

**BEFORE PROCEEDING WITH COMPLETE UNPACKING AND SETUP,  
CONSULT UNPACKING AND INSPECTION INSTRUCTIONS ON PAGE 7.**

**model 527-A  
ACTIVE GRAPHIC EQUALIZER**



**United Recording Electronics Industries**

**8460 SAN FERNANDO ROAD, SUN VALLEY, CALIFORNIA 91352**

**(213) 767-1000**

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### 1-3. ELECTRICAL SPECIFICATIONS:

GAIN	:	Adjustable to +10 dB (with controls set flat or E.Q. switched OUT.)
DISTORTION	:	0.5% maximum at +24 dBm output.
FREQUENCY RESPONSE	:	$\pm 1$ dB 20 Hz to 20 kHz (with no E.Q.)
CALIBRATION	:	Within 1 dB of indicated attenuator setting, up to 5 dB boost or cut; within 1.5 dB up to 10 dB boost or cut.
NOISE	:	Less than -90 dBm equivalent input noise in 0 dB input position; Less than -70 dBm in +20 dB position. (E.Q. switched IN; 15.7 kHz noise bandwidth.)
RATED LOAD	:	600 ohms resistive
RATED OUTPUT	:	+24 dBm
MAXIMUM OUTPUT	:	+30 dBm (before clipping)
INPUT IMPEDANCE	:	600 or 10 K ohms, unbalanced to ground.
OUTPUT CIRCUIT	:	Floating (transformer isolated)
EQ. CENTER FREQUENCIES	:	40, 50, 63, 80, 100, 125, 150, 200, 250, 315, 400, 500, 630, 800, 1000, 1250, 1500, 2000, 2500, 3150, 4000, 5000, 6300, 8000, 10000, 12500, 16000 Hz.
FREQUENCY TOLERANCE	:	$\pm 3\%$ of center frequencies.
FILTER BANDWIDTH	:	1/3-octave at 3 dB points, with 6 dB boost or cut.
FILTER TYPE	:	LC active feedback type equalizers.

