Film-Tech

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EARLY UNITS

WITH
DOLBY CAT#22
N.R. CARDS

STARSCOPE SOUND SYSTEM

The EPRAD "StarScope" theatre sound system(s), is a master of all old or new sound methods, regardless of producers system requirements and speaker placements. The concept is as follows:

* 6 Different Basic Plug-In Printed Circuit Boards.
* 1 Basic Power Amplifier Module (and Power Supply).
* 2 Different "System" cabinets, with 2 Possible "Mother" Boards (for 10 to 14 P.C. Boards).
* 2 Different Power Amplifier Cabinets (2 to 6 amps).

To achieve maximum versatility, and to avoid obsolescence, various functions are on individual plug-in circuit cards, as follows:

EQUALIZER BOARD(S) (Models 10EQ, 20EQ & 28 EQ)

A necessity for every auditorium or screening room.

Tunable (Gyrator) filters, wherein the equivalent inducter, say of 40 lbs. can be electrically created as required, in about 1 square inch of printed circuit board space, and weighs less than ½ ounce.

The frequency of each filter is screwdriver tunable, over a 2-4 time frequency range.

The gain of each filter is adjustable approximately 12Db. If greater correction is desirable, 2 or more filters can be superimposed on each other (for a range of 36Db, for a total of 72Db).

Inspection of acoustical problems of many theatres and screening rooms, by other investigators, indicate that there are usually 5 or less deviations that require correction in any one room.

It is usually thought that the speaker crossover network is the greatest problem. The other points of deviation may be caused by the cubical content, length, width, height, configuration, etc. Therefore, the adjustable 10 frequency, equalizer board may be more than adequate for 90% of the rooms.

20 and 28 adjustable frequency boards are available, at an added cost (P.C. boards are manufactured for 28 frequency filters).

Parts are supplied and soldered in for only the channels ordered (additional parts may be added when desired).

EPRAD, INC. 2541 TRACY ROAD, NORTHWOOD, OHIO 43619 (419) 666-3266

NOISE LIMITING BOARDS

A valuable improvement for any OLD or NEW print and any type of recording.

The Dolby Noise Board (Cat22) is presently supplied.

EPRAD Noise Boards using an unique, simplified design, are also available and are plug compatible with the Dolby board.

If desired, DBX, or Phase Linear, or others can be made available (at an extra price).

OPTICAL PREAMPLIFIED BOARD (See Note #1)

EPRAD's proven, RCA Dual CHip Preamps (2 on each board) are standard. These preamps have trim pots for Gain, Bass, Treble on each channel.

L.E.D. switches connect the "Academy Curve" or flat, as required (tied to the stereo-mono switch on the format board).

With 2 optical preamp boards, we can provide for 4 optical inputs and 4 optical outputs.

"QS" or SANSUI MATRIX CAPABILITY (optical stereo such as "Star Wars" sound)

A board using the Sansui chips providing 4 channel ambience or 1 or 2 channel "Gated" Surround Sound is available.

The Normal, Left-Center-Right outputs are provided. Additionally 1 channel Surround, or Left Surround and Right Surround.

StarScope is compatible with any "Sound 360" format requirements.

MAGNETIC 4 or 6 CHANNEL STARSCOPE (See Note #2)

An EPRAD cabinet for 4-6 noise limiting boards and 4-6 equalizers with 4-6 channel volume control is available (and in use) for 4-6 channel magnetic systems, where the magnetic preamps are already installed in a theatre.

If the theatre is equipped with necessary power amplifiers, the 4-6 StarScope system is plugged in between preamps and power amps.

The 4-6 system is equipped with a 6 position switch for setting the 300 millivolt input level for proper noise board operation. The readout is a 3 L.E.D. set, making adjustment and monitoring easy and simple.

All outputs are jacks, for complete flexability, regardless of system requirements and speaker placements.

POWER AMPLIFIERS (High performance and extremely wide range)

The output stage is direct coupled; NO transformer or coupling capacitors, essentially "Zero" generator impedance.

The RCA high power hybrid is rugged and has been used successfully by EPRAD for many years with unusually good results, and extraordinary reliability.

Maximum output at 4 ohms, 100 watts
62 watts sine wave power at 8 ohms
35 watts sine wave power at 16 ohms

For maximum impulse power, one super heavy duty power supply for up to 4 modules. 400 watts sine wave power.

* Tremendous capability at low frequency.
* Final stage is D.C. coupled.
* Each module individually fused to heavy duty power supply.
* 2 Separate bridge rectifiers and filters with diodes fused separately.
* AC line M.O.V. protected.

CONCLUSION

The StarScope system is a very cost effective, high performance and extremely flexible system of modules to fit any theatre. Compatible with any "OLD" recording and all new or proposed sound systems for any auditorium.

NOTE #1 At an additional price, a 4 optical channel preamp board will be available. This is for, 4 discrete optical tracks when available.

NOTE #2 No magnetic preamplifiers are available from EPRAD at this time.

We hope to soon have available for sale, a real time 30 channel analyzer using meters for Graphic presentation of system or room acoustical response. The analyzer has a built in pink noise generator.

The expected list price (with condenser microphone) less than $4000.00.

STARSCOPE SOUND SYSTEM
INTRODUCTION

To the User and Installer, a brief description of the functions of the system.

The new system of today, of recording sound on split optical soundtracks, is much better than yesterday's sound. The difference is like day and night.

To enjoy the full benefits of these fine optical soundtracks, the soundhead should have optics that are no more than 1 mill in height. Optimum for today is approximately 0.8 mills of light slit.

If your soundhead contains sound lenses of 1.25 or 1.35 optical slit, then they should be replaced (you can not get good sound if you do not replace them.)

"Slit Loss" circuits do not replace the loss of frequencies, but will make the higher frequencies electrically "Stronger" in relation to 1000 cycles than they were before.

SPLIT SOLAR CELL

The split solar cell replaces the present solar cell or photocell. The split cell, as the name implies, is two separate solar cells electrically bonded to one substrate. The solar cell must be adjusted so that the solar cell is as close to the film as can be, without touching it or being in any danger of touching the film emulsion side.

The solar cell must optically be adjusted so that the split cell sees only the ½ of the soundtrack, that each half of the cell is supposed to see.

Using 9000 cycle film, and a dual trace oscilloscope, the optical slit lens is adjusted so that not only is it properly in focus, but so that the phase relationship of the two halves, is correct.

Using a scope, the two pulses can be made to align by rotating the lens azimuth, at the same time maintaining its precise critical focus (not an easy thing to do).

OPTICAL PREAMPS

You cannot use your single ended optical preamp as furnished on your old sound equipment. It is now necessary to have two functioning preamps; one for each half of the split solar cell.

The optical preamps have a method of switching their response curve from the academy curve required for old monaural prints, to "Flat" required for the new split, variable area soundtracks (SVA).

SOUND CHANGEOVER

It is necessary that you have exciter lamp changeover. If your theatre soundhead and exciter lamp supply were not connected so that you could change over from one projector to the other by switching ON and OFF the exciter lamps, then that provision must be made. Either using double pole, double throw switches, or a commercial flip-flop relay arrangement.

To avoid electronic complexities and electronically generated noise, EPRAD does not build in any electronic changeover into the preamp.

However, this means that you must make sure that the solar cells are shielded from fluorescent and other lights which would generate noise into the sound. The solar cells of both projectors are left "Alive".

Note, in order to tune-up the optical slit lens and the solar cell, the mono-stereo switch should be put to the stereo position (so that a more accurate and precise job of setting the slit lens is possible.) Preamplifier in "Stereo" is Flat to 16kc.

NOISE LIMITING SYSTEM

Inherently the silver grains of the optical soundtrack are actual grains of silver. Even if the soundtrack were perfectly clean and brand new, the grainedness of the film recording would generate some kind of noise on top of the signals recorded on the soundtrack.

Worse however, is the dirt and scratches that accumulate with use of the print (and very importantly, the preamplifier itself generates some noise, inherent to all amplifiers).

Other noises picked up by the wiring or delivered by the power supply to the preamplifier, or picked up by the solar cells, are impressed upon the system and are in total very annoying to the audience.

The noise limiting board is a dynamic volume control, which increases or decreases its amplification depending on the strength of the dialogue, music or sound effects coming off the film.

When there is no "Sound" on the film, the "Noise Board" simply turns down the "Volume" and eliminates the inherent background noise that comes from the many sources outlined above.

For the "Noise Board" to properly control the system, the noise board amplifiers are turned on as determined by the frequency content of the particular sound at that moment.

Noise boards must be set for their proper "Threshold". That means that the sound coming from the soundheads, from the preamplifier, should be 300 millivolts, when a test film is run that has a 50% modulation factor. That is; when the soundtrack is delivering half volume, the preamplifier output should be 300 millivolts of signal. Then and only then, is the proper allowance made for the volume going up and down, as determined by the character of the noise control board.

The L.E.D. "Level" lights are much more accurate than a Pointer Meter (within plus or minus 3 millivolts).

If the threshold is not set properly and checked often, then you may be able to hear the noise board "Breathe, Pump". Or, it may be at a level so low that it is not serving its function at all. The Dolby type noise boards are very critical as to the "Threshold" adjustment. The DBX correction curve is not quite so critical of the threshold, but still must be watched and adjusted accordingly.

If the threshold is properly adjusted, the improvement is amazing; it is as FM is to AM Radio. This improvement is even more useful to old prints (though the characteristics in the threshold may have to be slightly readjusted). Provisions made on certain systems by means of a two or three position switch for the threshold adjustment. On other systems, it requires a change in a preamplifier volume control as related to the new sound equipment volume control.

This is important enough to repeat; A proper test film which is modulated at 50%, is threaded into the projector and the test film loop is run, and a preamplifier external or internal gain control is adjusted so that the input signal to the "Noise Board" is 300 millivolts, then the full benefit of the "System" is available.

Certain systems have a small meter to indicate this critical point. The EPRAD system uses a series of L.E.D. lights (so that you can see the effect of the adjustment at a distance). The lights are more accurate. If the top red light is lit, then the level is too high, or above 301 millivolts. When the center green light is lit, the level is 300 millivolts. When the lower red light is lit, then the level is below 300 millivolts.

With the EPRAD system, thread the 50% modulation film through the projector, run the projector, adjust the preamplifer volume control so that the center green bulb is lit. That is the end of the procedure.

If the EPRAD equipment is used with four track or six track magnetic systems, the procedure is exactly the same, the test film is put on the projector, projector is operated, and one track at a time is adjusted

via that particular preamp volume control, until the green light is lit, and neither red light is lit. Then the switch in the front panel of the multi channel EPRAD system is turned to select the next channel to be adjusted, and the procedure is repeated.

The next function of the system is to check for auditorium acoustics, speaker crossover networks, and any other amplitude distortions in the system.

The EPRAD equalizer is used to correct problems of acoustics and frequency dependent electrical and electronic problems of the overall system.

A system analyzer is required. There are various analyzers on the market, from the Shure 10 channel, to very expensive cathode ray tube analyzers. EPRAD prefers the Dynamic Real-Time Analyzer using the 30 meters. This graphic representation of the overall acoustical response is very east to grasp and therefore facilitates the system "Adjustment".

In any case, regardless of the analyzer, the purpose is to obtain flat acoustical overall response, from the audiences point of view, as is possible.

Some equalizer systems have set bands, for example, 27 separate adjustment controls, that will adjust a certain part of the frequency response of the system.

EPRAD's system has "Bands" which are tuneable. The 10 filter board is one octave equalization, of infinite frequency control.

We have found that normally all of the requirements are met with 5 filters. We think that the 10 filter system is more than adequate for even complex auditorium problems, and that normally it can be said that the 20 filter board and the 28 filter boards are "Over Kill" (see reprint of Eric Rasmunsen's S.M.P.T.E. article, attached).

The reason this is so, is that the acoustical problems are generally as follows. Primarly the speaker crossover network, the length of the room, the width of the room, the height of the room and the cubical content. These five elements, the speaker crossover network being the greatest, account for 99% of the possible resonances.

The EPRAD system filters are designed so that they can be "Tuned". A frequency mark on the equalizer cover for each filter is a nominal center frequency. The filters will tune over a range of 2-4 times the frequency mark for that filter.

To properly adjust for the overall acoustics, the following procedures should be used.

From film, or from a separate "Pink" noise generator, noise is introduced to the input of the theatre sound system and suffers all the consequences electrically and acoustically possible, and is reproduced by the theatre speaker system into the auditorium.

In the approximate center of the theatre auditorium, is placed a precision microphone. Precision microphone's cable is long enough to reach

the projection room and is connected to the Real-Time Graphic Analyzer.

Normally the overall response of the system will show one deep dip at the speaker crossover network, a bump approsimately 1000 cycles and another bump at 4-6000 cycles (see attachments).

