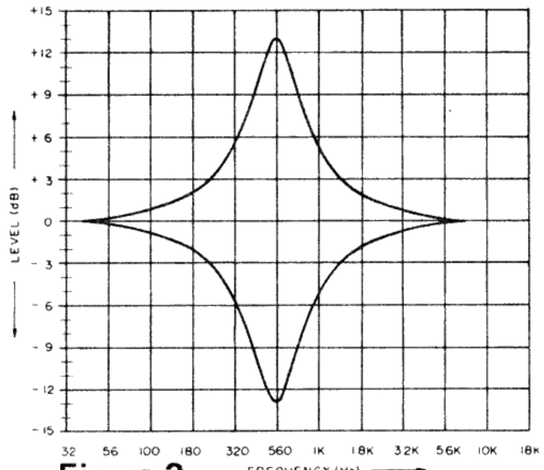


Figure 3
580 Hz Full Boost
580 Hz Full Cut

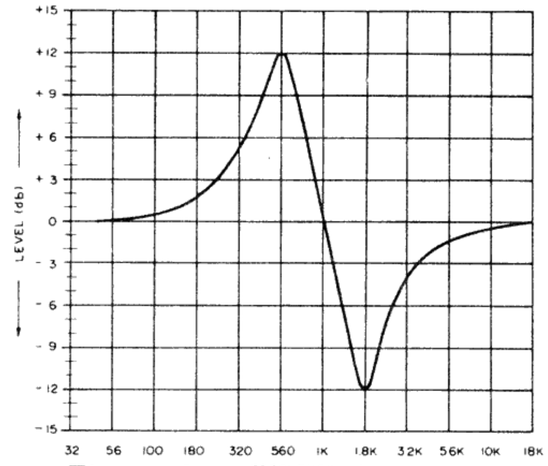


Figure 4
580 Hz Full Boost
1.7 kHz Full Cut

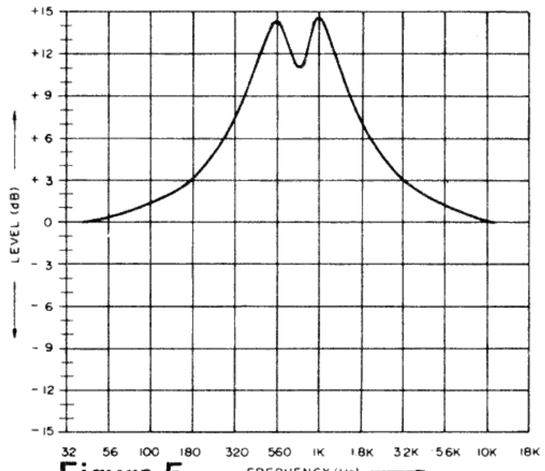


Figure 5
580 Hz Full Boost
1 kHz Full Boost

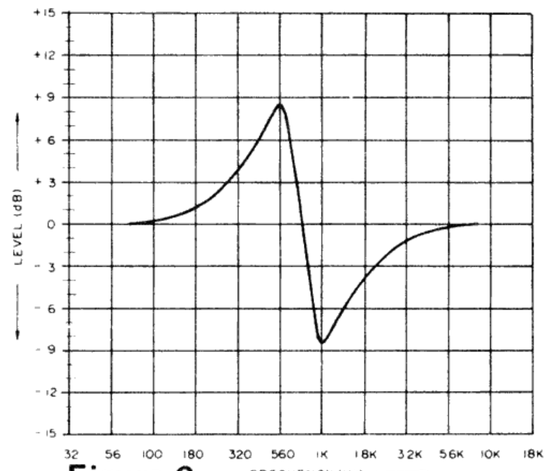


Figure 6
580 Hz Full Boost
1 kHz Full Cut