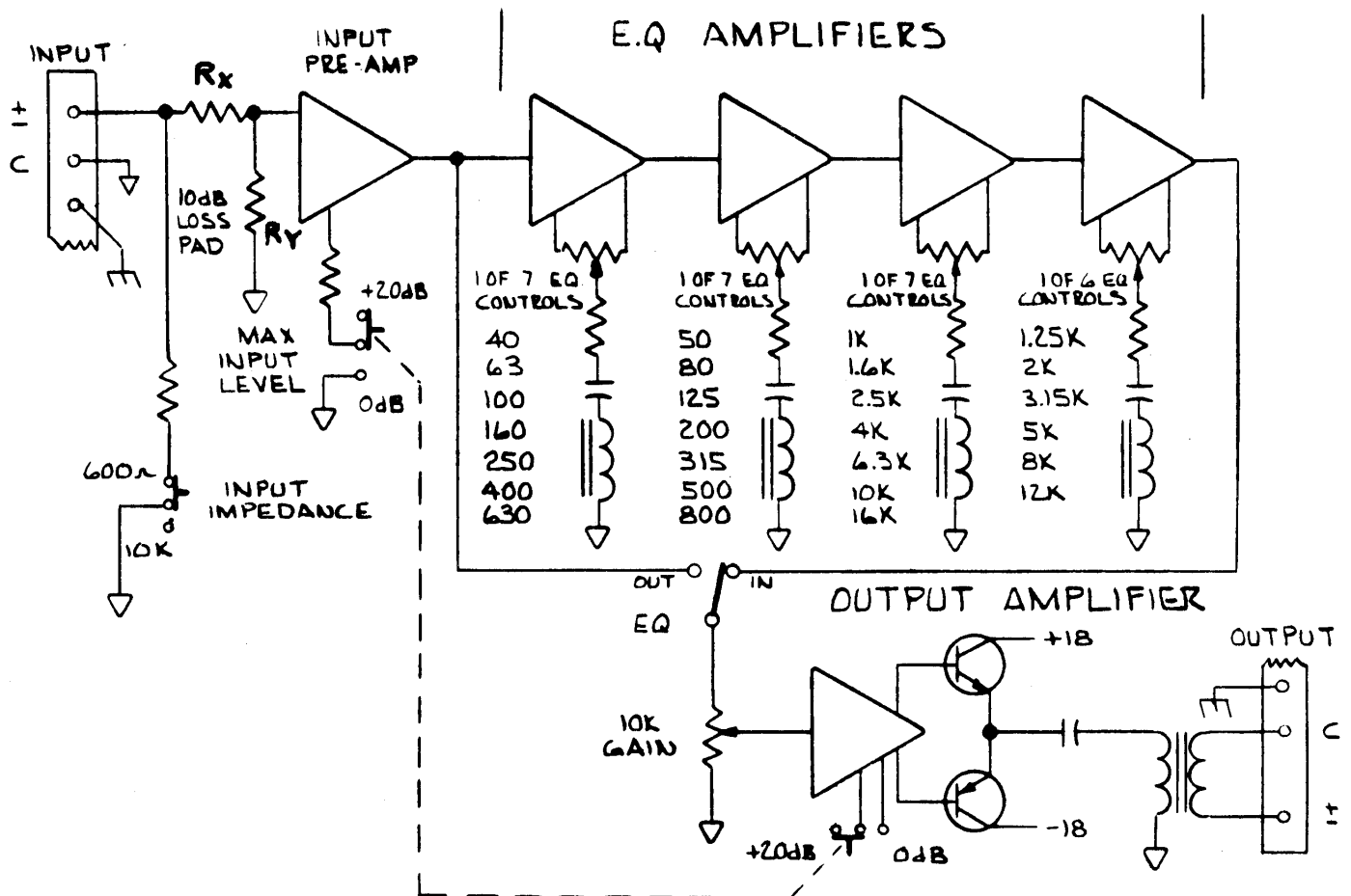
## SECTION I

### GENERAL INFORMATION

1-1. DESCRIPTION. The UREI Model 527-A 1/3-octave Graphic Equalizer was designed primarily for room equalization of sound playback and sound reinforcement systems, but has other obvious applications in professional recording, broadcasting and motion pictures.

Twenty-seven vertical controls are provided, allowing adjustment through a range of  $\pm 10$  dB of all standard 1/3-octave frequency bands from 40 to 16,000 Hz. Equalization is accomplished with active LC filters in the feedback networks of specially selected operational amplifiers. Gain is adjustable with a locking front panel control, and up to 10 dB of gain may be obtained. A rear chassis switch permits optimization of signal-to-noise and overload characteristics for unity gain at levels of -20 to 0 dBm and 0 to +20 dBm. An optional accessory, Model 527SC Security Cover, may be installed over the front panel to provide protection against inadvertent disturbance of the equalization controls in fixed installations.

#### 1.2. BLOCK DIAGRAM



1-4. CONTROLS:

- EQUALIZATION : 27 vertical slider potentiometers, continuously variable  $\pm 10$  dB.
- GAIN : Screwdriver adjustable control with lock nut.
- E.Q. IN/OUT : Toggle switch.
- POWER : Toggle switch and pilot light.
- INPUT IMPEDANCE : Rear panel switch - 600 ohms or 10 K ohms.
- INPUT LEVEL : Rear panel switch - 0 dBm or +20 dBm maximum.
- MAINS VOLTAGE : Rear panel switch - 115/230 VAC. (60/50 Hz)
- TERMINATIONS : Rear panel barrier strip In/Out. 6' 3-wire power cable.

1-5. PHYSICAL

- SIZE : 19" X 3 1/2" rack panel  
Depth behind panel 8"
- WEIGHT : 13 pounds
- FINISH : Front panel: Horizontally brushed clear anodized aluminum.  
Chassis: Cadmium plated steel.

