

# Film-Tech

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2.0 KT-21 Optical Sound Processor, MONO2.1 Introduction

The KT-21 is a program expander with several modes of operation that enable it to improve the quality of all film sound tracks, regardless of their format. In the "enhance" mode, a three-band expansion circuit decreases the noise and increases the dynamic range of any standard Academy print (that is, a dual-bilateral or single-track monaural sound track). The standard print's dynamic range is purposely restricted to about 50 dB to fit within the limitations of the optical record/playback medium. The amount of expansion the KT-21 provides is adjustable from a ratio of 1:1.1 (10%) to 1:1.3 (30%). A display indicates how much "upward" or "downward" expansion is occurring in each of three frequency bands. The Kintek system does not incorporate an Academy filter because of the superior results gained through noise-reduction and de-essing circuitry.

To provide complementary expansion characteristics for processing either Kintek, dbx, or Dolby sound tracks, the KT-21 has three decode modes. These sound tracks differ from standard Academy prints in that they have been compressed when originally recorded. The KT-21's expansion restores full dynamic range as it reduces noise.

Refer to Figure 2.1. How the KT-21 Works.

## 2.2 Front and Rear Panels

Refer to Figure 2.2. Front Panel of the KT-21.

1. Power Indicator. This LED (light-emitting diode) glows when the AC power is applied to the KT-21.

2. Expansion Control. Adjust this slider for the desired degree of expansion. A "1.1" setting results in a 10% increase in dynamic range; "1.2" gives a 20% increase. With an original 50-dB input, a setting of "1.2" stretches the output to 60 dB (the best average setting is "1.2")> Caution: Expansion can be overdone with sound tracks having very quiet dialogue and loud music passages, that is, sound tracks that already have a wide dynamic range. Expansion makes quiet passages even softer, so, too high a setting can reduce the quality of the program. The expansion control is active only when the KT-21 enhance button is engaged; the control is bypassed when any of the decode buttons are engaged.

3. Gain-Change Display. LEDs indicate the amount of gain change (expansion) in each of the KT-21's three frequency bands when the unit is in the "enhance" and "decode" modes. The red LEDs indicate upward expansion (volume increase), the center column of yellow LEDs shows no expansion, and the rest of the yellow LEDs indicate downward expansion (volume decrease). When the bypass button is engaged, the display acts as a program level indicator.

4. Enhance Switch. Engaging this pushbutton sets the KT-21 circuitry to work as a three-band expander. This mode is the most often used and is effective for reducing noise and increasing the "punch" of any standard Academy mono print. When the enhance button is in, the

## Section 2.0

expansion slider sets the specific expansion ratio, while the gain-change display indicates how much expansion is actually taking place in each of the three frequency bands (low, mid, and high).

Note: The button is labeled "3BX-Academy" because the three-band expansion circuitry is derived from dbx's patented 3BX Dynamic-Range Enhancer. Certain modifications have been made to match the 3BX processing to the specific requirements of motion picture sound tracks.

5. Decode Switches. Three of these four pushbuttons select the fixed expansion characteristics that complement certain types of sound tracks. The fourth button, labeled "aux," selects a rear-panel patch point. When any of these buttons is chosen, the expansion slider is bypassed.

The Kintek button sets the unit for three-band linear dB expansion at a ratio of 1:1.3. This setting complements the modest expansion applied to the Academy-compatible bilateral mono stripe on a Kintek optical sound track.

The dbx button sets the unit for full spectrum, single band, linear dB expansion at a ratio of 1:2. High-frequency de-emphasis is also applied to complement the compression and high-frequency pre-emphasis of dbx-encoded sound tracks. ° This type of processing has also been used by MCA in conjunction with their Sensurround system.

The Dolby button sets the unit for three-band expansion at a ratio of 1:2 and acts only on programs between -20 db and -40 db following Dolby processing characteristics. This mode provides Kintek noise reduction for Dolby "A" type encoded film sound tracks.

Note: When playing SVA (Dolby) sound tracks, try switching the KT-21 to the "enhance" mode and locating the expansion slider at the center of the scale. Compare the effect of this setup to that obtained in "Dolby Print Decode." Use the setup that sounds best.

6. Bypass Switch. Engaging this red pushbutton connects the KT-21 input directly to the output, thus providing a hard-wire bypass of all circuitry. Use the bypass button to remove the KT-21 from the sound system when no expansion is desired, a fault exists in the unit, or to make A/B comparisons between the processed and unprocessed audio signal.

Refer to Figure 2.3. Rear Panel of the KT-21.

1. H.F. Adjust. Use this screwdriver-adjustable trimmer to set the high-frequency response of the system, which is affected by room acoustics and loudspeaker characteristics. On units without an "A" after the serial number, the trimmer provides boost only. Newer units have +10 dB of control.

2. Input-Range Switch and Input-Adjust Control. Set the switch to "high" for nominal line levels of approximately +4 dBm to +10 dBm and to "low" for signals from devices like the KT-41 preamplifiers, which have levels from -20 dBm to -10 dBm. The control permits precise level matching.

3. Barrier Strip. Refer to Section 2.4.3 for connection information.

4. Output-Range Switch and Output-Adjust Control. These features operate in a manner similar to the input control and switch.

5. Accessory. Use this input in conjunction with the "aux" button on the front panel to play a tape or other non-sync sources. (Special voltage connections are also made through this connector. See Figure 2.4 and Section 2.4.3.