The tuneable filters of the equalizer individually are adjusted. For example, one of the filters is adjusted directly to center, its effect on the crossover network. Then the amplitude of that filter is adjusted so that the effect of the crossover network is nullified and the curve becomes essentially flat.

Please note that most adjustments are something less than 5Db.

Other filters close to the frequency where the discrepancy occurs are moved to the center of the bump or valley, and the amplitude adjustment of that filter is caused to correct the overall response curve.

In a matter of a few minutes with a good analyzer, theatre response curve from approximately 100 cycles to approximately 12,000 cycles should be essentially flat. Overall, if within plus or minus 1½Db, it is considered excellent. To account for high frequency recording pre-emphasis, the acoustical curve is Not flat. Rolls off at about 4,500 cycles (see graphs).

This essentially completes the whole system, installation and adjustments.

We have not covered power amplifiers, because they probably were either in the theatre before hand, or are a separate package and any acoustical malfunctions that might have been introduced by the power amplifiers, are corrected with the procedure above.

The final adjustment is to set the volume control of the StarScope system to approximately mid-range, and the power amplifiers individually adjusted to give the proper level to the theatre.

Please note that the EPRAD StarScope system has RCA pin plug inputs and RCA pin plug outputs. The purpose being to maintain full flexibility so that any old, present, tomorrow or in the future system can be accomodated.

If a certain sound system calls for moving the speakers to the side walls, then with proper replugging of the jacks, the proper speaker can be connected to the correct input.

The EPRAD system is designed to handle four channels of separate optical sound, when and if required, and by use of a separate box and separate mother board, the system can be used with six channel optical or magnetic systems (EPRAD at this moment does not have magnetic preamplifiers available.)

*StarScope preamplifier system automatically provides the Academy electrical response curve on mono position. "Stereo" is flat from 20 cycles to 12,500 cycles as defined by ANSI #2969.2.

CAUTION: "Peaker" pots are factory preset to Flat to Stereo and Academy Curve on Mono.

EQUIPMENT & INSTRUMENTS REQUIRED TO MAKE A PROPER STEREO VARIABLE AREA INSTALLATION

TEST FILM:

1. "Buzz Track"
2. 1kc 50% Modulated Loop
3. 9kc 100% Modulated Focus and Azimuth Film
4. Optional - Split Track SVA Film for Split Cell Alignment
5. Optional - "Pink" Noise Film

INSTRUMENTS:

1. Dual Trace Oscilloscope
2. Volt-Ohm Meter
3. Audio Spectrum Analyzer
4. "Pink" Noise Source

STARSCOPE
PRE-INSTALLATION INFORMATION

Unpack all equipment and check for any broken items. Notify the carrier immediately if any defects are noted.

Notify your supplier also as soon as possible so he can get a replacement on the way to you.

1. Carefully unpack the equipment and look for transportation damage. If the box has been damaged or the equipment damaged, please report this immediately to the carrier and have them inspect the damage. The freight company is responsible for all damages.

2. Install the mounting back box to the wall, or install the rack mounting ears to the box if you are using a "Rack".

3. When the cabinet or the back box has been fastened to the walls as directed, connect up the greenfield, or pipes bringing the solar cell wires to the system, 115v AC power to the system, and pipe the system to the inputs of the power amplifiers (if required).

   Please note that the 115v AC input to the system is a cord plug. This can be hard-wired in, but do not avoid the use of the input AC filter into the system. Cut the wire and reattach it if you are not going to plug it in, but do use the input provided for the 115v AC, because it has a radio frequency filter on the other end of it and inside the box.

4. Install all Conduit/Greenfield to the soundheads from the back boxes.

5. Terminate all the cables into RCA pin plugs and plug in each individual wire after being checked for shorts and continuity.

6. Install the 4-StarScope Power Amplifiers (if used).

7. Install the StarScope unit.

8. Wire the Stage and Surround Speakers to the Power Amplifiers.

9. Check All Speaker Circuits:

   A) Using a signal generator, inject a 1KHz signal at .5 volts into each input of the power amplifiers, one at a time. This will insure that all speakers are wired correctly and that they are operating normal (you can also set the balance at this time if you wish.)

10. Wire the Outputs of the StarScope unit to the Inputs of the power amplifiers.

11. Put in the 50% modulation test film and set the 300 millivolt level (when green L.E.D. is lit, you have set "Dolby-Level", which is 300 millivolts.)

    A) Do not at this time, touch frequency control pots marked CTR/FREQ, yet.

    B) Note large arrow on face plate points to its related boost/cut pot.

    C) Before starting to equalize, insure all filters are in "Zero position. Note "0" on face plate boost/cut control. Arrow on white part of control pot should be set on "0" (difficult to see).

    If it is a large theatre, it would be wise to put the microphone two or three different places and average out any differences. Obviously, we should favor the most popular part of the theatre where the most people will be sitting, because you cannot adjust the system to make all seats sound the same.

12. Adjust the level in the theatre, so that the volume control is approximately in the middle of its range. Set the mode switches and whatever function you want to test; test the entire system and you are finished.

13. TRIM sound to suit the theatre management.

    NOTE: DO NOT change preamplifier pots except; Balance pots for L-R and projector #1 & #2 (there are 4 separate preamplifier channels).

NOISE REDUCTION & EQUALIZER SYSTEM

The EPRAD StarScope directional sound system has been designed to give you the cleanest, optical stereo sound in the industry today. Properly installed and aligned, it will do just this.

The principle of this type of reproduction is based on a stereo-variable-area soundtrack (SVA). This system uses a split solar cell instead of the conventional single cell pickup in the old solar cells and photo electric cells.

The sound optics (sound lens tube) should be changed from the old 1.25/1.35 to 0.008 of an inch to give a much sharper image on the soundtrack. The adjustment of this lens is a critical alignment point. It must be adjusted to get the maximum amplitude and both signals must be in phase. This is covered in the alignment section of the instructions.

Both regular optical films and SVA film* may be run on any soundhead adapted for the SVA type sound reproduction without modification. There is a simple switch on the face of the master system for this purpose (stereo/mono), or the noise boards and equalizers can be bypassed with the bypass switch.

Speakers used with this system must be in good condition and be capable of reproducing frequencies from 30 Hz to 15 KHz without distortion and full rated power.

Old type tube amplifiers in general will not be suitable for this new sound system due to source impedance. The main power amplifiers must be a minimum of 60 watts (RMS) and have a very low generator impedance. The 4-Star amplifiers fit these specifications, with plenty to spare (100 watts).

The 4-StarScope system can mount on the wall or in a standard rack (19" relay rack). If mounted on the wall, you will need an area no more than 17 inches wide, 24 inches high and the depth will be 10 inches. All wiring to the soundheads and from the StarScope unit would be 100% shielded (Mylar) 2-conductor sound cable as well as all wiring internal to the rack.

To insure maximum sound reproduction, this system was engineered for, make sure your installer has the knowledge and test equipment for the installation. The alignment is as important as the proper installation.

Service on the system is simple, but very important. With a proper installation and good care afterwards, you will have the finest sound system on the market today and you will be able to prove it at any SVA presentation.

STARSCOPE INSTALLATION GUIDE

IMPORTANT

Before installing split solar cell, check condition of sound head.

A. Lateral Guide Rollers

1. Can it be adjusted properly?

2. Can it be locked in place and stay there?

3. Replace weak springs, worn washers, clean and relubricate bearings, if necessary.

B. Sound Drum

1. Is end play properly adjusted?

2. Is sound drum concentric?

3. Is sound drum clean?

C. Lens Tube

1. One mill and larger slit lens should be replaced with 0.8 mill slit for proper frequency response.

2. Make sure adjusting screws are free to turn and when locked in place, hold the lens tube securely.

3. Make sure lens tube optics are clean!

D. Exciter Lamp

1. Use a new exciter lamp.

2. Check voltage for proper setting. (Suggest 9V, 4A bulb set 6 volts approximately.)

3. Check positioning adjustments so lamp can be properly adjusted and locked in place.

Installing Split Solar Cell

A. Remove existing cell and cell mounting brackets.

B. Disconnect all existing cell wiring in sound head including any pre-amplifiers and switches.

C. Mount Cell

1. Some cells are furnished with mounting hardware. Otherwise, use existing hardware.

2. Check routing of wiring. Use sleeving or tape over wires and use wire clips to keep cell wires away from moving parts. For convenience, use existing terminals in sound head but be sure all other wires have been removed.

3. Keep all other wires away from cell wires. Run 2 wires (Belden #8761 Beldfoil) shielded cable to processor in separate conduit. Do not ground shield at sound head.

CAUTION:

In some sound heads it is necessary to remove sound drum flywheel to wire the cell. When replacing the flywheel, use extreme care not to push the sound drum into the split cell; it's easily broken.

Alignment of Cell

A. Visually position cell as shown in Illustration A. It is necessary to have the exciter lamp on when doing this. If lens tube has been replaced, re-focus approximately by eye. Hold a small piece of paper on the cell to see where the light is hitting. It should be near the top one quarter of the cell. Tighten the mounting screws.

B. Connect a dual trace oscilloscope to the output of the cell. Do not have the cells plugged into the processor. The oscilloscope should have a sensitivity of at least 10 mv per division.

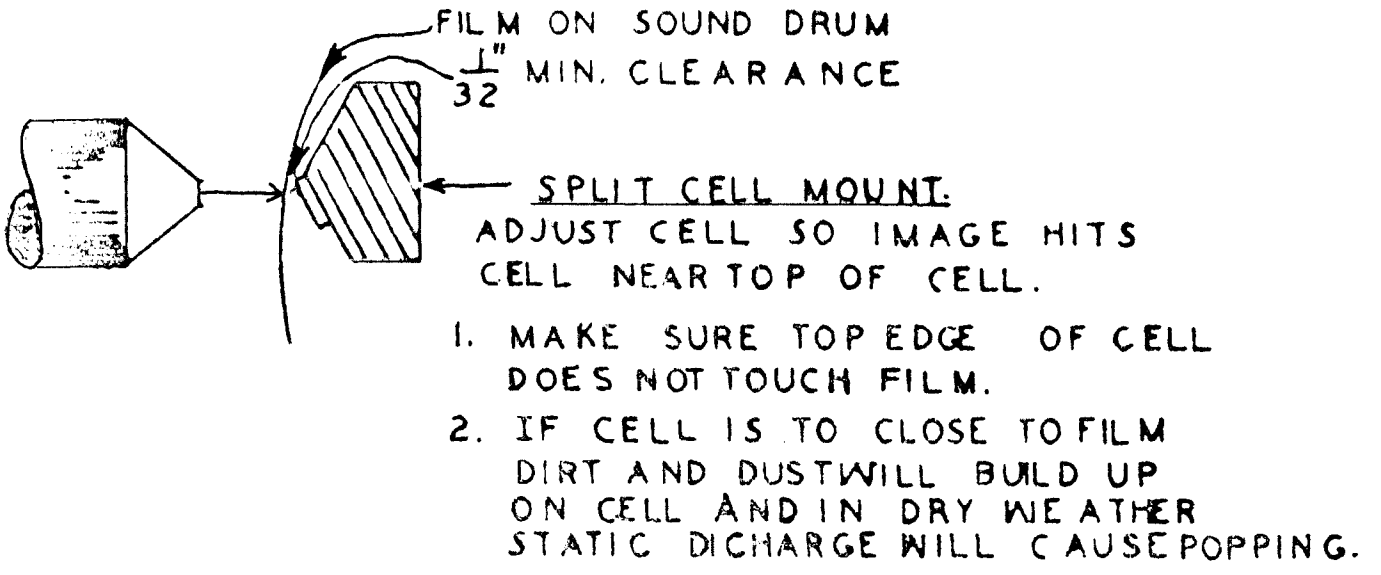
C. If the lateral guide rollers have been moved, run the buzz track film to center the film. Adjust the film from one extreme to the other and then center the adjustment so no signal is present from either cell.

