TAPCO®

TECHNICAL AUDIO PRODUCTS CORPORATION

2210

OWNER'S MANUAL

EV/TAPCO 2210 ONE OCTAVE GRAPHIC EQUALIZER

Equalizers can be used for many applications and purposes in both sound reinforcement and recording. Graphic equalizers are commonly used in sound reinforcement systems to reduce levels at certain frequency ranges that are causing acoustic feedback. Graphic equalizers are also used to increase levels of certain frequency ranges to make stage monitors more intelligible and reduce susceptibility to acoustic feedback. For recording applications, graphic equalizers are often used to "voice" (optimize frequency response) control room and studio monitors. Graphic equalizers may also be used for individual channel processing when several frequency ranges must be boosted. This cannot be done with the two or three band equalizers found on most mixing consoles.

The 2210 is a 10 band, dual channel graphic equalizer. It is tailored for economy, yet does not sacrifice quality, performance or ease of operation. The 2210 is equipped with a host of professional features that make it at home in any recording or sound reinforcement application.

**** DUAL CHANNEL OPERATION

**** TEN BANDS ON ISO PREFERRED CENTER FREQUENCIES

**** CENTER DETENTED SLIDE CONTROLS

**** OVERAL GAIN CONTROLS

**** PEAK STRETCHED LEDS

**** LOW NOISE

**** LOW DISTORTION

**** ± 12dB BOOST AND CUT

**** IN/OUT SWITCHES

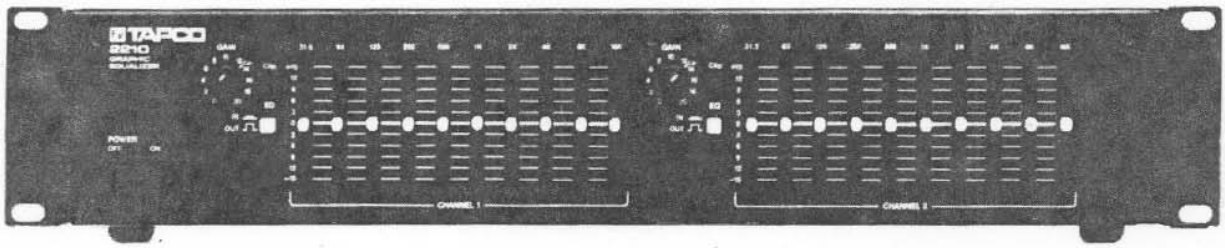
**** 1/4" PHONE JACKS FOR INPUTS AND OUTPUTS

**** STEEL CHASSIS

**** SECURITY COVER

**** RECESSED FRONT PANEL

DWG 30-700048-A



1. FRONT PANEL CONTROLS

A. POWER ON/OFF SWITCH AND LED

The power on/off switch simply turns the 2210 on and off. The Red Power "ON" LED will light when the power is turned on. Do not make any connections to or from the 2210 when the power is turned on.

When powering ON a system using the 2210, follow this procedure:

a. Turn on everything except the power amps. Wait at least 15 seconds.
b. Now turn on the power amps.

When powering a system down, reverse the above proceedure. Amps first, then everything else. To be really safe, turn the level controls down on the amps and then shut everything else down. If your system uses TAPCO amplifiers exclusively, you can merely pull the plug, as the load protection relay in the amplifier disconnects the speakers immediately upon power off.

B. CHANNEL GAIN CONTROLS

Each channel on the 2210 has a Channel Gain control that adjusts the level of signal coming into the equalizer. These controls allow the proper adjustment of input signal for optimum operation of the internal amplifier and EQ control stages. Each control has a position marked "Cal". With the gain control set in this position, there is no overall gain or loss through the 2210. What goes in comes out, with the exception, of course, of boosted or cut frequencies in the EQ section. This setting is helpful in initial settings of EQ and overall levels in the system, plus gives a fixed point to go from "flat" (Gains at "Cal", all EQ sliders set flat) to a tuned or equalized output.

For instrument level signals, set the Channel Gain controls to a higher setting than "Cal". Use maximum gain, if necessary. This gives weaker instrument signals the best chance of overcoming noise on their way through the 2210.