2-4. (continued)

- b. When the switch is in the 0 dB position, the first amplifier gain (including the input divider) is +10 dB and the output stage gain is reduced to 0, resulting in a +10 dB total system voltage gain (with GAIN control maximum.) Equivalent input noise is lower due to the preamplification of the input signal. In critical applications, where levels can be closely controlled,  $R_X$  may be jumpered and  $R_Y$  replaced with 10K. This results in a 10 dB improvement in signal-to-noise, with 10 dB less headroom before clipping.

## SECTION II

### THEORY OF OPERATION

For the following text, refer to the Block Diagram, Section 1-2.

2-1. INPUT SECTION. The input signal is applied to the first stage amplifier through an attenuator consisting of  $R_X$  and  $R_Y$ . Gain of the first amplifier is set by the position of the INPUT LEVEL switch. When equalization is disabled by switching the EQ IN/OUT switch to "OUT", the amplifier output is coupled to the GAIN control, bypassing the equalization stages. When the EQ IN/OUT switch is "IN", the amplifier output is coupled through a 1K resistor to the input of the first equalization stage.

2-2. EQUALIZATION SECTION. Equalization is adjusted by the positions of the vertical sliders on the 27 equalization controls. If a slider is moved toward the positive input of the equalization amplifier, voltage division of the input signal occurs in a narrow band of frequencies due to the low series resonant impedance of the LC circuit. This causes a reduction in output at the tuned circuit resonant frequency. If a slider is moved toward the negative input, the negative feedback of the amplifier is reduced at the resonant frequency, and the resulting gain increase results in a boost at that frequency. Four stages of this same configuration are cascaded to provide equalization throughout the audio spectrum. The output of the last stage is coupled through the EQ IN/OUT switch to the GAIN control.

2-3. OUTPUT SECTION. Following the GAIN control is an integrated amplifier with discrete output power transistors, followed by an isolation transformer and the output terminals. Optimum performance is obtained with a 600 ohm resistive load.

2-4. INPUT LEVEL SWITCH. This switch is located on the rear of the chassis, and permits optimizing operation in two program level ranges: Nominally -20 to 0 dBm and 0 to +20 dBm.

- a. When the switch is in the +20 position, the first amplifier gain (including the input divider  $R_X$  and  $R_Y$ ) is -10 dB; the feedback of the output stage is set for a voltage gain (including transformer) of 20 dB. This results in a net voltage gain through the unit of +10 dB, when the GAIN control is set at maximum (fully CW.)

3-2. (continued)

enclosure in which the chassis is installed, and the AC conduit ground. If hum is experienced, check for this possibility by using a 3-wire to 2-wire AC adaptor at the power receptacle, ungrounding the AC plug.

3-3. **POWERING.** The Model 527-A may be operated from either 110-120 VAC or 220-240 VAC mains supply, 50 or 60 Hz single phase, depending upon the position of the power transformer input switch. This is a recessed slide switch, which is located adjacent to the fuse post and line cord entry on the rear of the chassis. Unless a tag on the line cord specifies otherwise, your unit was delivered ready for operation from 110-120 VAC mains. Verify this before applying power to the unit by observing that the numbers 115 appear near the bottom of the slide-switch window. The AC fuse should be 1/8A, slo-blo.

To change for operation from 220-240 VAC, use a small screwdriver in the horizontal slot of the slide-switch. Push down firmly until the numbers 230 appear at the top of the window. (To change for 110-120 VAC, push up.) For 220-240 VAC operation, the line fuse should be changed to 1/16A slo-blo, for proper protection.

3-4. **EXTERNAL CONNECTIONS.** During initial setup the GAIN control should be set to minimum (CCW) to avoid overloading the subsequent amplifiers.

Input and output signal pair wires should be connected as indicated on the rear chassis above the terminal strip, following standard practices.

If the output is to be connected to a high-impedance circuit, a 620 ohm resistor (1/2 watt) should be shunted across the  $\dagger$  and COM. output terminals.