2.3 Specifications

Input Impedance	40 kilohms actual input impedance, bridges 600-ohm sources. Input transformer for ground isolation.
Input Level	-20 dBm (78 mV) to +10 dBm (2.45 V) nominal via range switch and gain trimmer, +24 dBm (12.3 V) maximum.
Equivalent Input Noise	-75 dB below 1 V, A weighted.
Output Impedance	80 ohms actual source impedance, drives nominal 600-ohm load (or any load of 150 ohms or higher impedance). Transformer output for ground isolation.
Output Level	-20 dBm (78 mV) to +10 dBm (2.45 V) nominal via range switch and gain trimmer. +24 dBm (12.3 V) maximum.
Frequency Response	20 Hz to 20 kHz $\pm$ 1 dB at 1.2 expansion, signal level at threshold of expansion.
THD Distortion	Less than 0.1%, 20 Hz to 20 kHz.
IM Distortion	Less than 0.5%.

Section 2.0

Connectors

Barrier Strips.

AC Power

120 VAC, 50 or 60 Hz, 30 watts maximum.  
Consult factory for operation with other  
line voltages.

Dimensions

3 1/2" H x 19" W x 10 1/4" D.  
(88.9 mm H x 483 mm W x 260 mm D.)  
Rack-mount front panel.

Weight

11 pounds.  
(5 kilograms.)

Kintek products are manufactured under one or more of the following  
U.S. patents: 3,681,618; 3,714,462; 3,789,143; 4,101,849; 4,097,767.  
Other patents pending.

## 2.4 Installation

### 2.4.1 Unpacking and Mounting

Remove the unit carefully from its shipping carton. The KT-21 was carefully inspected and tested at the factory. Contact your dealer in the event of any problems. We suggest saving the shipping carton and packing materials for safely transporting the unit in the future.

### 2.4.2 Precautions

When locating any electronic equipment near heat sources, provide adequate clearance for ventilation. Excessive heat shortens the life of any electronic component. Avoid high humidity and water.

Mounting electronic equipment and connecting cables as far as possible from motors and large power transformers lessens the possibility of 60-Hz hum being heard in the system.

### 2.4.3 Connections

Refer to Figure 2.3 for the connections on the rear panel of the KT-21. Use 2-conductor shielded cable with foil wrapping for all wiring. For the input, attach the cable shield to ground at the source component; for the output, wire the shield to the "GND" terminal (the KT-21 becomes the source for the following component). Under certain circumstances, the shield wire may need to be attached at both ends to eliminate a hum in the system.



## Section 2.0

If an unbalanced (high impedance) input is used, wire the ground and low terminals together at the source component. Attach the shield to the "LOW" and "GND" terminals for an unbalanced output.

In mono (single-channel) sound systems, install the KT-21 after the main audio fader. With SVA (three or four channel stereo) sound systems, use the KT-26 SVA (Dolby) Interface Unit. See Section 11.0.

AC Power. The unit draws approximately 30 watts. No AC Power switch is provided, but the unit can be connected to the switched AC outlet in an equipment rack or to an accessory outlet on adjacent sound equipment. Replace fuse with same size only: 1/2 amp Slow Blow (240 V).

Accessory Connector. Refer to Figure 2.4. This jack provides optional connection points for DC voltage and audio signals.

Pin	Use
3	Filtered signal output (high).
4	Processed signal input (high). (Switched into circuit by "aux" button on front panel.)
5	-12 VDC output.
6	-24 VDC output.
7	Ground.
8	+12 VDC output.
9	+24 VDC output.

## 2.5 Operation

### 2.5.1 System Alignment

Refer to Section 1.5.1 for the full alignment procedure. Check speakers for the proper operation of all drivers. Adjust projector

optics, guide roller, and azimuth.

The level trimmers for the input and output, which are screwdriver adjustable, are found on the rear panel of the KT-21. Once the unit is installed and the high/low switches are set to the appropriate range, the trimmers provide an additional 10 db of sensitivity adjustment to match precisely the system's operating levels so no abrupt change is heard when the KT-21 is switched in and out of the circuit. In addition, the input trimmer is used to set the KT-21 for the proper Dolby decode level. To properly set the input and output levels:

1. Set the KT-21 input and output high/low switches to the appropriate range. Set the switch to "low" when using KT-41 preamplifiers or for levels from -20 dBm to -10 dBm. Use "high" for levels from +4 dBm to +10 dBm if necessary.
  2. Set the output level control to maximum cw. With a pink-noise loop running, adjust the master fader to the normal position.
  3. Enhance Setup Procedure. Set the front-panel expansion slider at the left position. Push in the enhance switch. Observe the LED display and adjust the input level control on the rear panel until only one red LED is lit in the high-frequency band.
- Dobly Setup Procedure. Push the front panel "Dolby Print Decode" button and play a very loud passage found in the Dolby-encoded sound track. Then set the input trimmer so only the first LED in the row having the most signal energy is illuminated. This procedure sets the transition point (threshold) for Dolby or other film formats.

4. Push the "enhance" button. On the rear panel of the KT-21, make sure the high-frequency control is at the 12 o'clock position (on units without an "A" after the serial number, leave the control at the maximum ccw position). Turn down (full ccw) the output level control.

5. Making sure one red LED is lit in the high-frequency bank of the KT-21, run the pink-noise loop and place the SPL meter in the theatre--4 feet off the floor in the center of the seating area. Adjust the output control on the back of the KT-21 for a level of 75 dBc.

6. Turn down the master fader. Stop the projector and remove the pink-noise loop.

7. Run a reel of an Academy mono print of known good quality. Do not use trailers, as they are usually overmodulated and distorted.

8. Set the fader for a normal listening level in the theatre. Film levels vary depending on the recording level. It is not unusual, for instance, to run trailers at a lower master-fader setting than features.

9. High-Frequency Boost (Slit-Loss Compensation). The KT-21 has a rear-panel trimmer that is used to compensate for loudspeaker response and room acoustics. Secondly, the control is used for slit-loss compensation in the optical playback system, which is technically known as Sine x correction.

10. It is useful to listen to several films when an audience is in the theatre. If necessary, readjust the high-frequency control on the

KT-21 for a better treble sound after listening to music and effects.