C. CLIP/OVERLOAD LED INDICATORS

Two red LED indicators, one per channel, indicate signal clipping conditions at two points in the 2210's circuitry. One monitored position is just after the input gain stage, another just after the EQ control section. The LED's have been "peak stretched" so even the briefest clipping will not go unseen. The LEDs will flash if the equalizer sees too much signal at these points. When this occurs, either the channel gain control levels should be reduced, and/or the preamp signal source turned down. Another problem could cause the EQ stage to clip: a frequency or frequencies boosted to the point of overdriving the EQ contol amplifier stage. The solution here would be to push down the EQ sliders with the highest boost until the LEDs quit flashing.

D. EQ SLIDE CONTROLS

Each of the 10 detented slide controls in the equalizer section governs the relative loudness of one octave of the audio spectrum (20Hz to 20KHz). The frequency affected most by each slider is marked on the front panel under the slide pot. The EQ bands are broader when small amounts of control range are used, and become relatively narrower as the boost or cut is increased. This gives the musician or sound engineer control over wider bands when needed, more specific control when greater selectivity is desired.

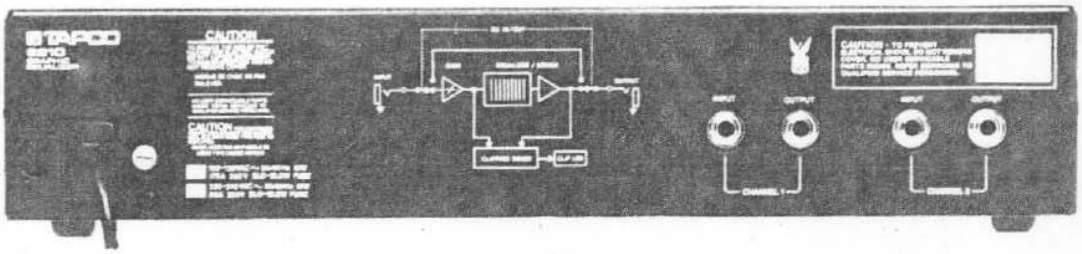
Each slider has a 24dB overall range, +12dB boost and -12dB cut. However, we recommend keeping the EQ controls as close to "flat" or center for the very best results.

E. EQ IN/OUT SWITCHES

The EQ In/Out switches on each channel take the EQ control and gain sections out of the signal path. A switch is provided for each channel which facilitates using the 2210 as two single channel equalizers; one channel for mains (house) and the other for monitors. Of course, you can always use it in stereo.

F. SECURITY COVER

A security cover is provided to prevent unauthorized tampering with control settings. It is installed by removing the two upper screws (one top left, one top right) that hold the equalizer into the rack, overlaying the security cover, and replacing the two screws.



2. REAR PANEL AND SYSTEM CONNECTIONS

A. INPUT AND OUTPUT CONNECTIONS

Each channel of the 2210 has two 1/4" phone jacks, one for input, one for output.

The 2210's normal place in the signal chain is between the preamp or mixer and the power amplifiers. Other likely places for it to be patched would be at the submaster or channel patching (channel insert) jacks on a mixer, or perhaps between an instrument and its amplifier. Really low level signals (like a Fender Rhodes stage piano) should be preamplified first before being fed to the 2210.

To connect the 2210 to a system, simply connect the output from a mixer, preamp or other line-level output signal source to the channel one or two input jack. Connect the channel outputs of the 2210 to the line level inputs of a power amp or low level, electronic crossover. Maximum output level of the 2210 is +18dBu. Remember to make any connections to or from the 2210 with the power swithed off or the unit unplugged.

B. POWER CORD AND LINE FUSE

Connect the 2210 to an AC power source of 110-130VAC, 50-60 Hz, 10 W. In countries other than the USA or Canada, observe the line voltage label on the rear panel.

Replace the fuse with a 175ma (.175amp) slo-blo type (120V version only). Bussman type MDL 175/1000 250V or Littlefuse 313.175. Repeated fuse blowing is a sign of component failure. Refer the unit to qualified service personnel. Export models: (countries other than the USA or Canada) see rear panel for fuse information.