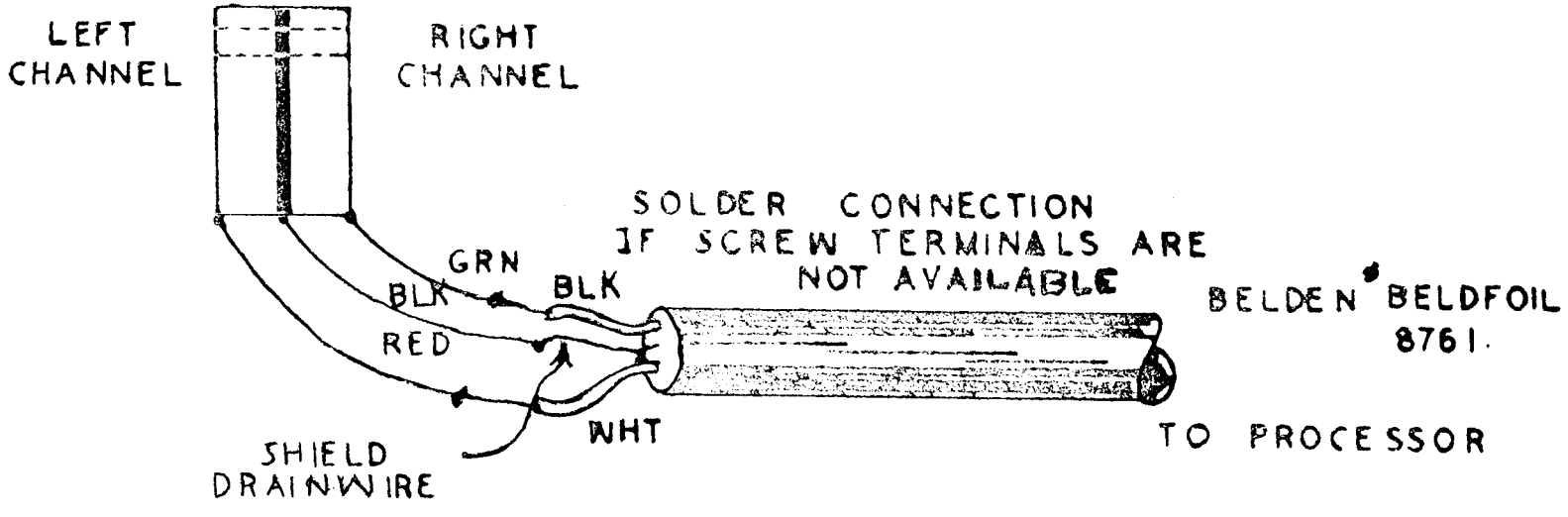
D. Lens tube adjustment

1. Thread the projector with 9KHZ or 7KHZ sound focus film. 9KHZ will be more accurate.

2. Looking at signal from both cells, simultaneously adjust lens tube to maximum output on both cells.

ILLUSTRATION "A"





3. Note, output may not be exactly the same for both cells, since you have not yet adjusted the cell in and out or checked the exciter lamp position.

4. If the sound head has separate focus and azimuth adjustments, lock the focus in place - switch one of the scope inputs to the "X" axis if the pattern on the scope is not a 45 degree straight line, as shown, adjust the azimuth until the pattern closes up. Recheck the focus (see Illustration B).

E. Exciter Lamp Positioning

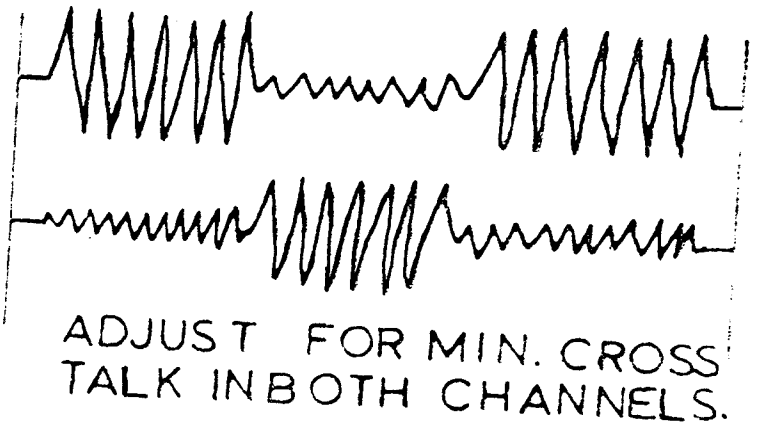
1. Check the exciter lamp position so a maximum signal is obtained from both cells.

F. Lateral Adjustment of Cell

1. Thread projector with the Dolby #67 alternate track test film.

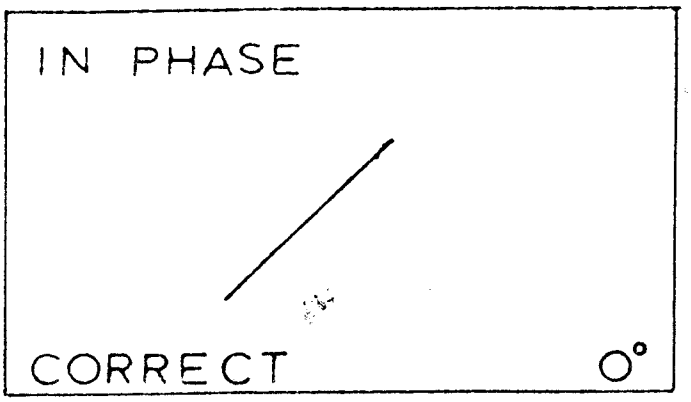
2. Adjust time base of scope so you can see at least two alternations, using chopped mode only.

3. Move the cell in and out so that the cross talk of both signals is at a minimum and equal. You will always have some cross talk with this test film. Be careful not to tilt the cell sideways.

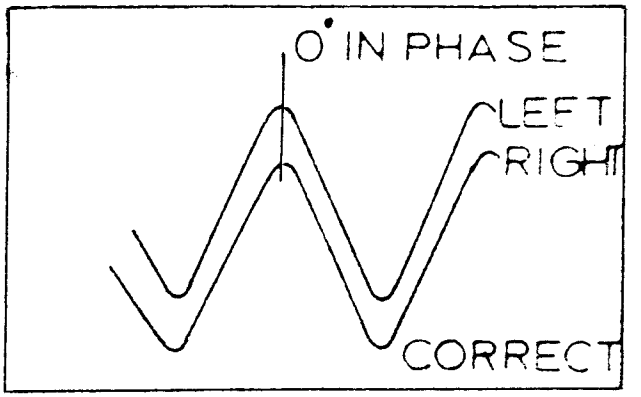


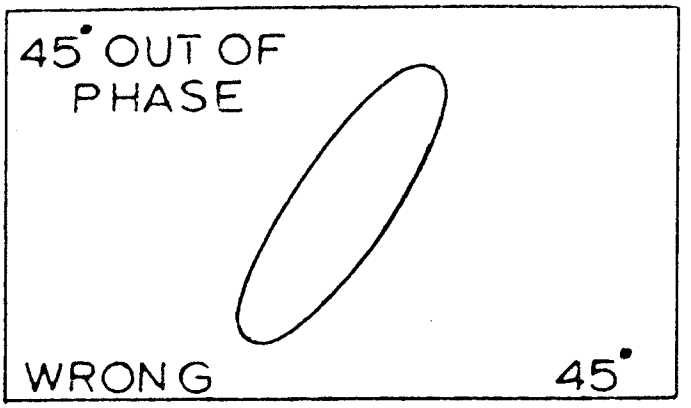
4. Be careful not to run the cell in to the sound drum. If you have had to move the cell in or out a large amount, recheck the setting of the lateral guide roller with the buzz track test film.

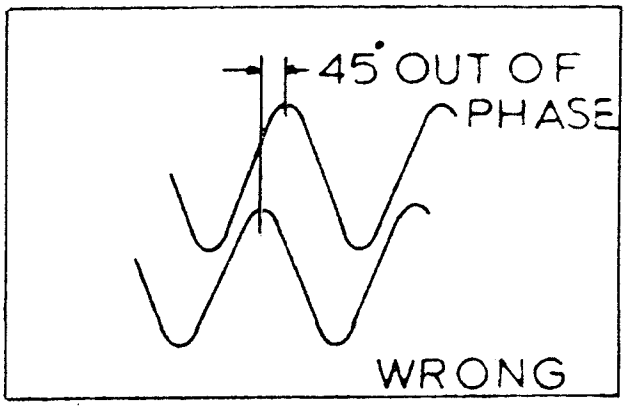
SCOPE CONNECTED FOR PHASE "PICTURES"
X-Y INPUT
Y-INPUT LEFT X-INPUT RIGHT

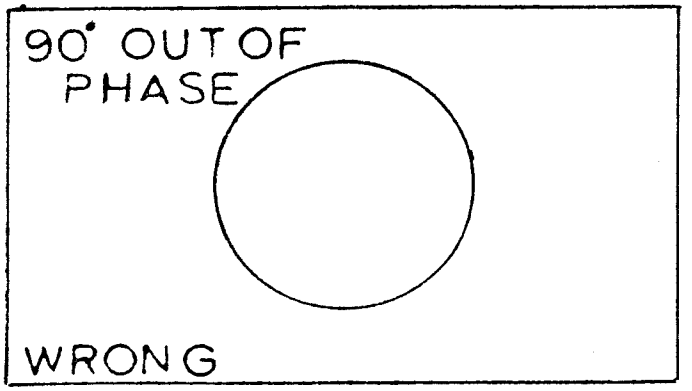


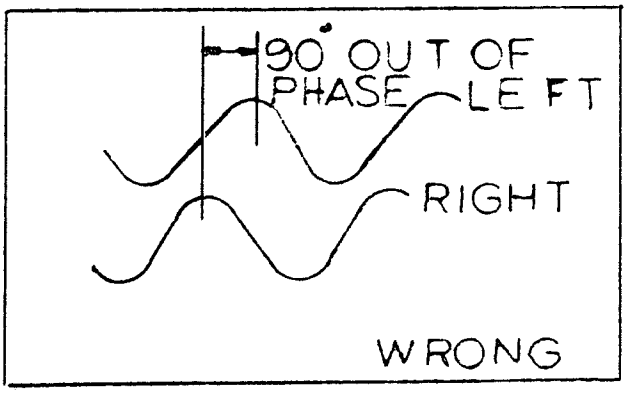
SCOPE CONNECTED FOR DUAL TRACE "PICTURES"

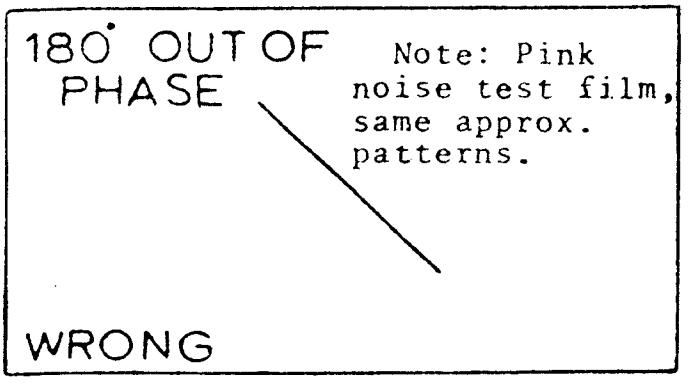


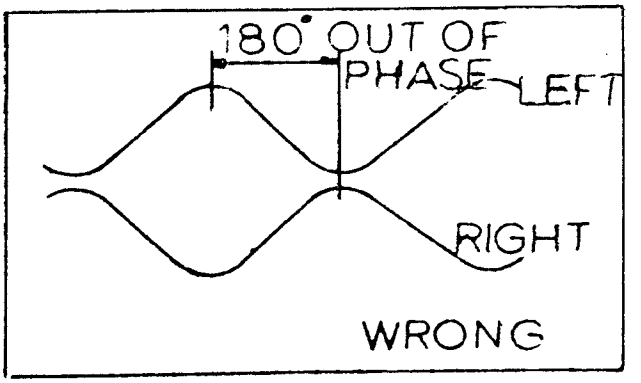












12-6-78

5. Tighten the cell screws while the projector is running to make sure the positioning does not change.

This completes the cell adjustment.

Set 50% Processor Level

A. Thread projector with Dolby #97 50% level test film.

B. Plug cell leads into processor, make sure left and right channels are correctly identified.

C. Processor Controls:

1. Mode switch - stereo

2. Source switch - film

3. Level set in - left position

4. Surround - out

5. Fader - at min

Note: Make sure the exciter supply is at the voltage setting that is to be used. If the exciter voltage is changed, you must recalibrate the pre-amplifier, by using the following steps.

D. If single projector is used, cells should be plugged into projector #1 position.

E. With level set in the left position, adjust the lower trim pot in the left channel of the pre-amplifier until the green light comes on. Turn the pot clockwise to increase the signal level.

F. Switch the level set to right position and adjust the lower trim pot in the right channel of the pre-amplifier until the green light comes on.

G. In most cases the lights will flicker up and down when a splice goes thru the sound head. In any case, the adjustment should be made so the green light is on most of the time.

H. Fine balance for "Surround"

1. Set surround switch to the in position.

2. Note - the exact settings of the gate threshold and rate controls on the surround card for repositioning later.

3. Turn threshold control full clockwise and rate control full counterclockwise.

4. Monitor the surround output with an oscilloscope, a.c. volt meter, or simply listen to the 850 Hz tone on the surround channel monitor.