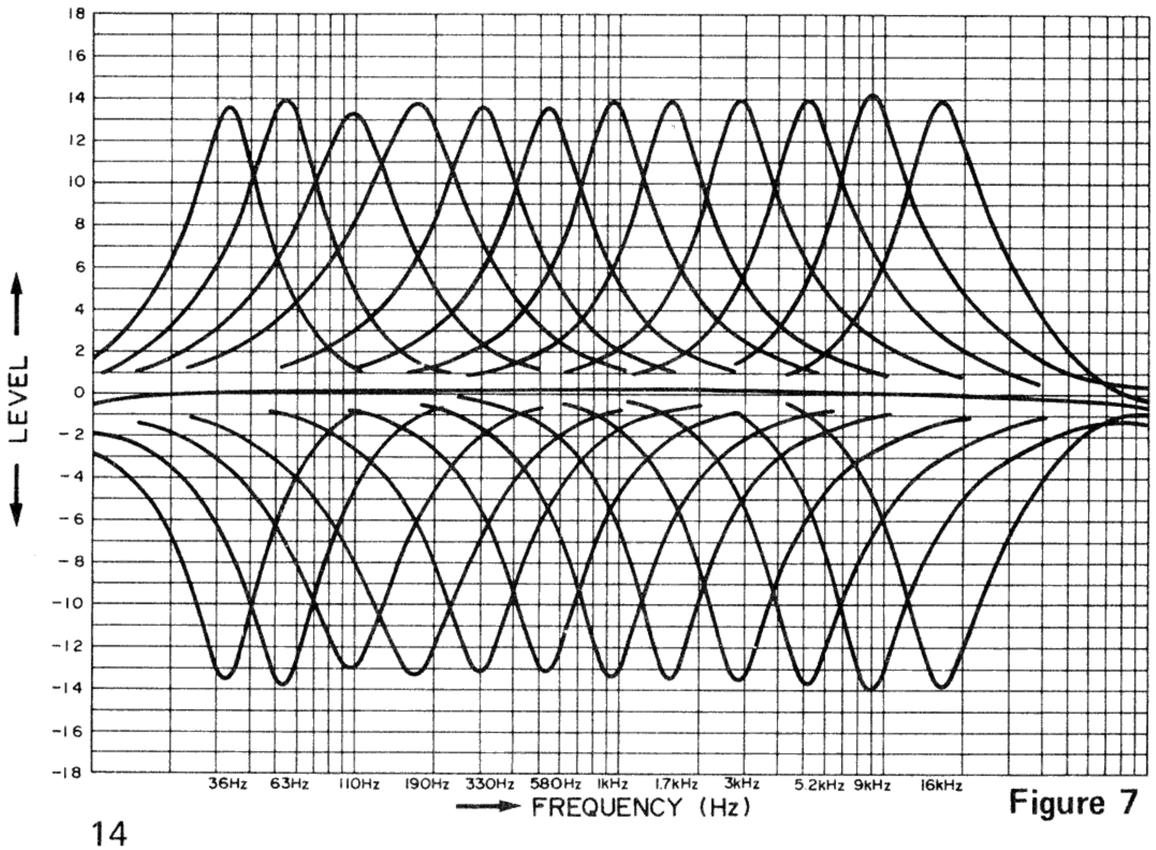


Figure 7

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THE MUSICAL SPECTRUM

This chart correlates familiar musical instruments with the 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 (gray bands) that give each individual instrument its character or timbre and set it apart from the rest.