CAUTION: NO USER SERVICEABLE PARTS INSIDE. REFER ALL SERVICING TO QUALIFIED SERVICE PERSONNEL. HIGH VOLTAGE PRESENT INSIDE CASE.

3. SOUND REINFORCEMENT APPLICATIONS

The most common sound reinforcement uses for the 2210 are:

1. equalization of house or frontal system
2. equalization of monitor or foldback system.

The 2210 should be connected between the mixer and the power amplifier(s). If there is a compressor, it should be connected after the equalizer. Effects devices can be connected before or after the equalizer.

Detailed equalization of any system without instrumentation (test equipment) is difficult if not impossible. It is possible to achieve approximate results without the use of instruments. The use of a real time analyzer is strongly recommended for best results with this equalizer.

An alternate method is known as feedback or regenerative tuning. Basically, the sound system is brought to the threshold of feedback and held there. All normally used microphones should be in place and on. The frequency (pitch) of the feedback is noted and the corresponding slider on the equalizer adjusted to attenuate at the feedback frequency. Move the control just enough to cause the feedback to go away. Now increase the gain and repeat the process. The trick is in knowing when to stop. Generally, when you can get two frequencies to feedback simultaneously, you're there. A smooth looking curve on the equalizer controls may not necessarily be the best curve. Remember, LESS EQUALIZATION IS BETTER.

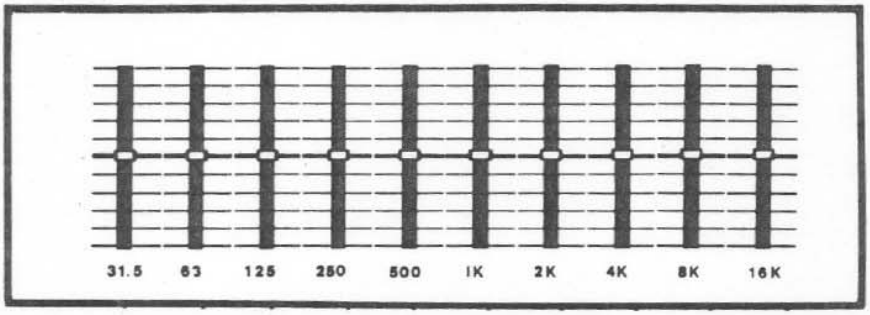
A simple method for converting pitch to frequency is via a piano. All you have to do is remember that middle C is approximately 250 Hz. Moving up an octave doubles the frequency and moving down halves it. Now locate the feedback pitch on the piano and make a rough guess as to its frequency.