5. Very slightly adjust the left or right channel pre-amp gain so as to minimize the surround channel output.

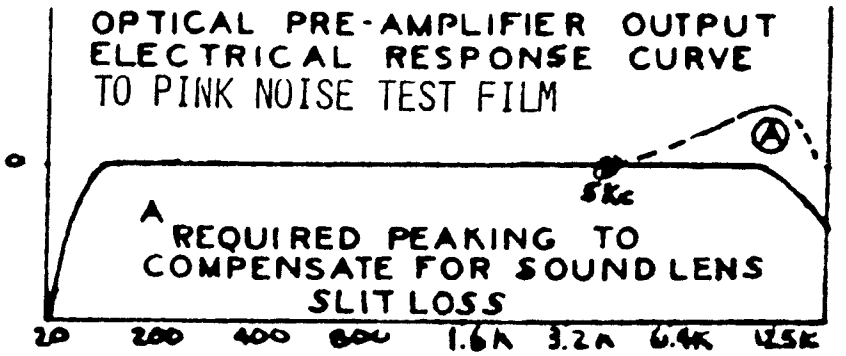
6. Ideally, the left and right level set tests will still display the green indicator but a true null in the surround channel is the desired goal.

I. If two projectors are used, thread the 50% film in the #2 projector; repeat the adjust for the left and right channels adjusting the upper pot in each channel.

Note: In single projector installations, you can plug the cells into the #2 position and set this input as a stand-by pre-amplifier.

J. If you recheck the 50% level at different times of the day, line voltage variations may cause some change in the indication of the lights due to a slight change in exciter lamp brightness. It is not necessary to readjust the level setting.

K. Sensitivity of the lights is plus or minus 5mv, the 50% level sets the input to the noiseboard at 300 mv, this small variation does not effect the noise reduction capabilities of the system.



Adjust: Slit loss pot, for "flat" to 12.5 kc. read at output of pre-amp "test

To Set Surrounds

A. Unplug either left or right solar cell inputs to StarScope (of the one machine in use) surround should GO ON full.

B. Or, use the edge of a business card to cut off more than one-half of either left or right light beam from sound lens to solar cell (film running) and surround channel should gradually come on, until when light is totally shut off (on one side only of split solar cell) the surround should be full on.

C. With test film - follow spoken instructions.

D. With test cassette tape, follow spoken instructions.

E. With stereo variable area print (that is recorded with surround channel) run film and set gate threshold until surround channel goes ON as it is supposed to.

F. MOST important, surround MUST be OFF with no voices "leaking" thru when it is supposed to be OFF.

Note: Voices "leaking" thru generally means left and right channels are unbalanced (reset with 50% test film).

EQUALIZING

Now that the input levels are set, we can finish the job.

Frankly, most all theatres under 1000 seats are quite good acoustically.

The architect avoided parallel walls, avoided a curved back wall (that would "focus" the sound back to the screen) and treated the walls and ceiling so as to absorb most sound energy over 2000 cycles.

Further, the theatre is equipped with "projection" type speakers such as the Altec "Voice of the Theatre" A4's, etc.

A. The problems left are probably associated with one or more of the following factors:

1. Electrical

a. Speaker crossover network "dip".

2. Multi-mode

   a. Cubical volume resonance

   b. Length

   c. Width

   d. Height

Note: Less efficient or less "flat" loudspeakers can add "coloration" to the sound, as can alcoves, balconys, etc.

B. Required for Equalizing

1. A "pink" noise generator or pink noise test film.

2. A sound pressure level meter. (SPL)

3. A spectrum analyzer either 1 (whole) octave or one-third octave.

Note: Above three may be combined in one meter or individual units.

Note: A spectrum analyzer can be considered as a group of electrical filters with storage "buckets" and a means of reading out the amount of electrical energy stored in each frequency "bucket".

Ten "bucket" analyzers are probably better (and a lot less expensive) than 27, 30, or 400 bucket devices, especially with theatres under 1000 seats. (A competent and experienced engineer can gain more information by using the "larger" analyzers and averaging at least nine different microphone locations in the auditorium).

However, it is our experience using ten channel, 30 channel and 400 channel spectrum analyzers SIDE by SIDE, that the ten channel analyzers agreed best with what our ears heard.

Reference: Rasmussen's Paper on equalizing 100 theatres.

C. Set up analyzer in the booth and analyzer microphone about the center of the auditorium about ear high with microphone pointed at the screen and mark equalizer cards left, center, and right just as they appear from left to right.

1. Let's start (now that we have a basic understanding). Withdraw all equalizer cards and reinstall center equalize card on the extender board and into StarScope center channel slot.

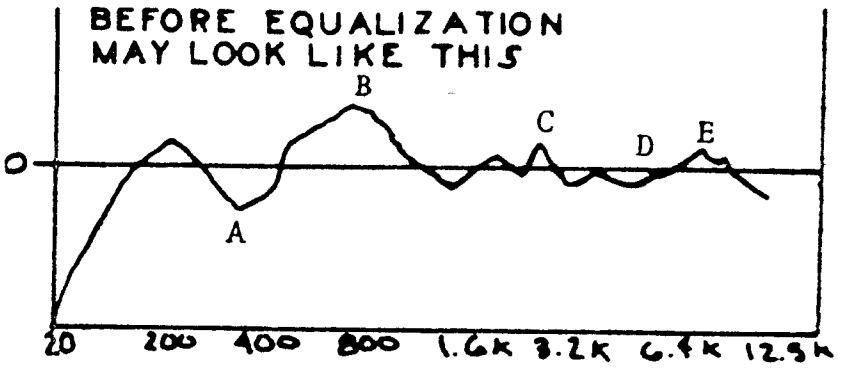
2. Turn off all power except the stage center speaker power amplifier.

3. With "pink" noise into the sound processor (left and right, inputs);

   a. Adjust processor volume control to about or a little over one-half way.

   b. Observing the Sound Pressure Level (SPL) meter set power amplifier to 72 dbm pink noise in the auditorium.

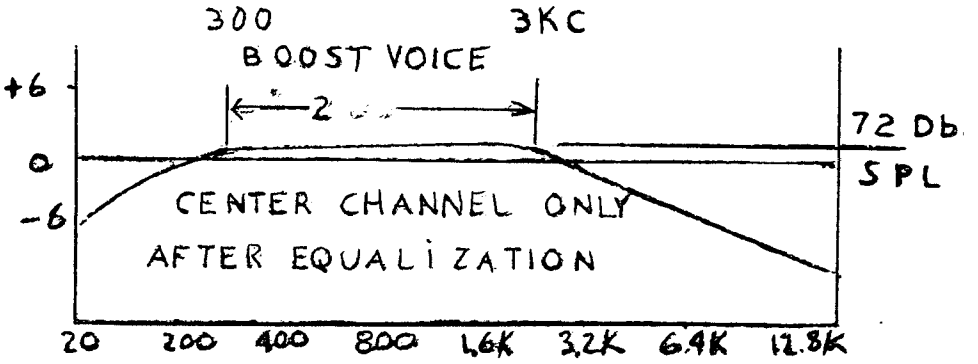
4. Observe sound spectrum on the analyzer; it may follow a curve about like this:



Note: One octave - doubling of that frequency example 400 to 800 cycles is one octave.

5. Probably A is speaker "dip", B cubical volume, C length, D width, E height and/or back wall.

6. Adjust center channel equalizer cut/boost controls so as to flatten out the response curve but to be a little higher at voice frequencies. So the analyzers display looks about like this (from 300 cycle to 3,000 cycle should be up 2 db from zero point).



Note: DO NOT change power amplifier volume control, mark it, seal it.

Note: EPRAD equalizers are of the parametric type (most advanced, frequency adjustable) BUT don't touch frequency controls UNLESS there might be a very unusual condition, and then one or more of the filter center frequencies might be "moved". IF required - we make equalizers up to 30 channel for use in vast arenas or auditoriums with thousands of seats. Adjust cut/boost starting at high end of spectrum (normally cut/boost is less than 3 db).

7. Move extender card to LEFT channel slot and install LEFT equalizer into extender card.

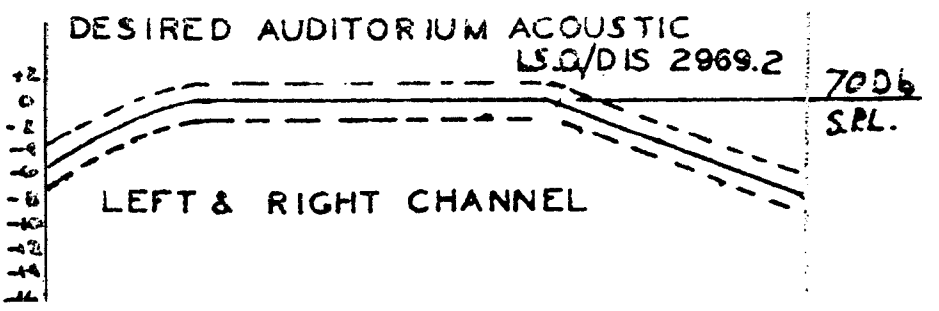
8. Turn OFF center channel.

9. Turn ON left channel power amplifier ONLY.

10. Set power amplifier gain control for 70 db (SPL).

11. OBSERVE uncorrected spectrum, correct by ONLY adjusting cut/boost controls so that the response curve will be nominally flat from 100 cycles to 4500 cycles and then fall off 3 db/octave (no "voice boost" for LEFT or RIGHT). Like this (for BOTH right and left channel).

Note: Set power amplifier volume control for 70 db SPL, mark it, seal it.



12. Repeat steps 6, 7, 8, 9, 10 for right channel. Set power amplifier volume control for 70 db SPL; mark it, seal it and tape over it.

13. Turn off left-center-right power amplifiers. Turn on #4 for surround channel.

14. There should be NO sound coming out of surround speakers as yet. If there is, reset 300 millivolts input indicators for left and right so only the green L.E.D. is ON for either channel using 50% modulated loop.

15. Unplug either left or right input cord. Surrounds should come ON and surround L.E.D. indicator should light. If there is no surround or L.E.D. surround light, adjust surround board threshold pot until L.E.D. is ON and surround sound is on.

16. Plug in both inputs. Surround will go OFF. If NOT slightly readjust surround threshold pot until surround and L.E.D. are off.

17. Unplug one input (to turn on surround again).

18. Set power amplifer #4 (surround) for 73 db SPL. Once this is accomplished do not change power amplifier #4 volume control; mark it and seal power amplifier volume control.

    Congratulations - you have finished the electrical adjustment.

19. NOW. Thread up projector with pink noise film. Turn on all amplifiers, exciter lamp and projector motor.

    IF the sound slit was properly set;

    IF the sound track is centered;

    If the sound lens is OK;

    EVERYTHING STAYS THE SAME ALL equalizer readings will be the same.

    IF NOT; "back to the salt mines"
    Locate trouble and correct.

20. To test "surrounds" use a card or anything to block off one-half of the light slit at the film. The surrounds should go ON.

    IF NOT, locate trouble or reset surround threshold slightly.

Finally,

21. Run test film, make your own listening test in the auditorium.

    Dialogue should be "perfect".

    When it's quiet - there should be no film noise.

22. Invite theatre owner and/or his representative, let them listen awhile.

23. IF, theatre owner does ask to sharpen the voices, or whatever; tweak the equalizers to please him. (He knows his theatre best.)

Note: When sound is correct. Spaceships, airplanes, etc. should be too loud. (That's what the audience likes.)

NOW! You should be complimented on doing a find job. The audience will be pleased.

Thank you and enjoy the added audio dimension that StarScope gives to the theatre.

EPRAD, Incorporated

PRODUCTS OF EXCELLENCE

SALES BULLETIN

DATE: July 14, 1978 NUMBER: 2452

SUBJECT: Static Noises in Sound Systems

If the split solar cell is too close to the film, the electrostatic discharges (especially dry climate) will cause random mysterious noises in the sound.

Move the split solar cell further away from the film.