AFTER ALL ADJUSTMENTS HAVE BEEN MADE, USE THE RED ARROWS TO SHOW THE CORRECT SETTINGS OF EVERY CONTROL.

When all set up procedures have been completed, the sound in the auditorium should be of a high-fidelity stereo quality. The surround channel should blend with the screen channels during loud music and effects passages not containing dialogue. The surround channel should not be raised to the point where obvious and constant level changes are heard. An unnatural and distracting effect will result, especially when the surrounds are off; in addition, the screen sound may seem inadequate.

The same is true for the low-frequency transducer. The low frequencies should enhance the overall sound but not be so overpowering that the bass becomes boomy and unnatural.

Because every film sound track is equalized and mixed differently, fine-tuning adjustments have been provided for the surrounds and low-frequency transducer on the front panel of the KT-24. A few minutes during the opening credits of a feature will allow enough time for the adjustment of these levels to give the optimum stereo blend in the theatre.

2.6 Theory of Operation.

2.6.1 Flow Chart SEE FIG. 2.5

2.6.2. Schematic and Board Layouts

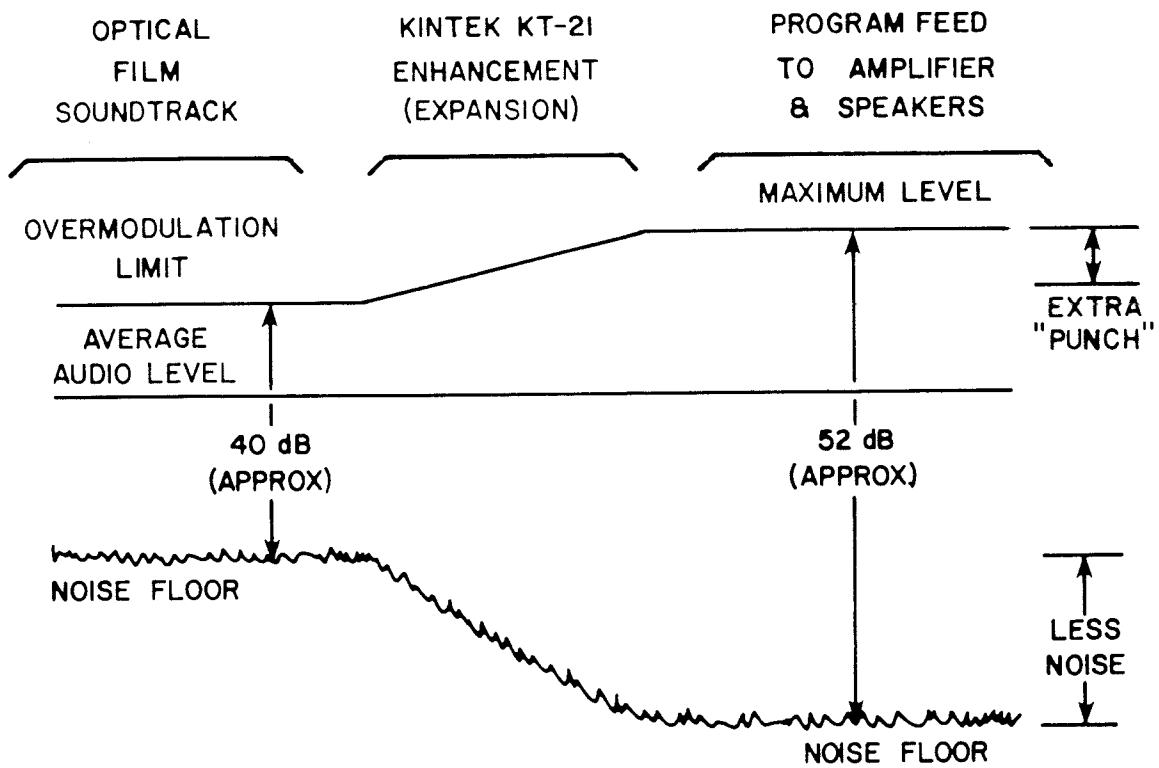


FIGURE 2.1. HOW THE KT-21 WORKS.