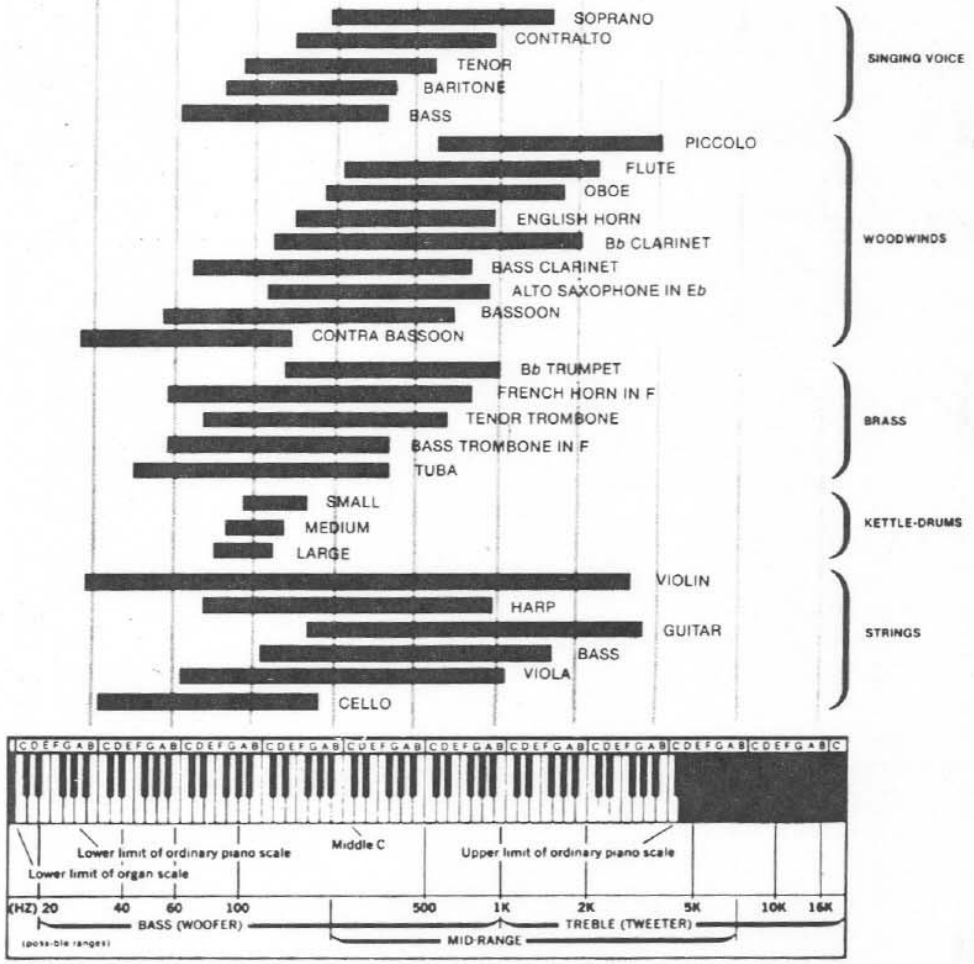
When using a real time analyzer, you have the choice of using pink noise and a calibrated microphone to adjust the equalizer for smoothest overall response or to simply use the analyzer to tell you which slider to move when doing a feedback tuning. The best method is to use the calibrated microphone and pink noise first, then do a feedback tuning to get out the last small peaks. Having the analyzer connected to the system during performance may help you to spot feedback more exactly when it happens, as it will usually be the slowest to decay on the analyzer display.

If you use the pink noise method, remember that ruler flat frequency response from 20 to 20KHz is not necessarily what you really want. Most loudspeaker systems sound best when a 'house curve' or controlled high frequency rolloff is introduced. This should consist of a gentle (approx 3dB/oct) rolloff starting somewhere between 5 and 10Khz (sometimes known as the Boner Preference Curve)

THE FREQUENCIES OF MUSIC

(Ranges of fundamental components of tones for the principal instruments and voices)





Only the fundamentally generated frequencies are shown. Harmonics are extended both above and below these fundamentals, and are controlled by the EQ bands at the outer ends of the spectrum.

It is generally preferred to go after (try to smooth out) the major peaks and leave the dips alone. Large amounts of boost should be avoided. Dips in the response may be caused by absorption within the room and will soak up incredible amounts of energy. Fortunately, dips are much less audible than peaks. A good job of system/room equalization will probably require less than 6dB of equalization at any single frequency if done properly.

4. RECORDING APPLICATIONS

The usual uses for the 2210 in the studio are:

1. control room monitor equalization
2. sophisticated tone shaping.

Connect the 2210 between the mixing console outputs and the power amplifier(s). When using the 2210 for tone control, connect it in the channel or submaster patching loop of the console or between the console and tape machine. It is not recommended to be connected between an instrument and the mixer, unless the instrument can produce line level signals (0dBv or approx .7 V). It won't hurt anything to do this, but it may be noisy. (See Section 1B)

When used for control room monitor equalization, use of a real time analyzer is recommended. Equalization by ear or other method does not produce optimum or even near optimum results. The sonic quality of the finished product is inversely linked to the sound or tonal balance of the monitors. Too much bass on the monitors will produce thin sounding mixes. Excessive high end will cause dull sounding mixes. Peaks and dips will result in dips and peaks in the mixes and so on. Again, as in sound reinforcement overall flat equalization will not produce optimum results and the use of a controlled high frequency rolloff (3-9dB/oct @8khz) will generally produce the best results. When your monitors are equalized correctly, your mixes will sound good on almost anything.