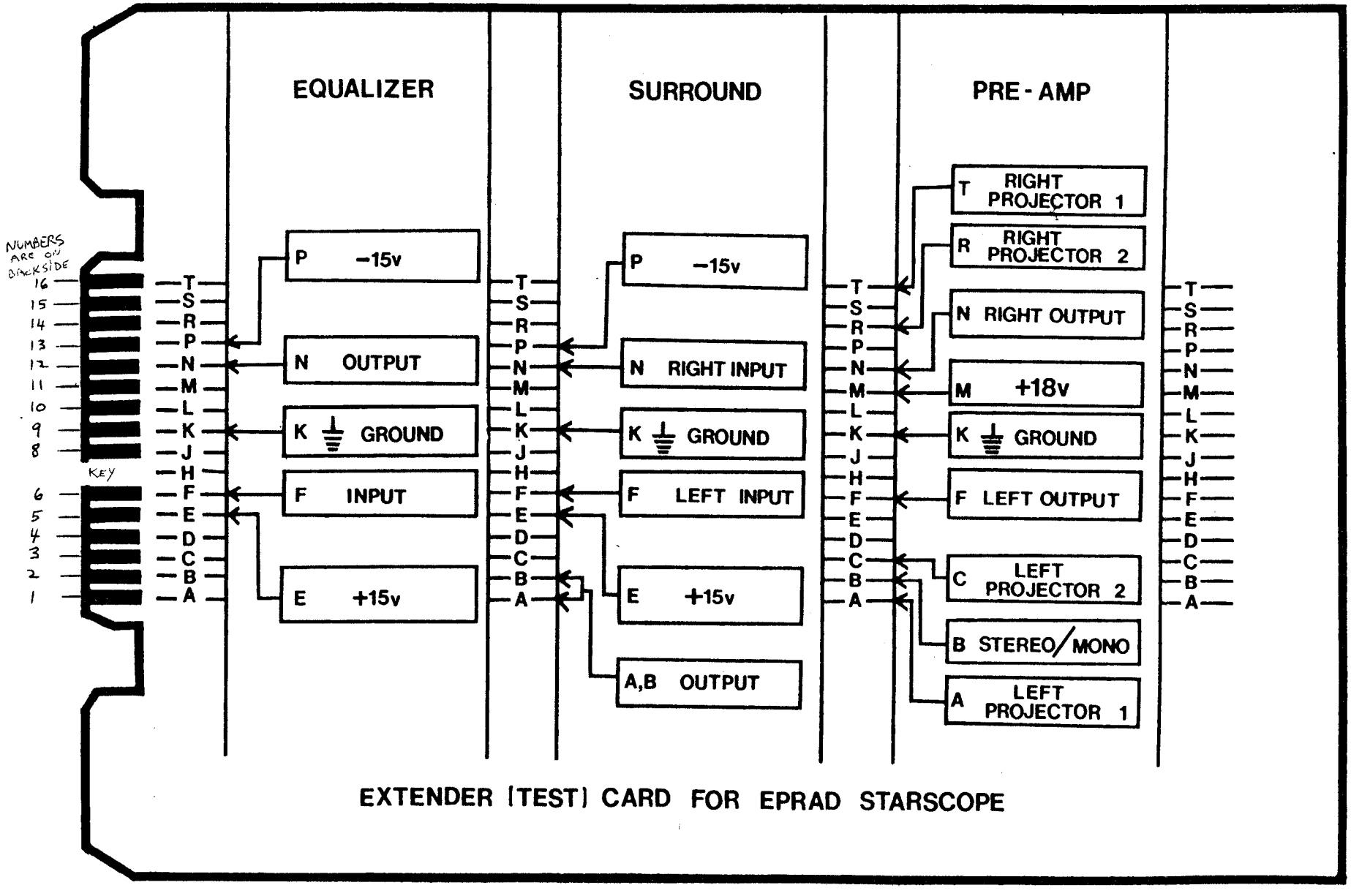
Do not move solar cell more than necessary to eliminate noise. The further you move the solar cell away, the less "separation" of left and right track signals.

C Simonds

EPRAD Engineering Department

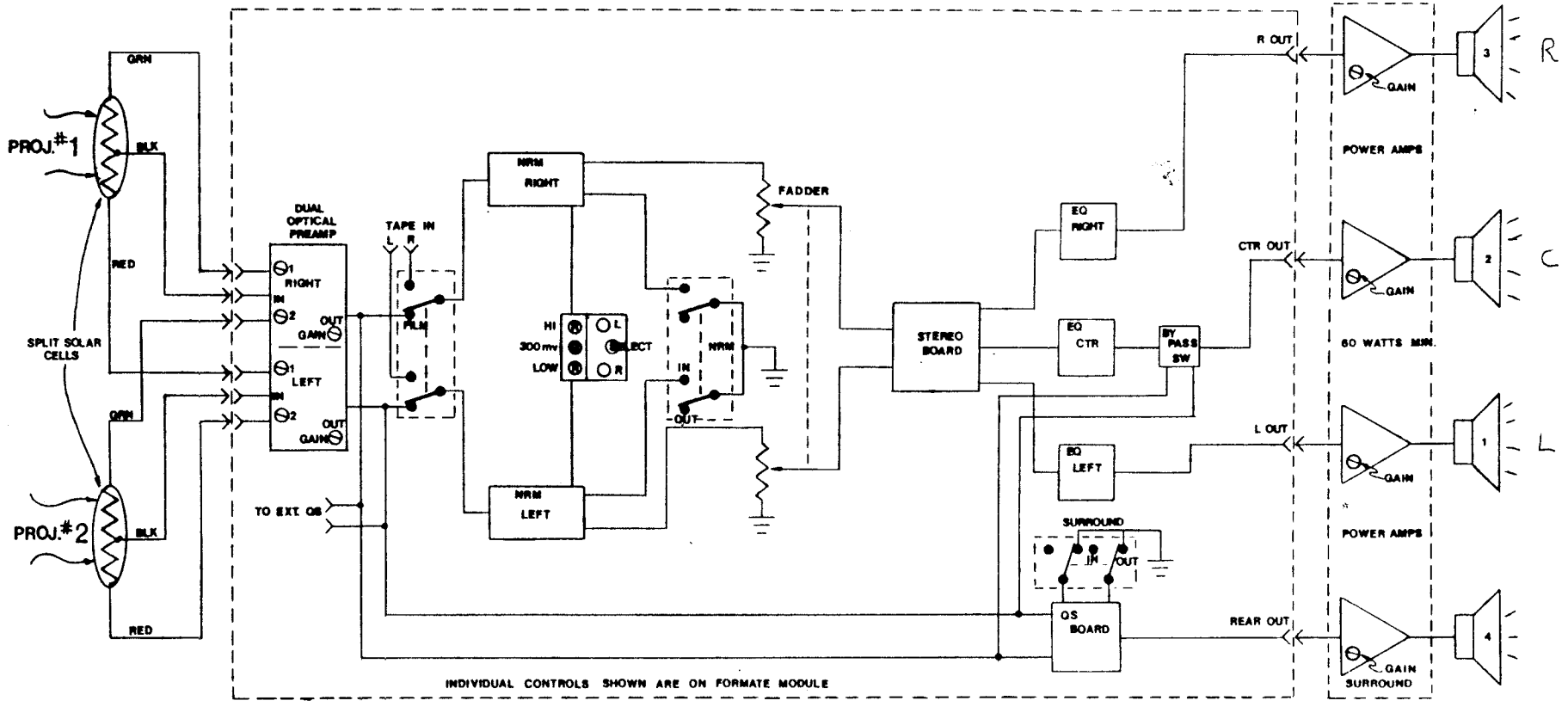
123 W. Woodruff / P.O. Box 4712 • Phone (419) 243-8106
Toledo, Ohio 43620 • Cable Address: EPRAD

E R D ®
INCORPORATED
ELECTRONIC PRODUCTS RESEARCH & DEVELOPMENT



EXTENDER [TEST] CARD FOR EPRAD STARSCOPE

#25390



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MATERIAL

FINISH

EPRAD
INCORPORATED 1213 W. WOODRUFF TOLEDO OHIO

TITLE
STEREO SCOPE BLOCK DRAWING

TOLERANCE (EXCEPT AS NOTED) SCALE

DEC. FRACT. ANGLE

DRAWN	CHECKED	APP'D	DATE

ASSEMBLY No

DWG No 25302

1. Observe instructions (A).
2. Then, connect "Pink Noise" Generator to StarScope tape input jack, turn on one (1) of the loudspeakers (at a time).
3. Observe and record analyzer read outs, so as to identify "Peaks" and "Dips".
4. First, at speaker crossover frequency, boost equalizer level pot of equalizer marked closest to that frequency (if required, next filter can also be "Tuned" to crossover frequency, doubling available correction.)
5. "Tune" center frequency to the "Center" of the frequency you are working at.
6. Set, boost-cut, pot to remove the discrepancy.
7. Go to next "Worst" frequency that needs correction and repeat Steps (5) & (6). Except for speaker crossover, most other acoustic problems are resonances and will be best solved by "Lowering" peaks.
8. Repeat for each channel.

NOTE: When you are finished there should be as many Pots "Boosted" as there are "Cut".

NOTE: There cannot be any useable "Sound" above 12kc, so Cut the 16kc, so as to remove Noise (set frequency and Cut/Boost for minimum noise and responce, indicated on analyzer above 14kcs.)

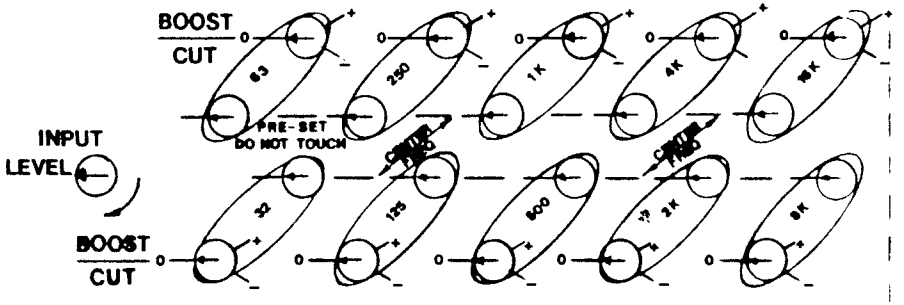
CONCLUSION:

Fine tune the system to please the management and owner.

PLEASE! FILL OUT AND MAIL INSTALLATION REPORT TO EPRAD

(A)

1. Before attempting acoustic equalization, set all Boost -Cut pots at ZERO (9 o'clock position). DO NOT touch center frequency pots!
2. Using a good oscilloscope, check and set optical light slit lens for "Critical Focus and Perfect Azimuth" (phase shift "ZERO"). Replace sound lens if not to Max. 1.0 mill slit.
3. Observe output of preamplifier. Set input level pot so that there is no "Clipping" or distortion (but at max. possible, short of "Clipping".)
4. With 50% modulation test film 300 millivolts, green level set lamp will then be lit on StarScope test lights.