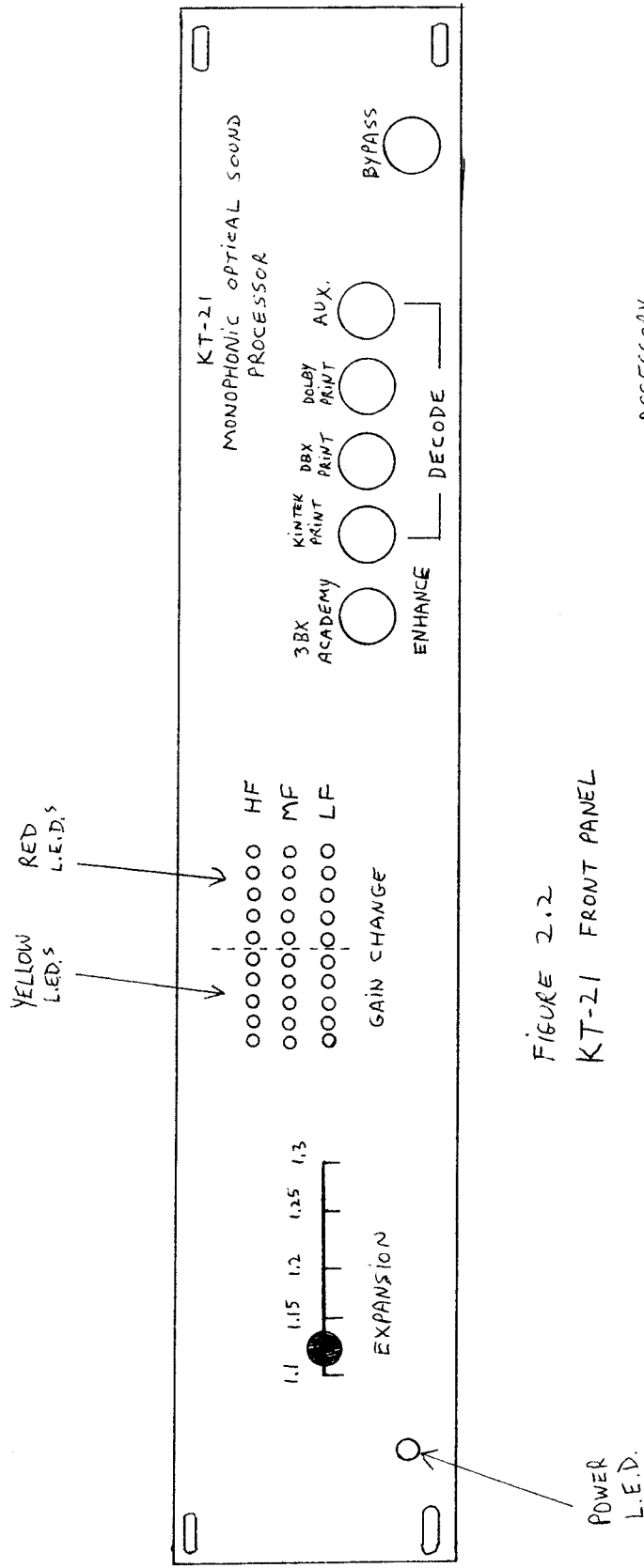
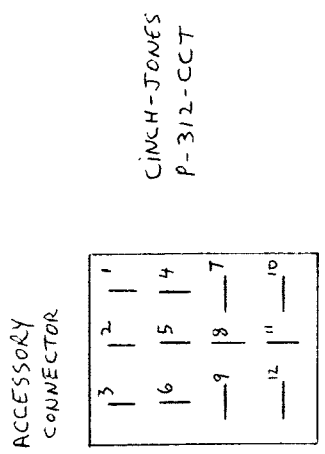


FIGURE 2.2  
KT-21 FRONT PANEL



AS VIEWED  
FROM REAR  
OF UNIT

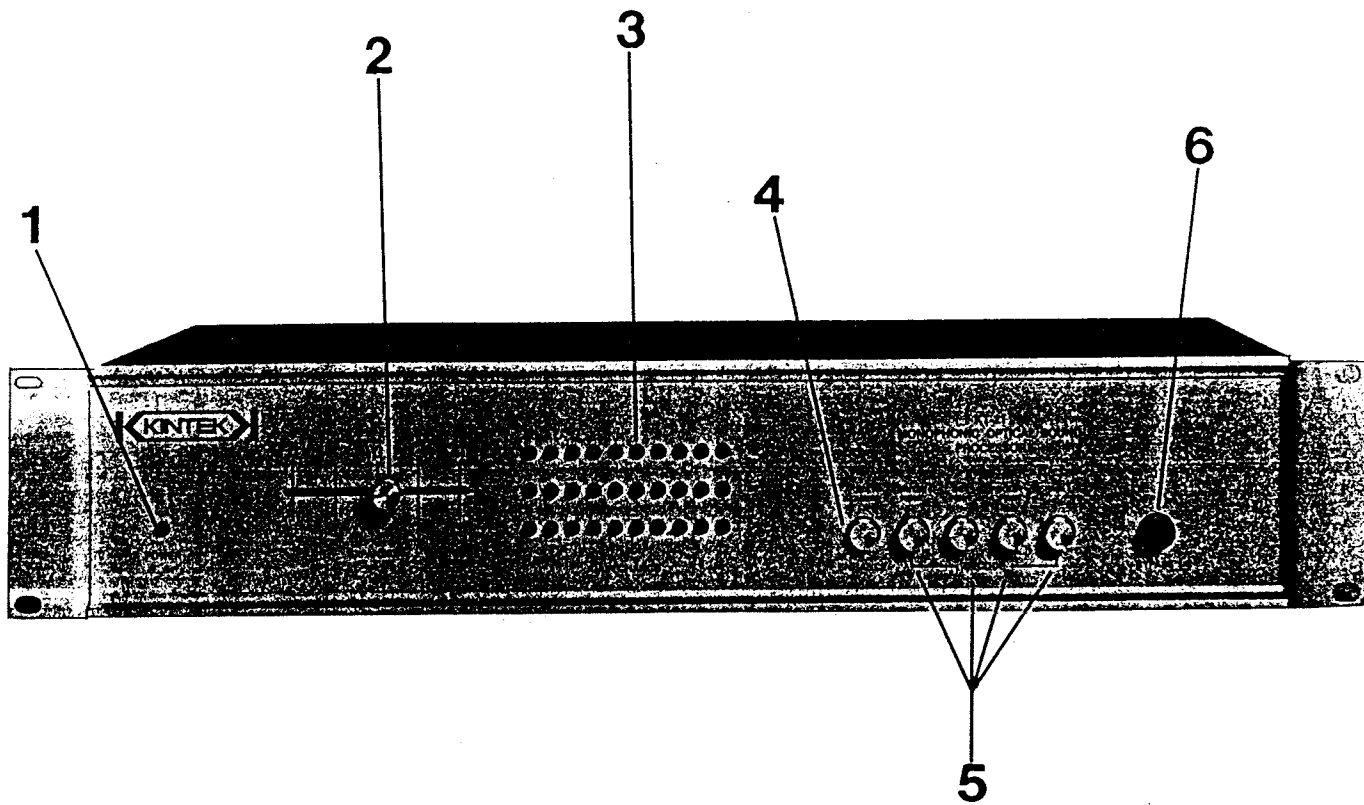


Figure 2.2. Front Panel of the KT-21.