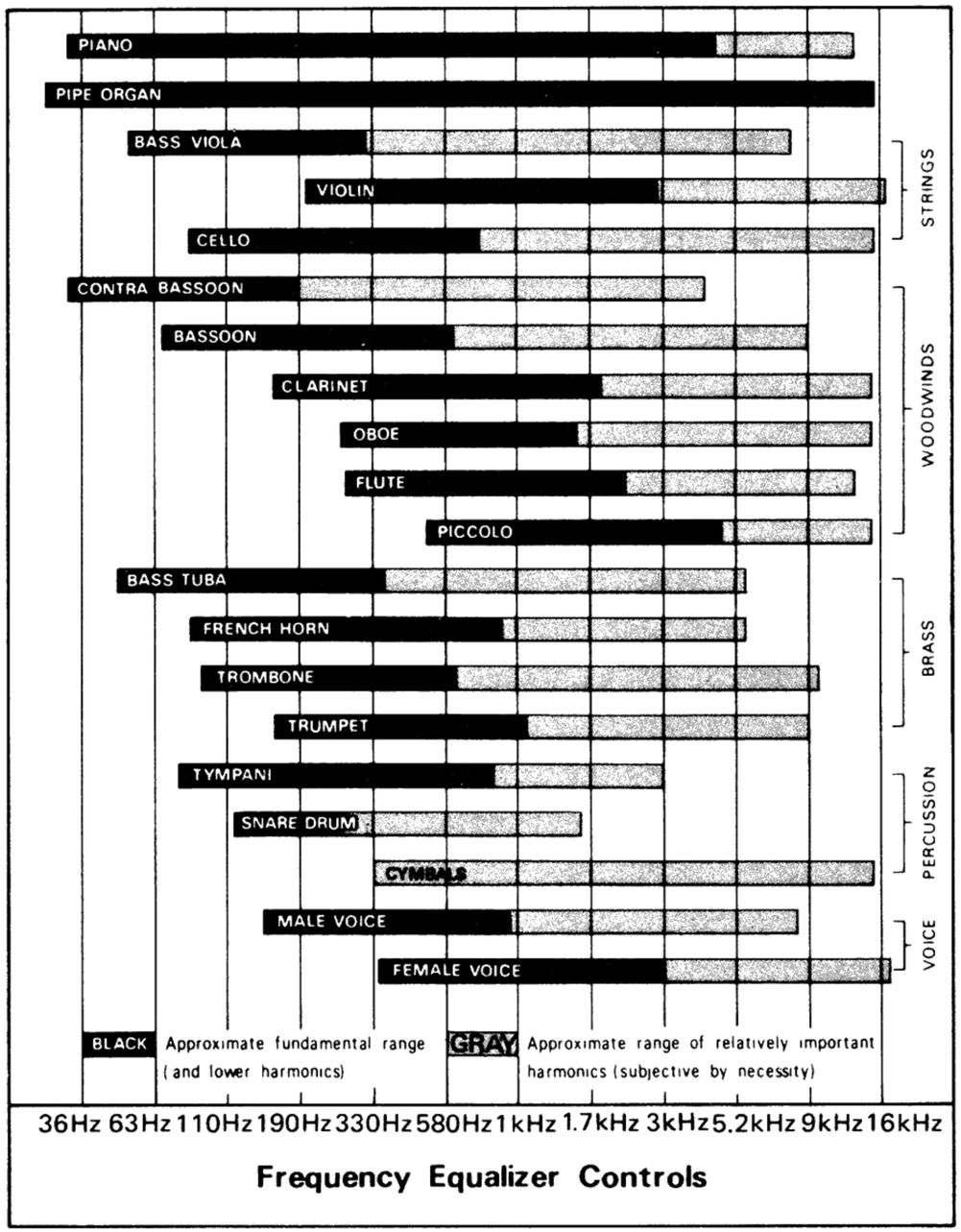
Interestingly enough, the human ear is more sensitive to certain octaves the musical spectrum than to others. Whoever designed this engineering marvel, deemed it necessary to tune the ear more toward the midrange frequencies where speech and voice communication occur, than to the outer octaves of low bass and high musical overtones. As a result, very small energy changes here will cause a more drastic psycho-acoustic 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, contrabasoon, etc.) or they can be used to reduce rumble, acoustic feedback and other low frequency abberation. The 36 Hz, 63 Hz and 110 Hz controls will 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. The 190 Hz and 330 Hz controls are important for good overall balance.

Approximate Frequency Ranges for Musical Instruments and Voice



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The Mid-Range (approx. 400 ~ 2,600 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 580 Hz, 1 kHz or 1.7 kHz control settings optimum for certain types of music, and other settings just right for other 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. Use the 3 kHz and 5.2 kHz controls for this effect.

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 of the 9 kHz control 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 rapidly above 13 to 15 kHz. As a consequence, the 16 kHz control will have a very subtle effect. It can be used to add a little more dimension to the sound or as a very high frequency noise filter.

CAUTION
If your sound system employs separate components, e.g. pre-amplifier and amplifier, and the Equalizer is connected between the output of the pre-amplifier and input of your power amplifier, it is important to follow the procedures below:

1. Power on Sequence
   A. Turn on the Equalizer.
   B. Turn on your pre-amplifier.
   C. Turn on your power amplifier.

   Follow the reverse sequence in turning your system off.

2. Your must reduce the volume control setting **before** switching the Equalizer **in** or **out** of the sound system. Failure to do this will result in excessive volume when the Equalizer is introduced into the system and can result in damage to your amplifier or speakers.