EPRAD #25310 EQUALIZER

NOTE: THESE INSTRUCTIONS APPLY TO ALL CONFIGURATIONS AND NUMBER OF FILTERS

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MATERIAL

FINISH

EPRAD INCORPORATED 121 W. WOODRUFF TOLEDO OHIO

TITLE: EQUALIZER COVER & INSTRUCTIONS

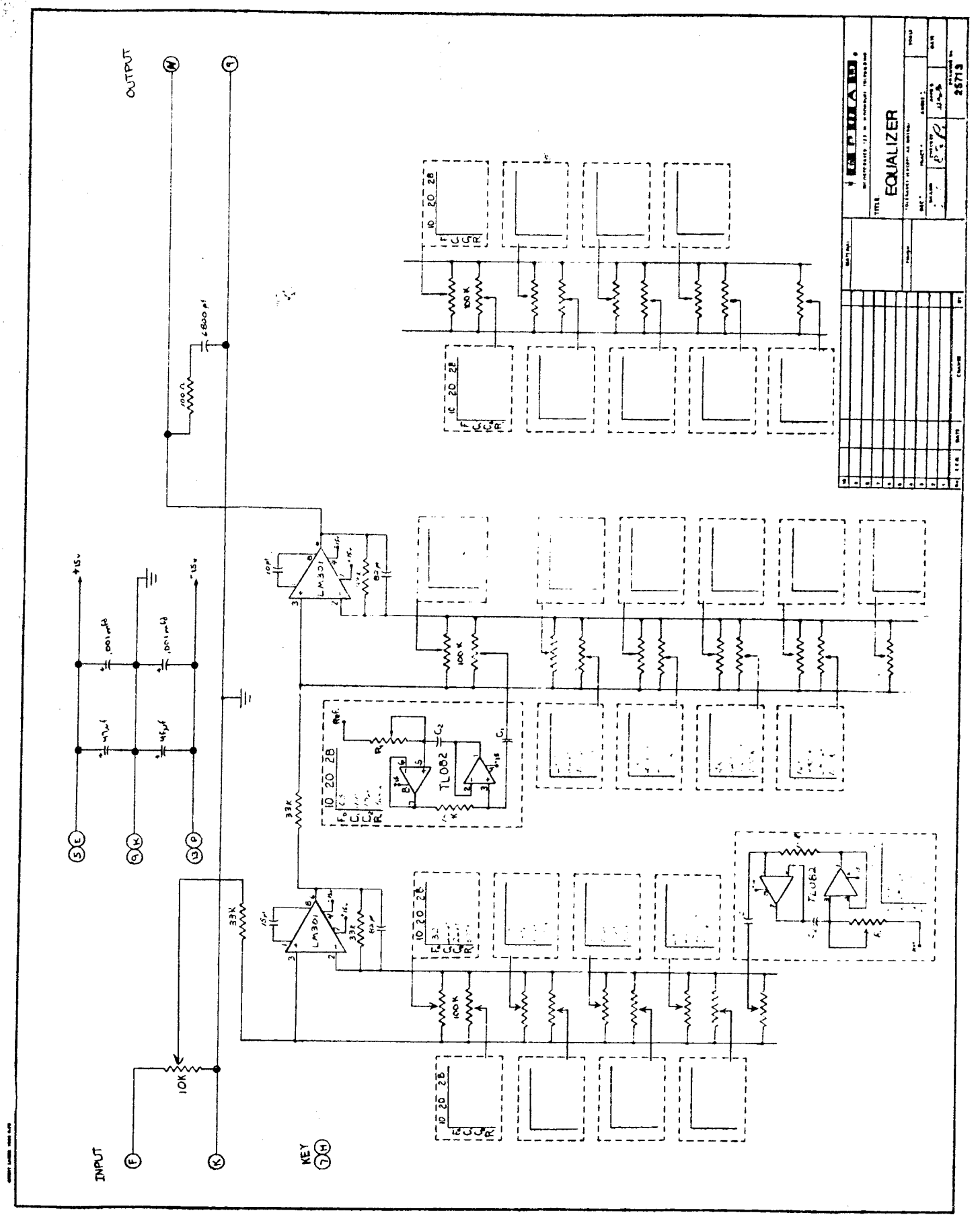
TOLERANCE (EXCEPT AS NOTED) | SCALE

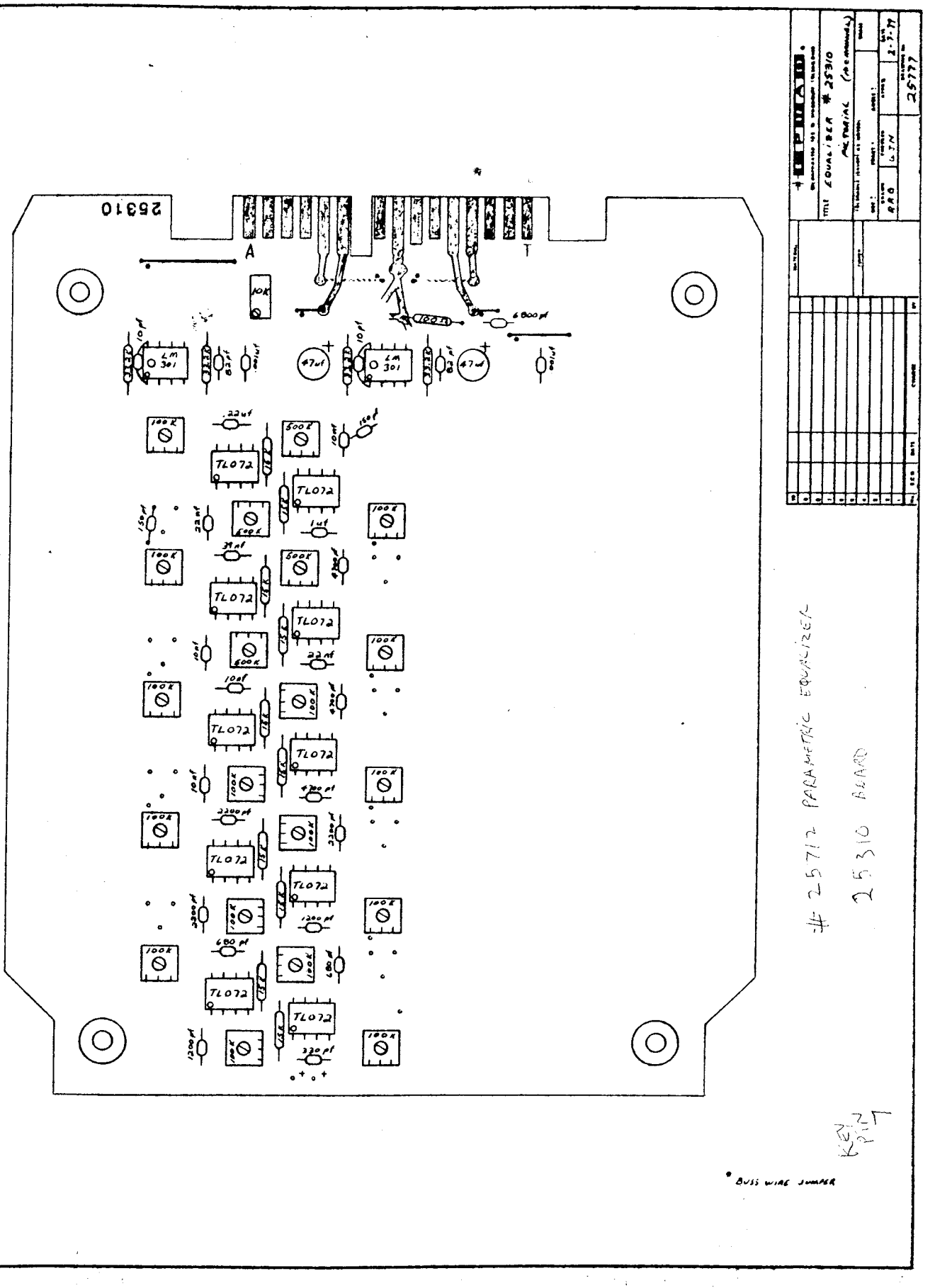
DECS | FRACS | ANGLES

DRAWN | CHECKED | APPD | DATE

ASSEMBLY No. 2572

25712 PARAMETRIC EQUALIZER
25310 BOARD




25310
A
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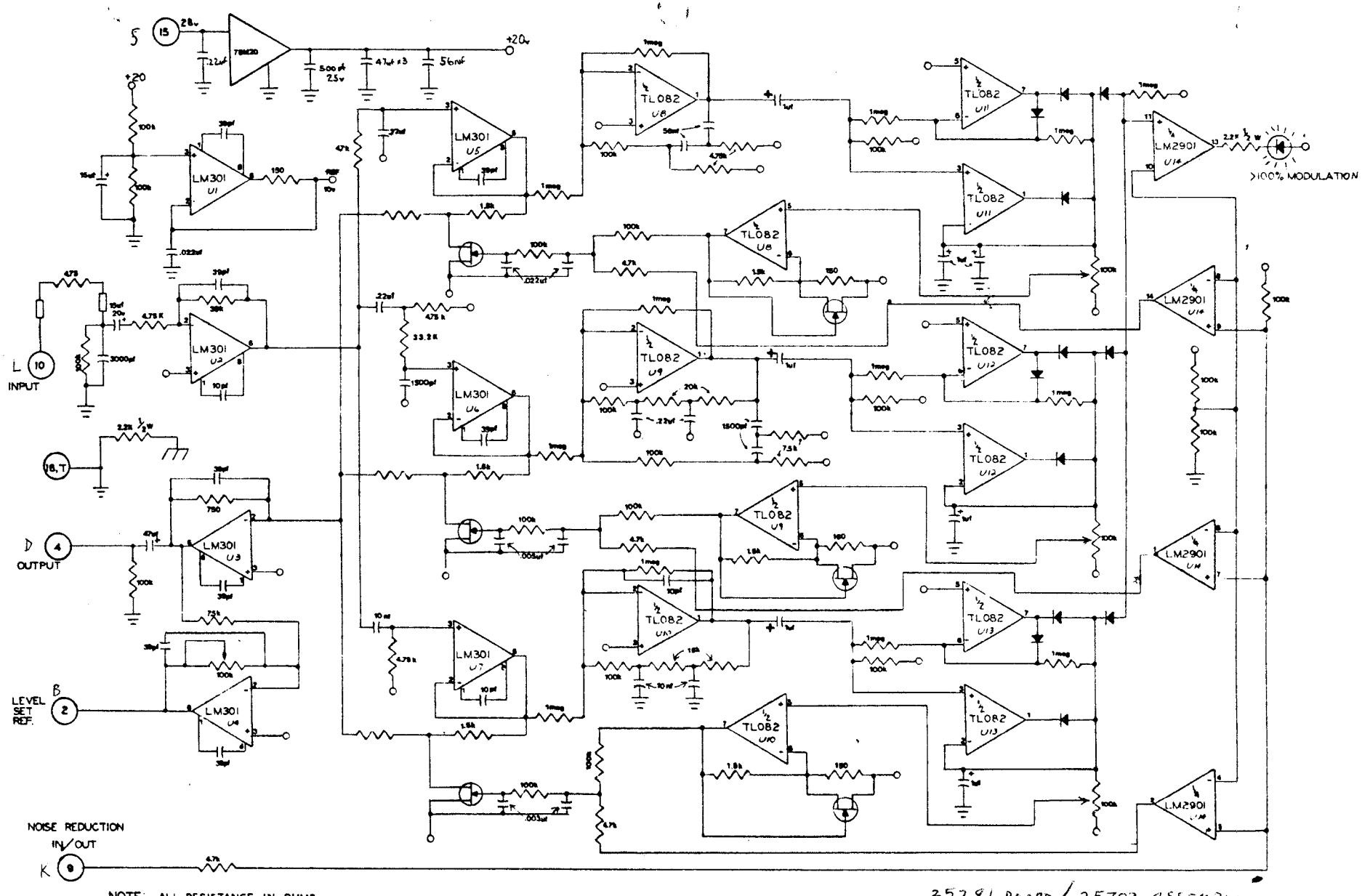
6800 pf
LM 301
47uf
TL072
100K
500K
.22uf
.1uf
3300 pf
1200 pf
680 pf
320 pf
EPCOM
TITLE EQUALIZER # 25310
ACTUAL (as assembled)
SIZE B
DWG NO 25717
REV
SHEET 1 OF 1
25712 PARAMETRIC EQUALIZER
25310 BOARD
KEY PUNCH
* BUSS WIRE JUMPER



NOTE: ALL RESISTANCE IN OHMS

F.E.T. MPF 4391 (2N4391)

DIODE'S IN4148

LED DIALCO #550-0408

KEY PIN 5

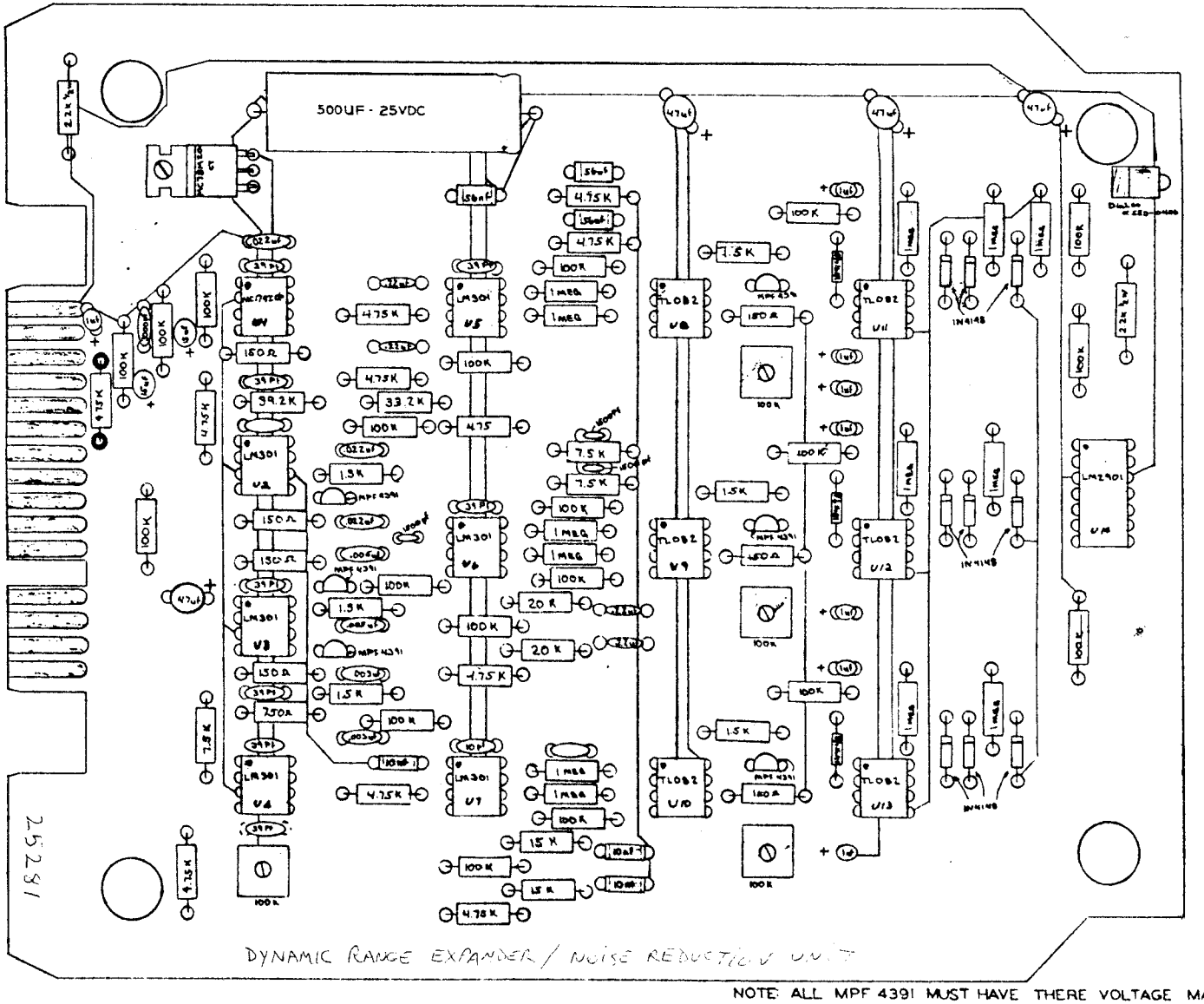
25281 BOARD / 25702 ASSEMBLY

DRAWN T. Cutler	CHECKED E.S.P.	APPROVED	DATE 5/3 [illegible]