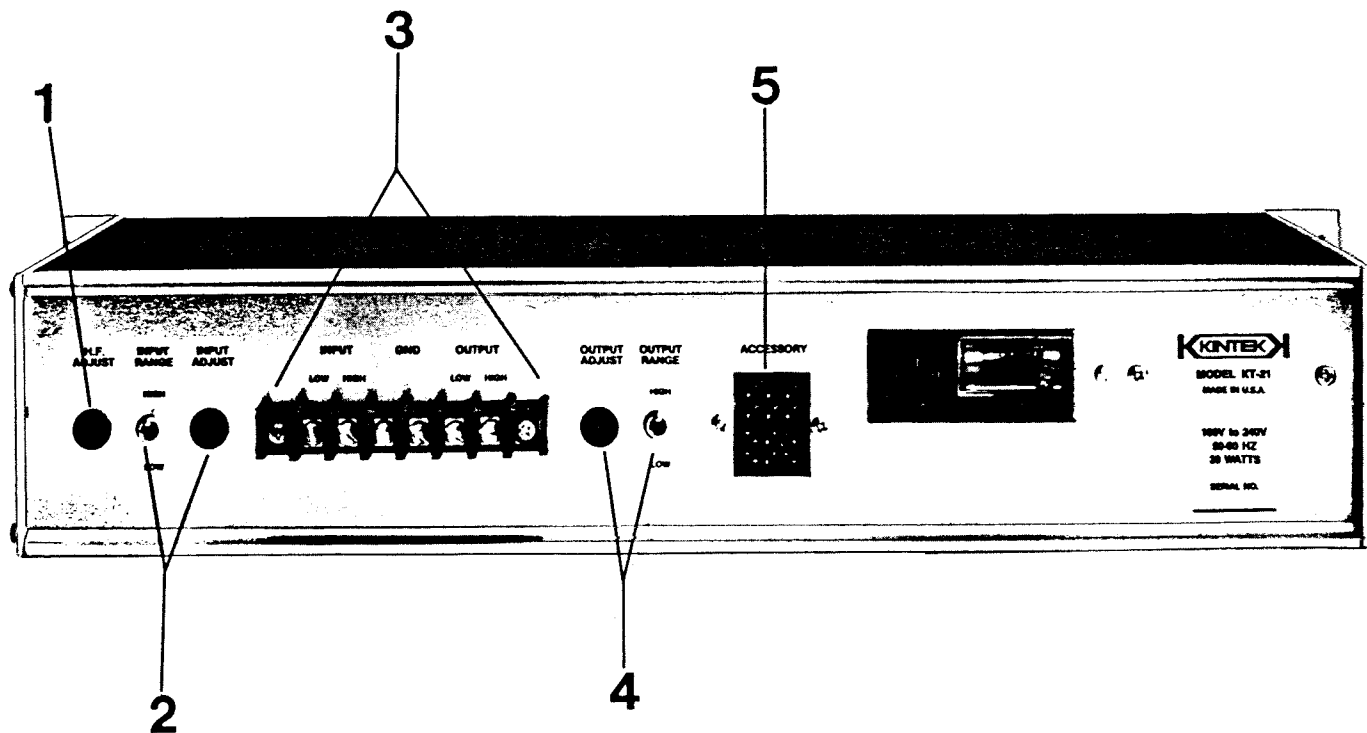


Figure 2.3. Rear Panel of the KT-21.

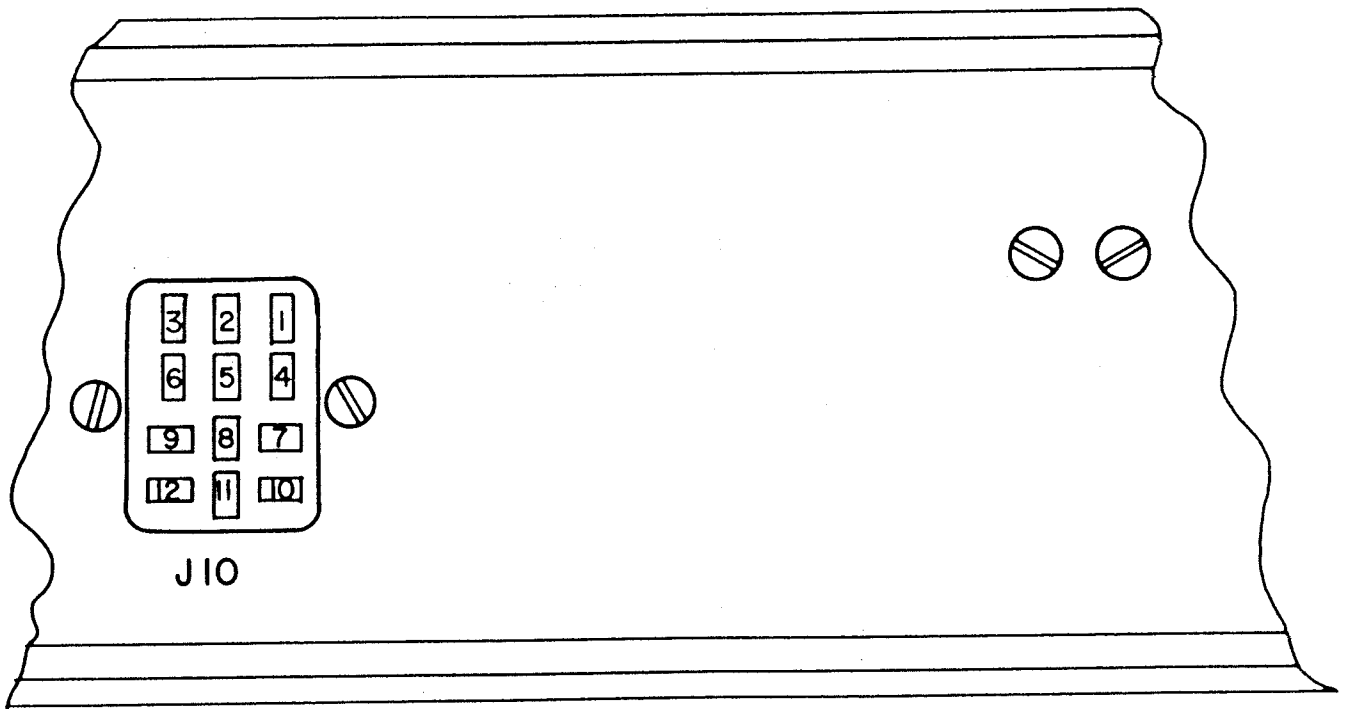


FIGURE 2.4. KT-21 ACCESSORY CONNECTOR PIN ASSIGNMENTS.