5. IN CASE OF DIFFICULTY

A. Is the unit turned on? Is the fuse good?
B. Check control settings. Is the gain control turned up?
C. Check all cables. 95% of all problems are caused by bad cables. Make sure you have inputs and outputs straight.
D. Bypass the unit by plugging the input and output cables together. If you now get sound, the equalizer is defective.
E. When all else fails, take the 2210 to an authorized TAPCO service center or contact the factory. Be prepared to supply the serial number of your unit.

*** CAUTION ***

NO USER SERVICEABLE PARTS INSIDE. CAUTION--HIGH VOLTAGE PRESENT INSIDE CASE. REFER ALL SERVICING TO QUALIFIED PERSONNEL, AUTHORIZED WARRANTY CENTER OR TO THE FACTORY.

F. For further applications assistance, write or call the factory. If you write, include your phone number and a time when you can be reached at that number.

6. SPECIFICATIONS

FREQUENCY RESPONSE	20-20KHZ ±1dB
EQ CENTER FREQUENCIES (HZ)	31.5, 63, 125, 250, 500, 1K, 2K, 4K, 8K, 16KHZ
HARMONIC DISTORTION	.05% (+4dBm output, 20-20KHz)
CCIF IM DISTORTION	.05% (19KHz+20KHz 1:1, +4dBu)
SMPTE IM DISTORTION	.05% (+4dBu output)
OUTPUT NOISE	-86dB (re 1V, 20KHz NBW)
MAXIMUM IN/OUT LEVEL	+18dBu
POWER REQUIREMENTS	120V, 60Hz, 15W max
FUSE (100-120VAC)	175ma (.175amp) slo-blo type (120V version only). Bussman type MDL 175/1000 250V or Littlefuse 313.175.
SIZE (HWD)	3.5"x19"x7"
WEIGHT	9.5 lbs.
SECURITY COVER	INCLUDED

7. TAPCO BIBLIOGRAPHY

BOOKS

1. THE PA BIBLE available from Electro Voice, 600 Cecil St., Buchanan MI 49107, ATTN: PA BIBLE. $2 gets you Vol 1 and all subsequent chapters.

2. THE AUDIO CYCLOPEDIA Howard Tremaine c1969 Howard W. Sams Co. Indianapolis IN.

3. ACOUSTIC TECHNIQUES FOR HOME AND STUDIO F. Alton Everest c1973 Tab Books #646, Blue Ridge Summit PA 17214

4. SOUND REINFORCEMENT an anthology of articles from the Journal of the Audio Engineering society. c1978 Audio Engineering Society Inc.

5. SOUND SYSTEM DESIGN Don and Carolyn Davis c1975 Howard W. Sams Co. Indianapolis IN.

MAGAZINES

1. RECORDING ENGINEER/PRODUCER published bi-monthly (6 iss/yr) by Gallay Communications Inc. POB 2449 Hollywood CA 90028. $10/yr.

2. STUDIO SOUND monthly, subscription department, Link House, 25 West St., Poole, Dorset BH15 1LL, Great Britain. Sent free to qualified readers.