TITLE NOISE REDUCTION SCHEMATIC

SCALE —

DRAWING NO. 25703



DYNAMIC RANGE EXPANDER / NOISE REDUCTION UNIT

NOTE: ALL MPF 4391 MUST HAVE THERE VOLTAGE MATCHED

EPIAD

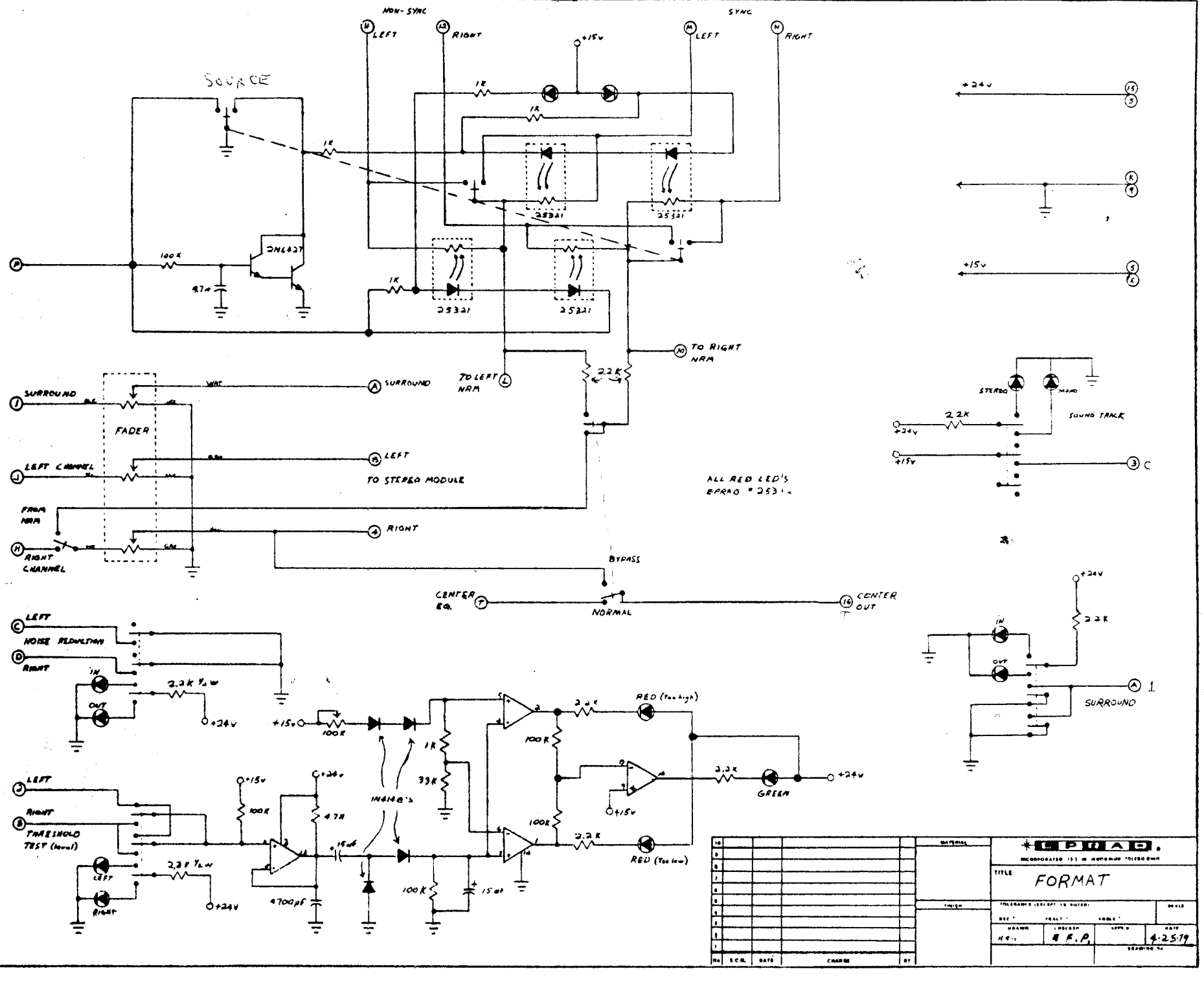
TITLE: Pictorial of Noise Module

SCALE: 2X

DRAWN: Cathee

DATE: 11-12-78

25702 ASSEMBLY
25291 BOARD



No.	E.C.N.	DATE	CHANGE	BY	

MATERIAL

FINISH

EPMAD

INCORPORATED 1971 IN HOMEWOOD TELEVISION

TITLE: FORMAT

TOLERANCE (EXCEPT AS NOTED)

SCALE

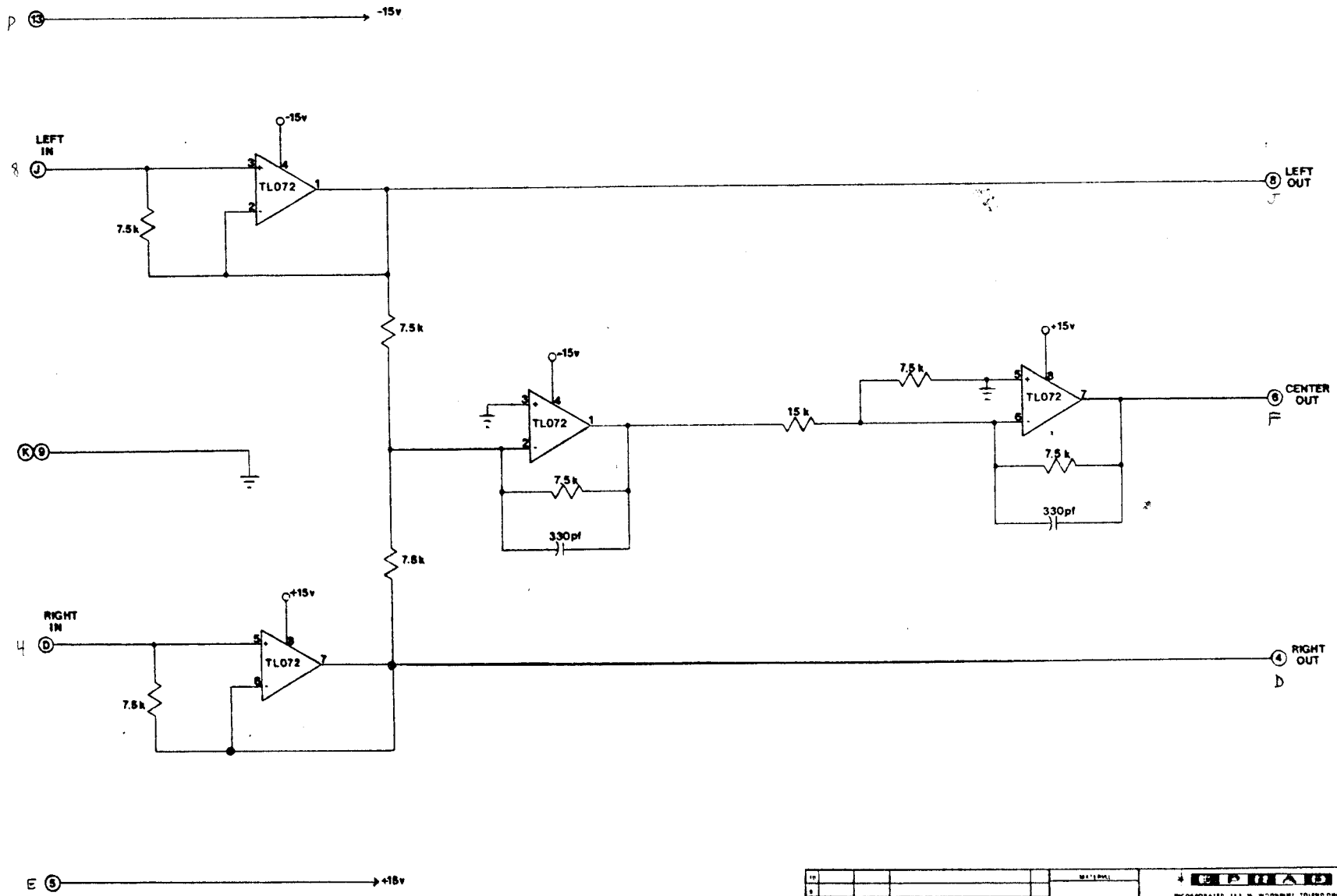
DRAWN: K.K.

CHECKED: E.F.P.

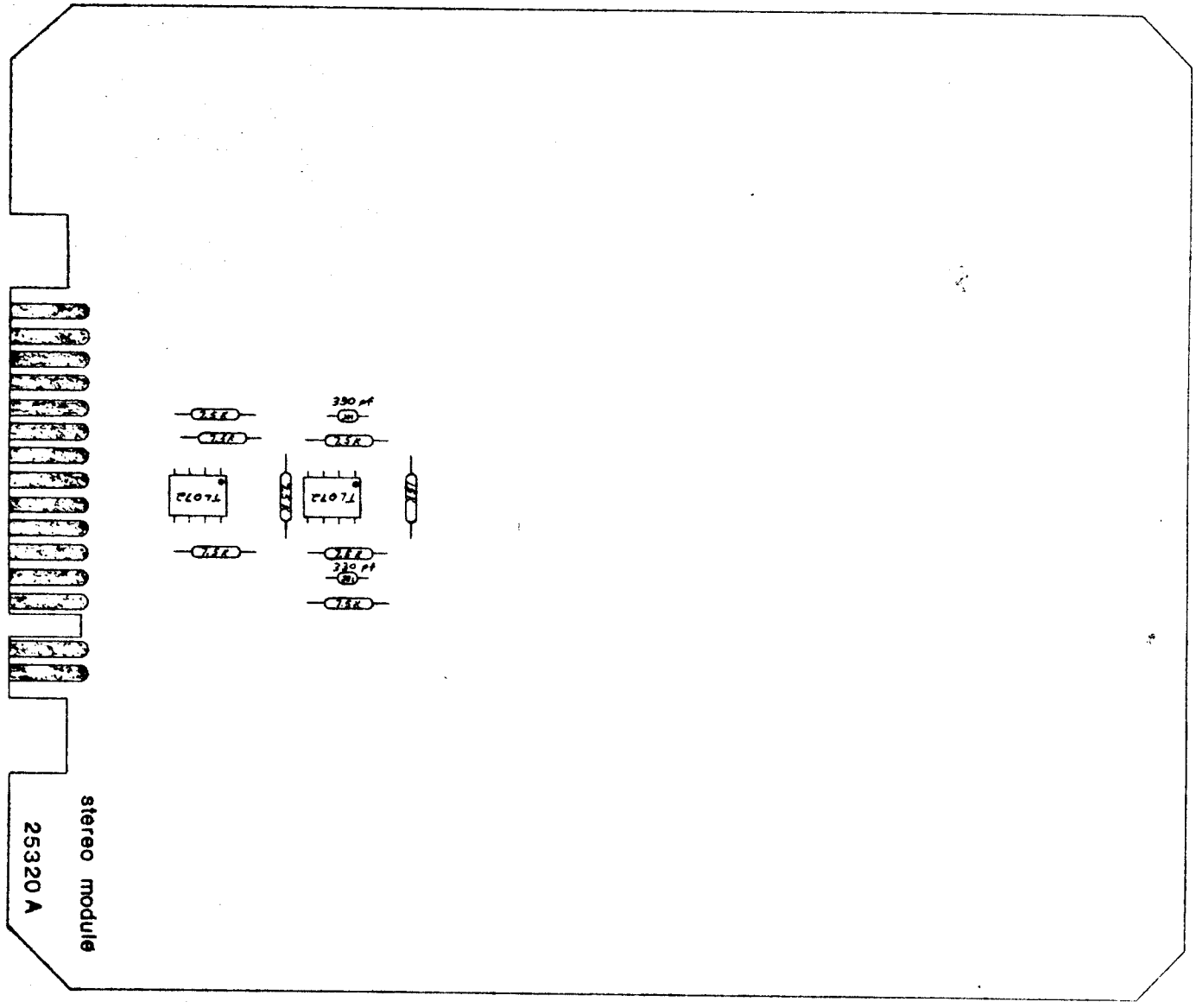
APPD.

DATE: 4-25-79

DRAWING No.



TITLE	STEREO BOARD 25320A
DRAWN	RRB
CHECKED	
APPD	
DATE	2-15-75
DRAWING NO.	25778



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MATERIAL

FINISH

EPIAQ.