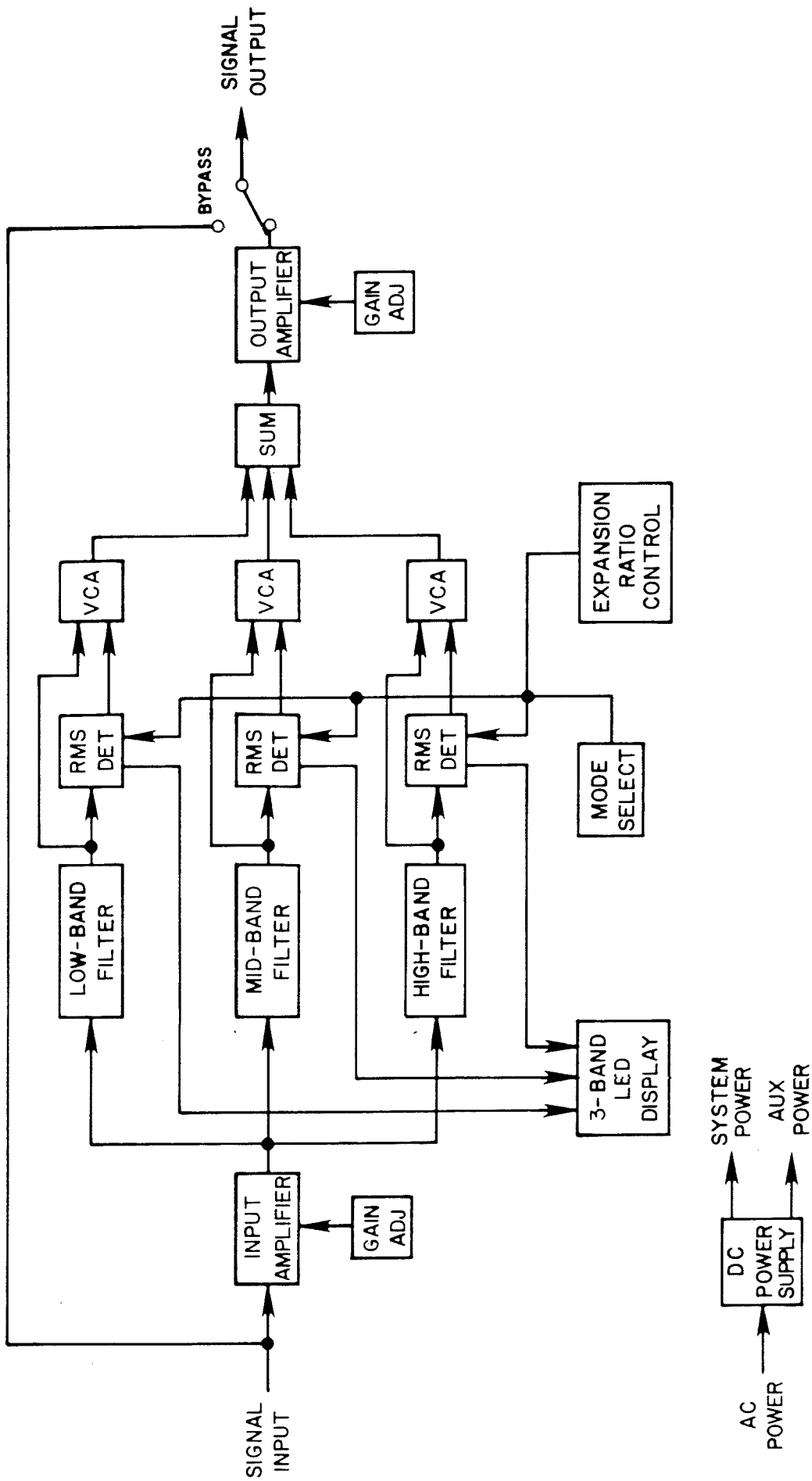
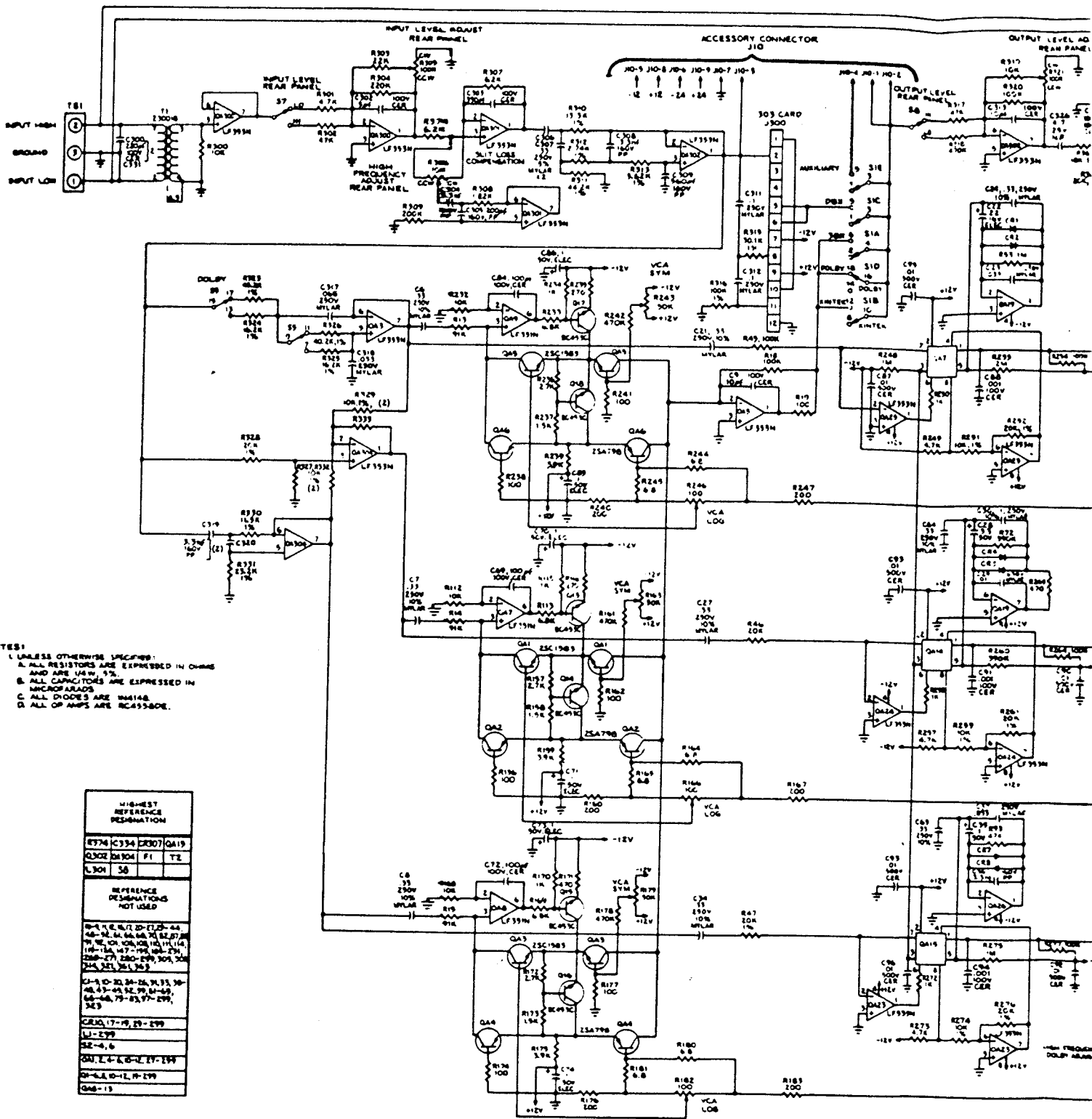