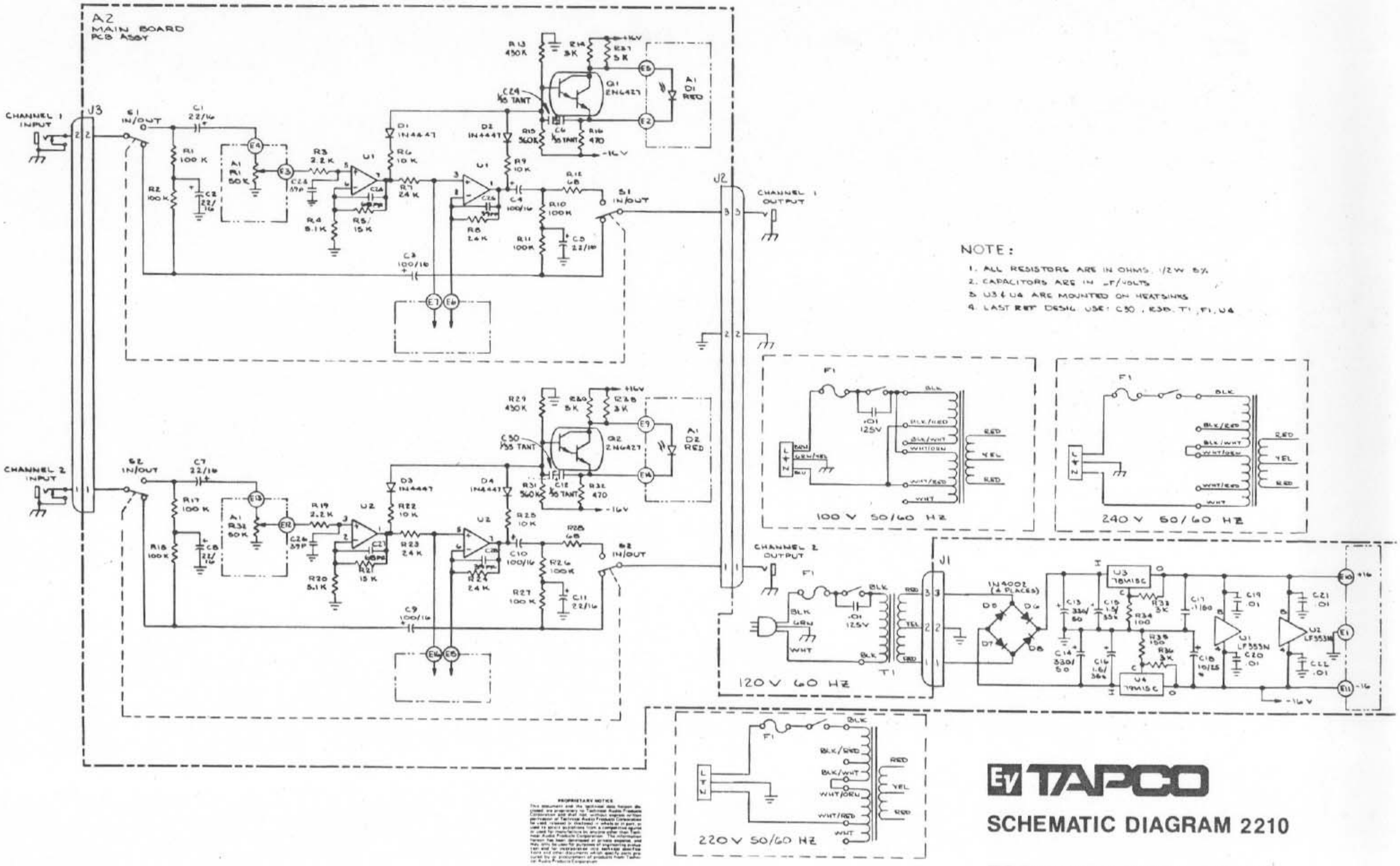
3. MODERN RECORDING AND MUSIC monthly, Cowan Publishing, 14 Vanderventer Ave, Port Washington NY 11050. $12/yr

4. SOUND ARTS Sound Arts Merchandising Inc, 220 Westbury Ave. Carle Place, NY 11514.

5. JOURNAL OF THE AUDIO ENGINEERING SOCIETY (JAES) monthly except Jan/Feb and Jul/Aug. Free to members of any grade, $45 to nonmembers.
State of the Art papers on all phases of audio engineering. Papers are written by professionals in audio engineering and are usually presented at one of the society's yearly conventions (Europe and the US). Highly technical, written at engineering level (don't spare the math).

Membership in the society is open to anyone with an interest in audio engineering. There are 3 membership grades: Member, Associate and Student. Dues vary with membership grade. A subscription to the Journal is part of the yearly dues. Contact: Audio Engineering Society, Lincoln Building, 60 E 42nd St. New York NY 10165. (212) 661 2355

6. dB the SOUND ENGINEERING MAGAZINE monthly, $9/yr. Sagamore Publishing Co.