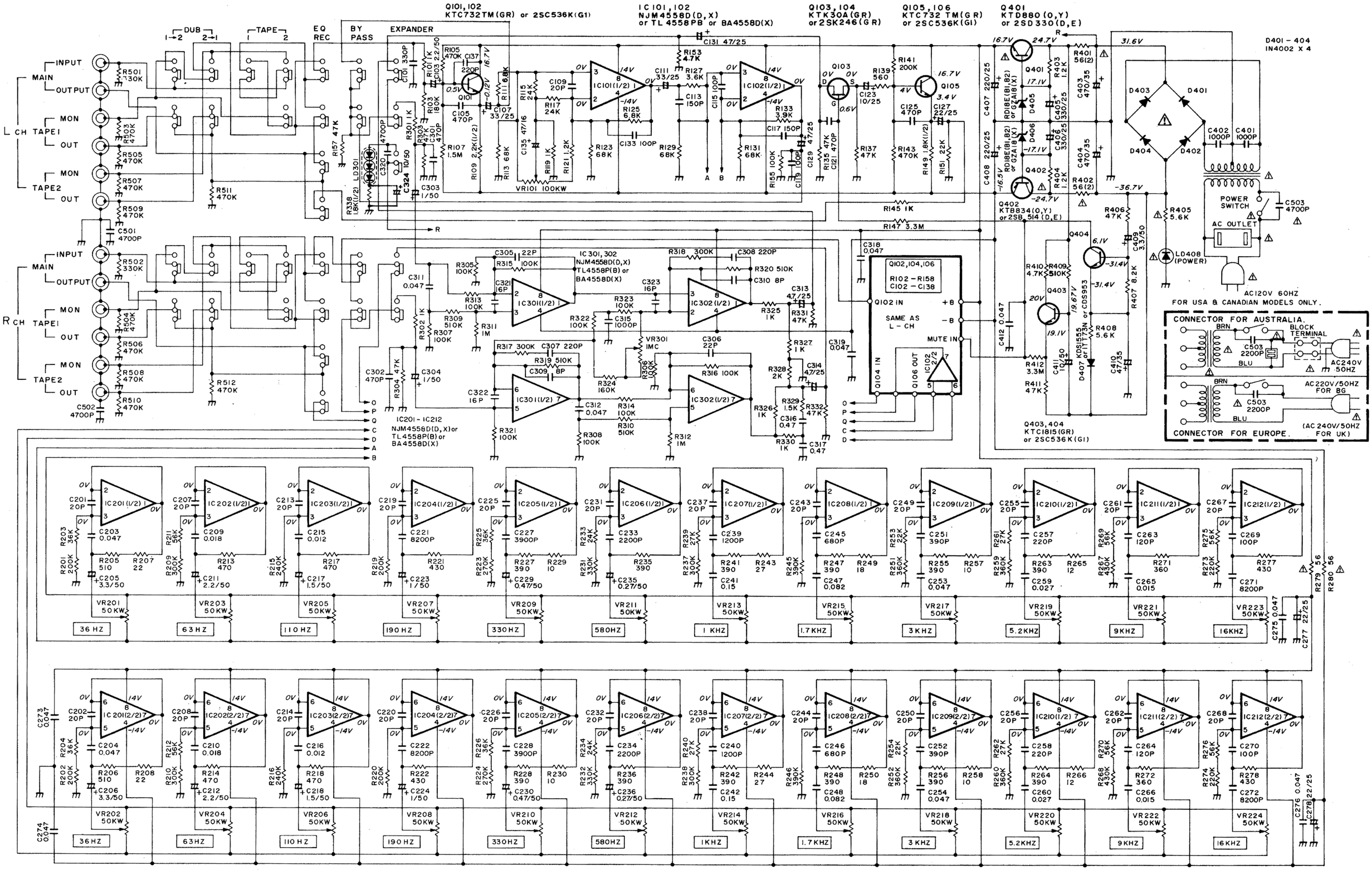
All Equalizers are designed for unity gain; in other words, the level of signal out is the same as the level in **WHEN ALL FREQUENCY CONTROLS ARE SET AT 0**.

In one or several frequency controls are boosted in either or both channels (stereo), the output level from our 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 your master volume control setting, this can result in overdriving of your power amplifier and/or speaker system and incurring possible damage.

Thus, we suggest you reduce the master volume control setting of your sound system before switching the Equalizer in or out of the system and them restore the master volume control setting for your listening pleasure.

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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).
(3) "DUBBING" AND "TAPE MONITOR" SWITCH POSITIONS ARE OUT.
(4) "EQ REC" SWITCH POSITION IS OUT.
(5) "EQ/BY PASS" SWITCH POSITION IS EQ.
(6) "EXPANDER" SWITCH POSITION IS OFF.

CAUTION : SINCE THE COMPONENTS MARKED BY ⚠ ARE CRITICAL FOR SAFETY USE ONES DESCRIBED ON PARTS LIST ONLY.

Schematic subject to change without notice. For most accurate Schematic (and parts) contact Radio Shack, National Parts Dept., Fort Worth, TX 76101.

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