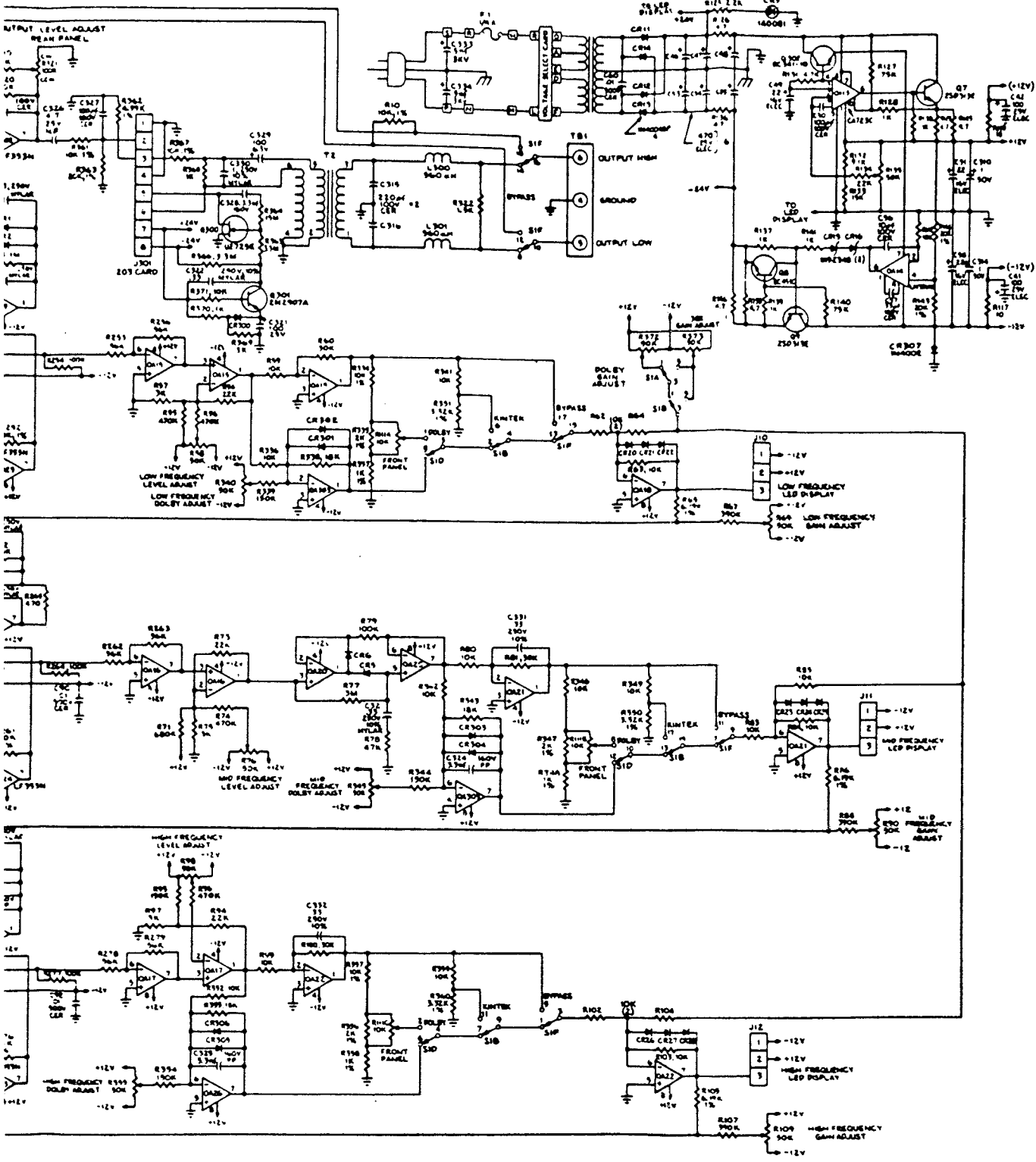
FIGURE 2.5. FLOW CHART OF THE KT-21.