3-5. **LEVEL ADJUSTMENTS.** The Model 527-A is designed to operate basically as a zero voltage gain device (with all EQ set at 0), although up to 10 dB of voltage gain is available. Two operating program level ranges are accommodated by the position of the INPUT LEVEL switch on the rear of the chassis (see Section II, paragraph 2-4.) and are used as follows:

- a. -20 to 0 dBm: Set INPUT LEVEL switch to 0 position. Set GAIN control to produce output equal to input. (Note: GAIN control may be adjusted to provide output up to 10 dB higher, if desired.)



SECTION III  
INSTALLATION

3-1. UNPACKING AND INSPECTION. Carefully examine the contents of the shipping carton for any sign of physical damage which could have occurred in transit. Though your 527-A was carefully packed at the factory, and the container was designed to protect the unit through rough handling, accidents do happen.

IF DAMAGE IS EVIDENT, DO NOT DESTROY ANY OF THE PACKING MATERIAL OR CARTON, AND IMMEDIATELY NOTIFY THE CARRIER OF A POSSIBLE CLAIM FOR DAMAGE. SHIPPING DAMAGE CLAIMS MUST BE MADE BY THE CONSIGNEE.

Besides the 527-A unit itself, you should verify that the shipment included the following:

- a. This instruction manual.
- b. A two-part warranty card, bearing the same serial number as the unit.
- c. If ordered, the accessories 527SC Security Cover (Check your packing slip and purchase order to verify this option.)

Complete the Warranty Card, and mail the return portion immediately to activate your one-year warranty. (No postage required.)

3-2. ENVIRONMENTAL CONSIDERATIONS. The Model 527-A will operate satisfactorily over a wide range of ambient temperatures, from  $-20^{\circ}\text{C}$  to  $+50^{\circ}\text{C}$  ( $-4^{\circ}\text{F}$  to  $+122^{\circ}\text{F}$ .) If included in an equipment rack with high heat producing equipment, such as power amplifiers, adequate ventilation should be provided, however, to prolong life of components. Also, while coils and other circuitry susceptible to hum pickup are adequately shielded from moderate electromagnetic fields, installation should be planned to avoid mounting the 527-A immediately adjacent to large power transformers, motors, etc.

To comply with existing Electrical Codes, the 527-A is supplied with a three-wire AC power cord, the grounding pin of which is connected to the chassis. In some installations, this may create ground-loop problems, if a significant potential difference exists between a grounded metal

3-5. (continued)

- b. 0 to +10 dBm: Set INPUT LEVEL switch to +20 position.  
Set GAIN control to produce output equal to input, or for up to +10 dB of gain.
- c. +10 to +20 dBm: Set INPUT LEVEL switch to +20 position.  
Set GAIN control to produce not more than +10 dBm at output, to allow adequate headroom for program peaks and equalization.

Signal-to-noise ratio is a function of input level and setting of INPUT LEVEL switch. Output headroom before distortion (clipping point is +30 dB) is a function of the GAIN control setting. Worst case signal-to-noise for the two switch settings in (a) and (b) above are:

- a. -20 dBm input: 70 dB (15.7 kHz noise bandwidth)
- b. 0 dBm input: 70 dB (15.7 kHz noise bandwidth)

3-6. SECURITY COVER

If your 527-A was purchased without the accessory 527SC Security Cover, and it is desired to later add this feature, remove the two dummy screws located just to the left and right of the group of 27 equalization controls. The Security Cover is furnished with captive screws to mate with these holes.

#### 4-2. (continued)

drawn of the system response. Examination of this curve will show a general tendency of accentuation in certain areas of the audio spectrum and deficiencies in other areas. A good starting point is to set the controls on the 527-A to the inverse of the measured curve. Another check is then made with the Sonipulse and the E.Q. controls trimmed for optimum response. (The EQ IN/OUT switch on the 527-A may be used to compare the results.)

Consideration should be given to the basic laws of physics when performing equalization of playback or sound reinforcement systems, such as the normal greater attenuation in air of high frequency sounds, with respect to low frequencies. As the distance between the sound source and the listening position increases, it is natural for high frequencies to be attenuated. If equalization is performed to create a perfectly "flat" response, particularly throughout a large room, the result will be excessively "bright" or "tinny" sound. While the so-called "room curve" which is applied to produce a natural response in systems is somewhat subjective and a matter of personal preference, attenuation in the order of 6 dB per octave above 5 or 6 kHz is frequently used.