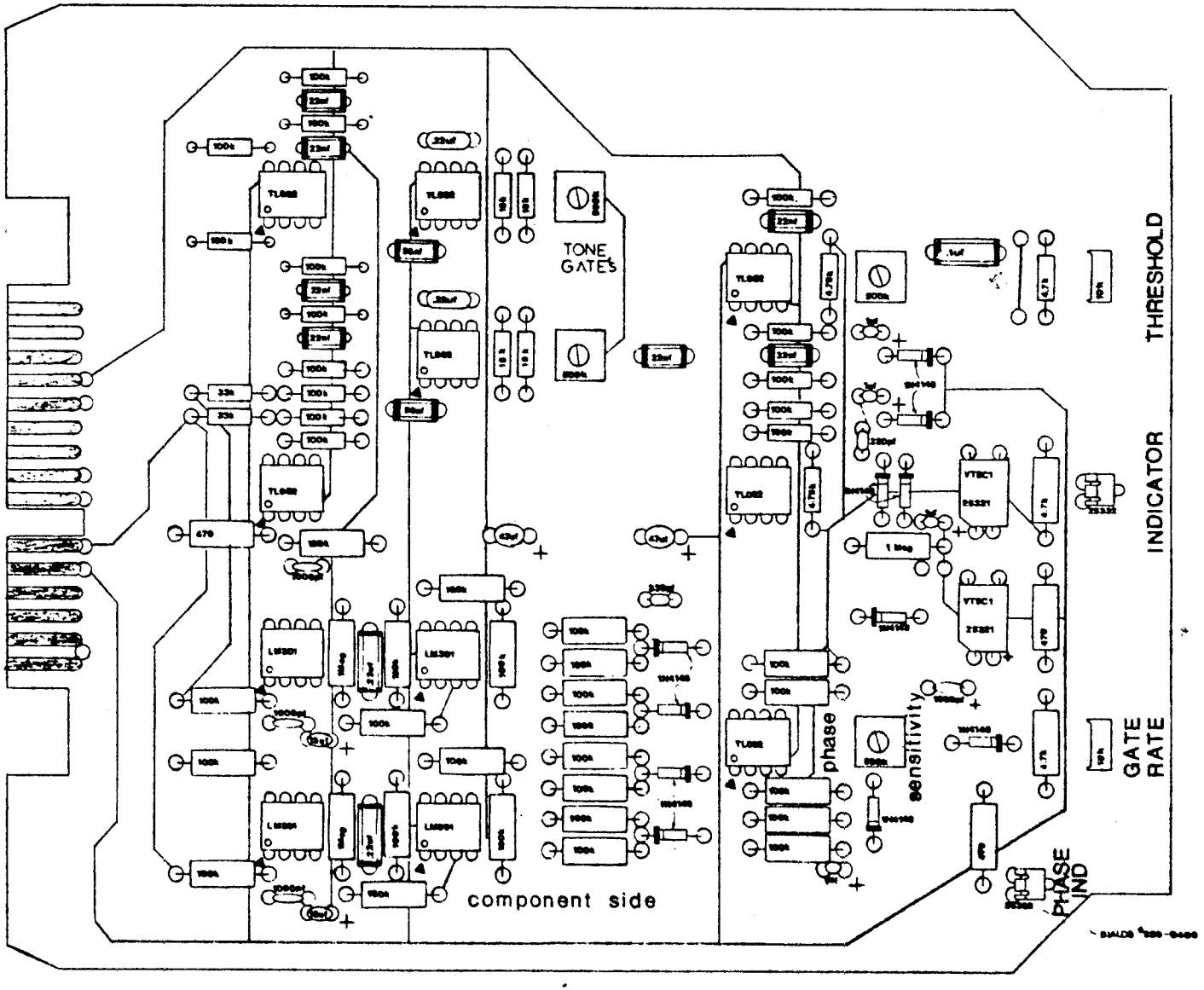
TITLE: STEREO MODULE "25320A

PICTORIAL

SCALE

DRAWN: A.A.B. | DESIGN: E.J.A. | APPD | DATE: 2-1-79

DRAWING No. 25776



1N4148 —SPRAGUE # 01Y01

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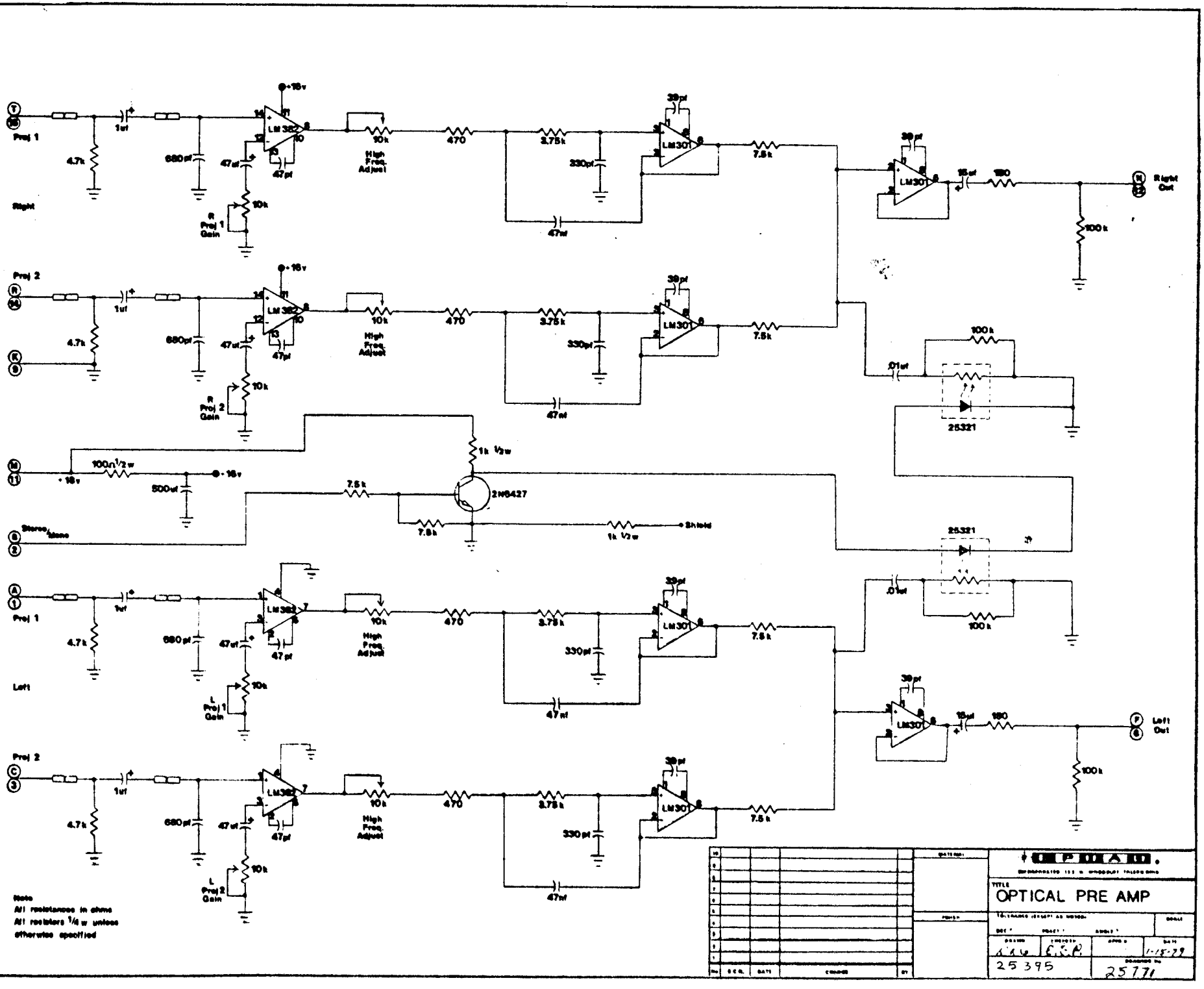
TITLE: Pictorial Surround Board

SCALE 2X

DRAWN JLC

DATE 10-23-78

DRAWING No. 25708A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Proj 2
Proj 1
Left
Proj 2
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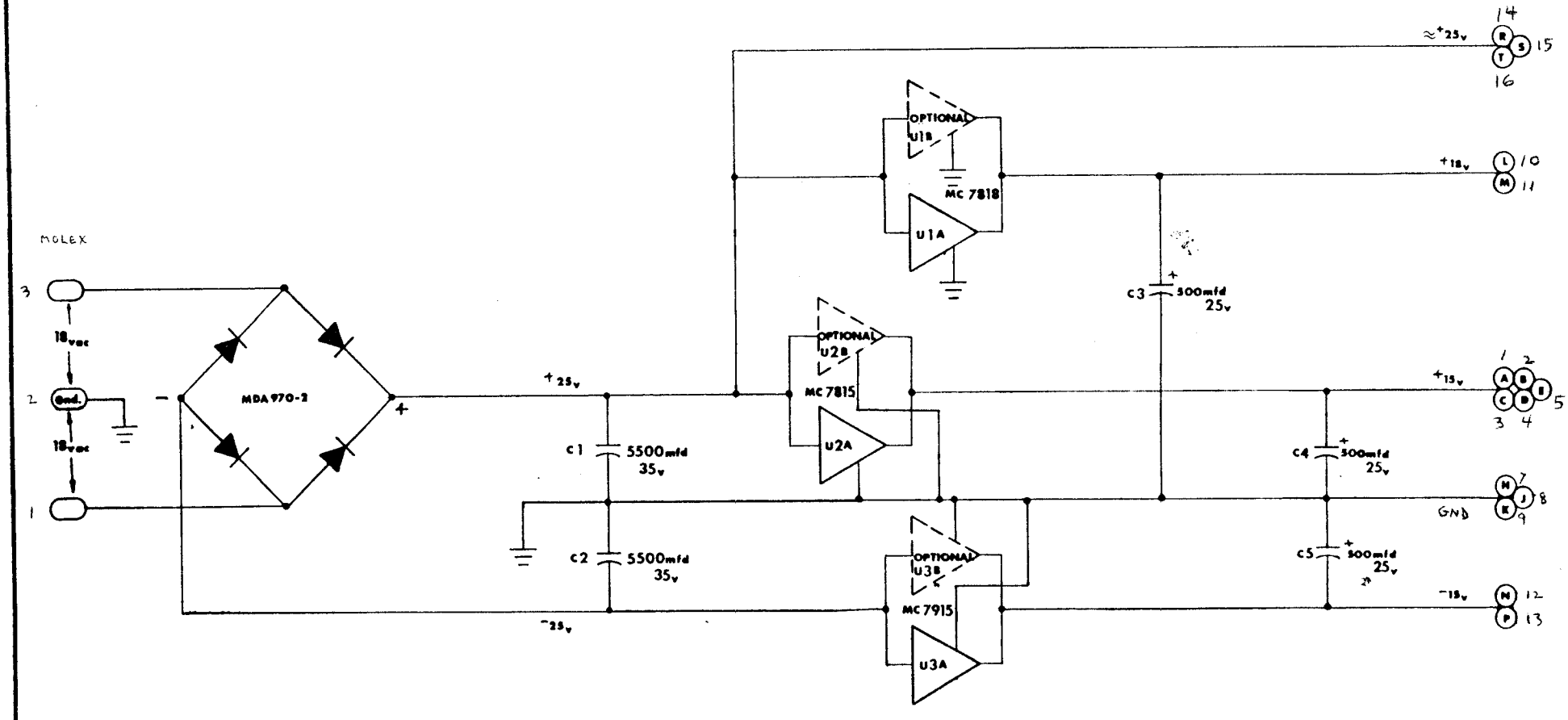
1uf
680pf
47uf
47pf
10k
R Proj 1 Gain
R Proj 2 Gain
L Proj 1 Gain
L Proj 2 Gain
High Freq. Adjust
470
3.75k
330pf
39pf
47nf
7.5k
LM382
LM301
15uf
180
100k
Right Out
Left Out
.01uf
25321
1k 1/2w
100n 1/2w
+18v
+16v
500uf
2N6427
7.5k
7.8k
Shield
Stereo/Mono
Note
All resistances in ohms
All resistors 1/4 w unless otherwise specified
OPTICAL PRE AMP
11-15-79
25395
25771

EPIAB
PRE AMP 25395C
PICTORIAL
25395C
500 ul - 35 v
LM387N
NE5534N
high freq
gain
Proj 2
Proj 1
L
R

GREAT LAKES 2000 12-71



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MATERIAL

UNLESS

EPRAD INCORPORATED 123 W WOODRUFF TOLEDO OHIO

TITLE **POWER SUPPLY** 25350

TOLERANCE (EXCEPT AS NOTED) SCALE

DECS FRACT ANGLES

DRAWN JCS CHECKED APPR'D DATE

ASSEMBLY No. 25710

DWG No. 25711