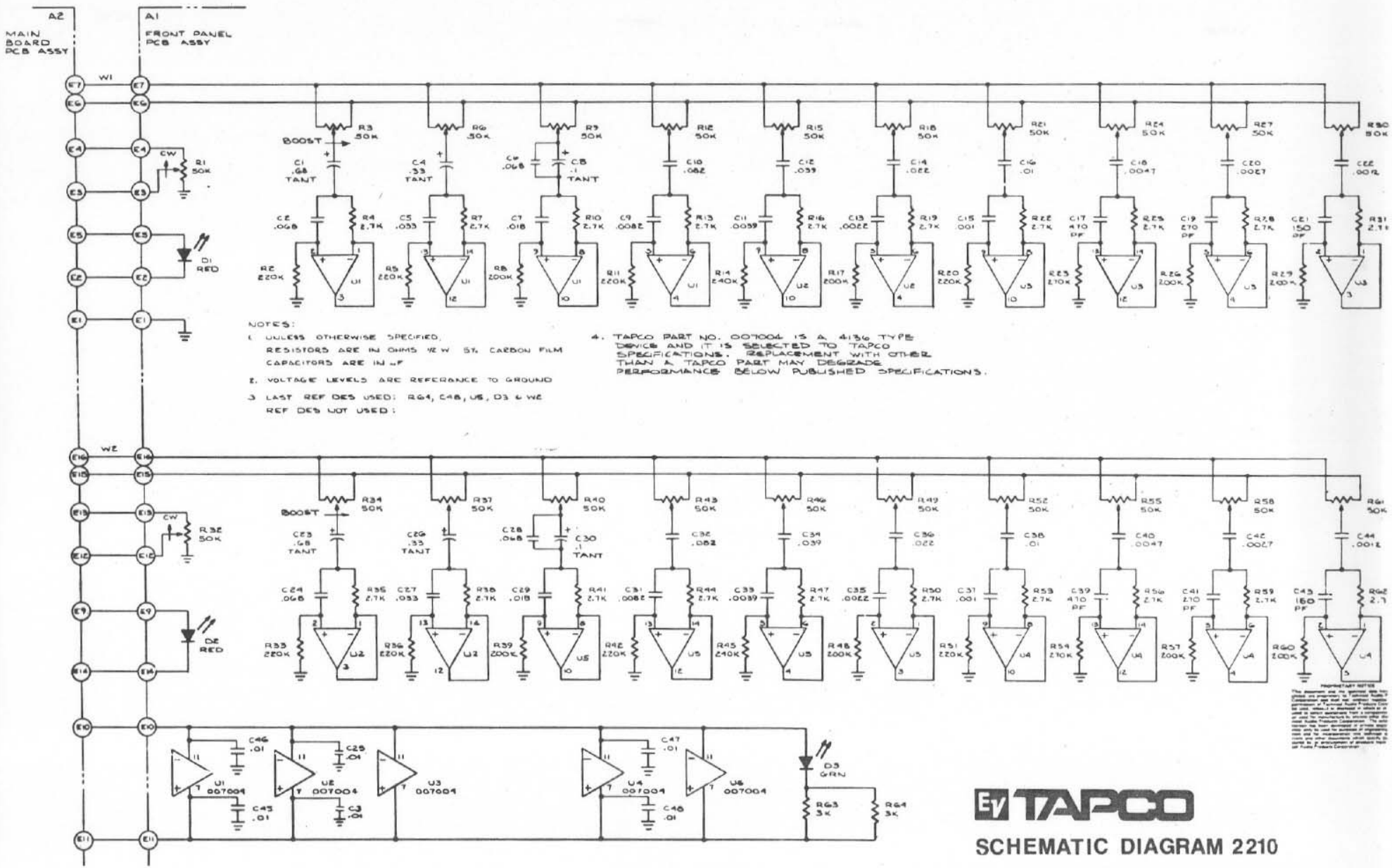
NOTE:

1. ALL RESISTORS ARE IN OHMS, 1/2W 5%
2. CAPACITORS ARE IN µF/VOLTS
3. U3 & U4 ARE MOUNTED ON HEATSINKS
4. LAST REF DESIG. USE: C30, E38, T1, F1, U4

EV TAPCO

SCHEMATIC DIAGRAM 2210

FOR REFERENCE USE ONLY



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