After equalization of a room is completed, the settings should be logged or the control positions marked so they can be reset if tampered with. Additional protection from inadvertent misadjustment, especially in unattended locations, is afforded by the accessory Model 527SC Security Cover, available from your UREI dealer at nominal cost.

## SECTION IV

### OPERATING PROCEDURES

4-1. GENERAL. The 527-A is straightforward in design, and operation is self-evident from the markings on the controls. When the EQ IN/OUT switch is moved to the IN position, the various equalization controls are adjusted for the correction or effect desired.

It is beyond the scope of this manual to present a complete treatise on equalization techniques, and prior knowledge of equalizers and filters is presumed. Experimentation and familiarization with the unit will aid in the development of good technique. However, a word of caution concerning the use of any narrow-band equalizer of this type is in order:

Any filter, regardless of its configuration, which is capable of peaking certain frequencies is subject to "ringing". This is aurally perceived as a "hollow" quality, or persistence of the sound. It is desirable in general, to avoid the sharp peaking of a single specific frequency in a narrow band. Ringing can be minimized by contouring the response curve gradually on each side of the peaked frequency. Of course, in some applications sharp peaking may be desirable - as in producing special effects.

When the 527-A is used as a room equalizer, it is best to obtain the desired correction by attenuating peaks, rather than boosting deficiencies, since attenuation (even in a narrow band) does not introduce ringing.

It has been found in practice that it is not always desirable to attempt to equalize to the last dB all minor anomalies in response of an acoustical system. This often results in an artificial or "processed" sound. The obvious advantage of a 1/3-octave equalizer, such as the 527-A, over broadband equalizers is not so much the narrow bandwidth of the individual filters as the ability to accurately contour the equalization to the inverse of the measured curve.

4-2. USING WITH SONIPULSE. The 527-A was primarily designed as a companion for the UREI Model 100-A SONIPULSE Acoustic System Analyzer. Center frequencies are coincident with the standard ISO/ASA measurement frequencies of the Sonipulse. When equalizing a room, the Sonipulse is switched through its range (40-16,000 Hz) and a curve