- NOTES:
1. UNLESS OTHERWISE SPECIFIED:
  - A. ALL RESISTORS ARE EXPRESSED IN OHMS AND ARE 1/4 W, 5%.
  - B. ALL CAPACITORS ARE EXPRESSED IN MICROFARADS.
  - C. ALL DIODES ARE 1N4148.
  - D. ALL OP AMPS ARE MC45580E.

HIGHEST REFERENCE DESIGNATION			
R74	C34	D307	Q19
Q302	D104	F1	T2
L301	S8		
REFERENCE DESIGNATIONS NOT USED			
R1-4, 6, 8, 10, 12, 13, 23-44			
46-62, 64, 66, 68, 70, 82, 87, 88			
91, 92, 93, 94, 102, 103, 111, 114, 116-124, 147-199, 204, 231, 236-271, 280-299, 301, 303, 324, 325, 351, 353			
L1-3, 10, 20, 24-26, 33, 36-43, 45-52, 55, 59, 61-69, 68-68, 73-83, 97-299, 323			
C10, 17-19, 21-299			
L1-299			
S2-6, 6			
Q1, L, 4, 6, 8-2, 17-199			
D1-6, 10-1, 1, 199			
Q48-13			

FIGURE 2.6 SCHEMATIC



SCHEMATIC OF THE KT-21 ENLARGED

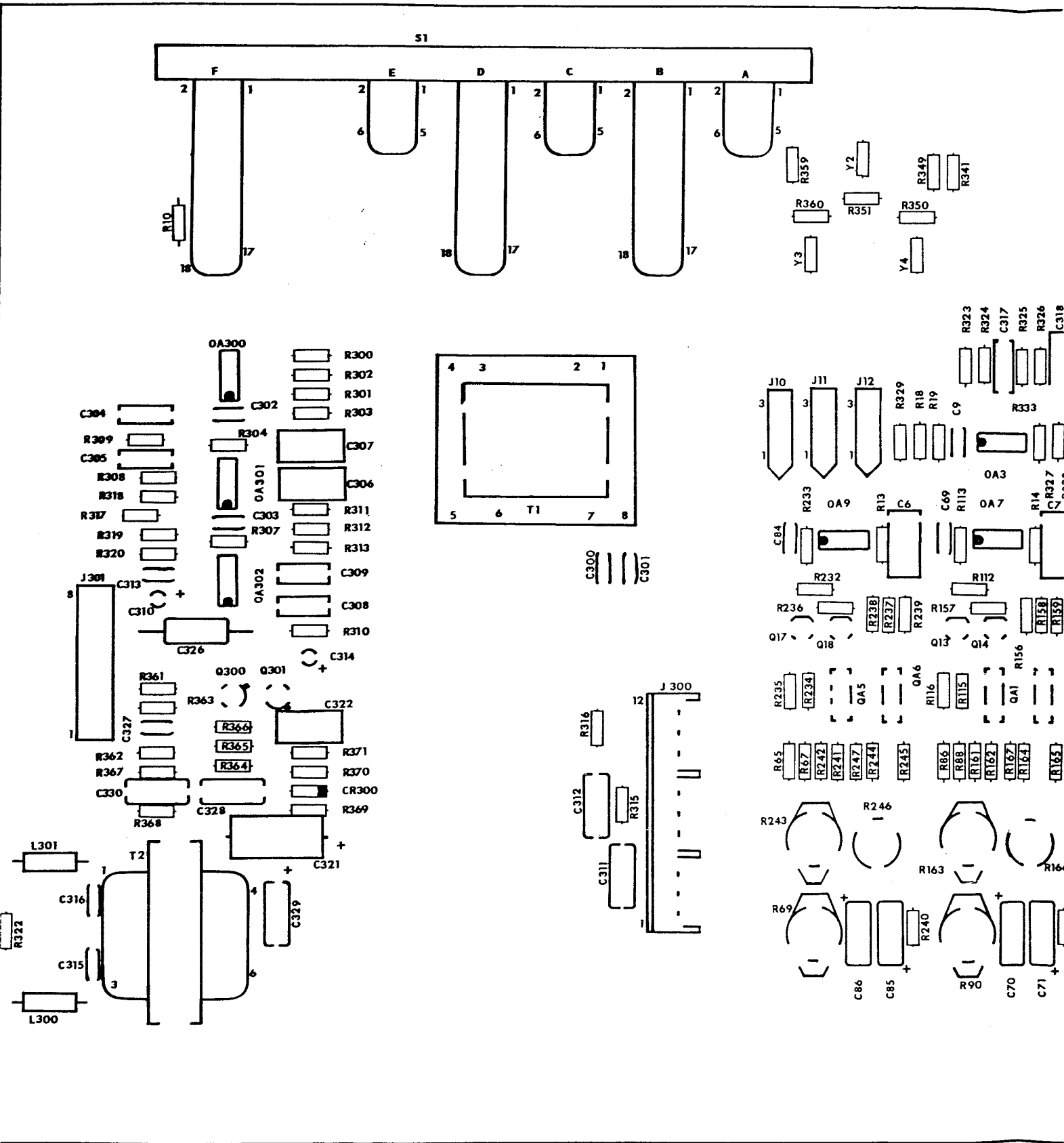


FIGURE 2.7