## SECTION V

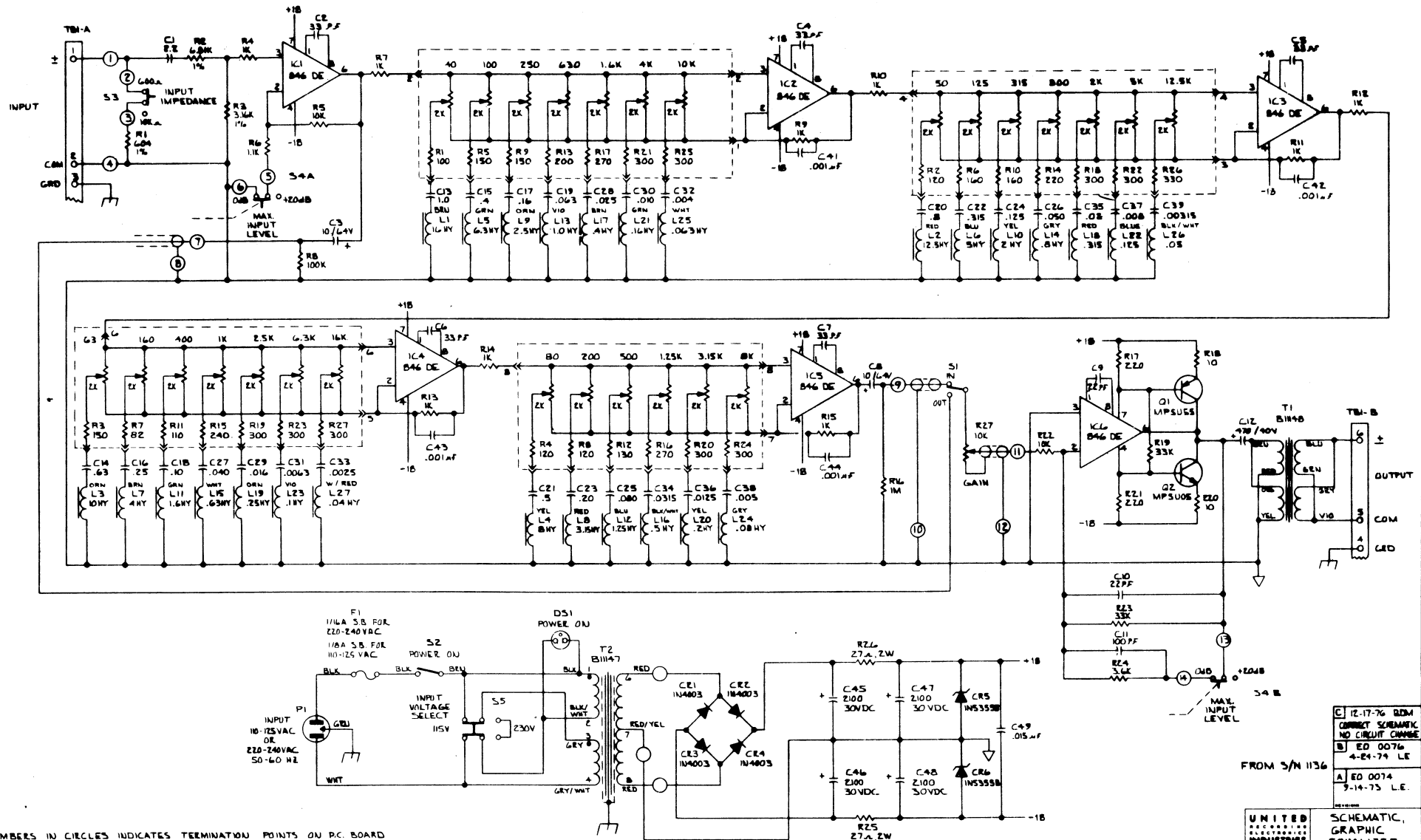
### MAINTENANCE

5-1. GENERAL. Your Model 527-A is ruggedly constructed and should provide years of trouble free use with normal care. All parts used are conservatively rated for their application, and workmanship meets the rigid standards you have learned to expect in UREI products.

No special preventive maintenance is required.

5-2. REPAIRS AND WARRANTY. The Model 527-A is factory warranted against defects in material and workmanship for one year after initial purchase. This Warranty must be activated at time of purchase by returning the registry portion of the Warranty Card to the factory. Should a malfunction ever occur, the dealer from whom you purchased the unit will be glad to handle return for factory repair; or, you may ship it directly to the factory for prompt service. Be sure that it is well packed in a sturdy carton, with shock-absorbing material such as foam rubber, styrofoam pellets or "bubble-pack" completely filling the remaining space. Particular attention should be paid to protecting the equalization control arms and other protruding parts. Include a note describing the malfunction, and instructions for return. We will pay one-way return shipping costs on any in-warranty repair.

Because of specially selected components used in this product, field repairs are not authorized, and attempts to perform repairs may invalidate the warranty. Therefore, owner repairs are discouraged. It is for this reason that complete schematics and service instructions are not furnished.



3 NUMBERS IN CIRCLES INDICATES TERMINATION POINTS ON P.C. BOARD

2 RESISTOR VALUES ARE IN OHMS, 25%, 1/2W

1. CAPACITOR VALUES ARE IN MICROFARADS

NOTES:

C 12-17-76 QDM  
 CORRECT SCHEMATIC  
 NO CIRCUIT CHANGE  
 B ED 0076  
 4-24-79 LE  
 A ED 0074  
 3-14-75 L.E.

FROM S/N 1136

UNITED ELECTRONIC INDUSTRIES	SCHMATIC, GRAPHIC EQUALIZER
MODEL: S27A	REV: 12-19-72
LOS ANGELES CALIFORNIA	LE D11882