Film-Tech

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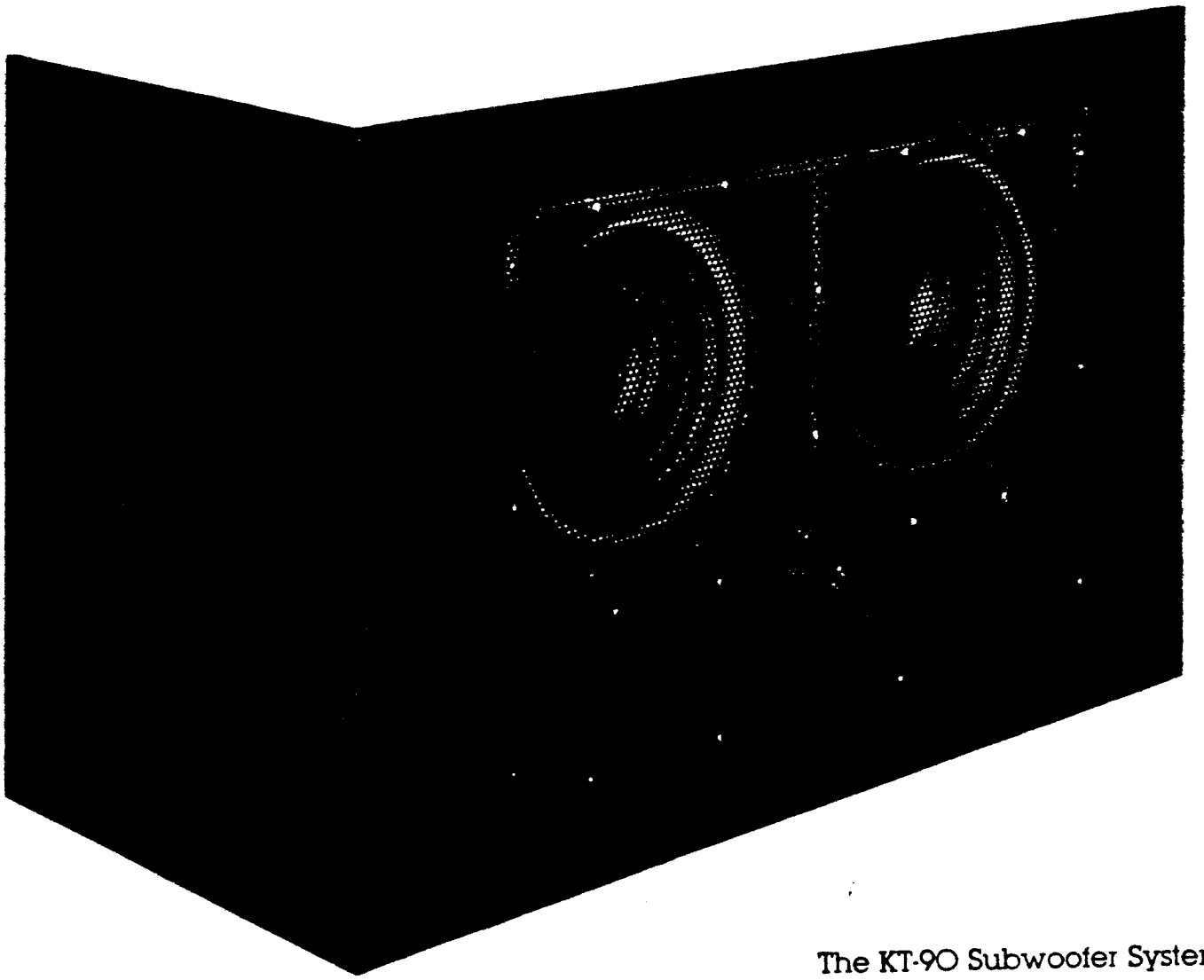


The KT-90 Subwoofer System.

5.0 The KT-90 Subwoofer System

5.1 Introduction

The KT-90 Subwoofer System is specially designed to reproduce bass information from 20 Hz to 200 Hz, as generated by the sub-harmonic synthesizer in the KT-24 Surround-Sound Processor. See Section 4.0 for information on the KT-24. The KT-90 contains a 500-watt power amplifier that is carefully matched to the characteristics of the speaker drivers and the cabinet.

Specific features of the KT-90 include thermal protection of electronics and speakers, over-travel protection of speaker cones, a compressor to prevent clipping and distortion under high-signal conditions, and custom-designed 15-inch speakers with 6-pound ceramic magnets contained in heavy-duty frames.

The KT-90 is designed for the reproduction of the low-frequency sounds found in music and in special effects but normally missing from sound tracks. An installation with multiple KT-90s can create intense earthquake and cannon effects.

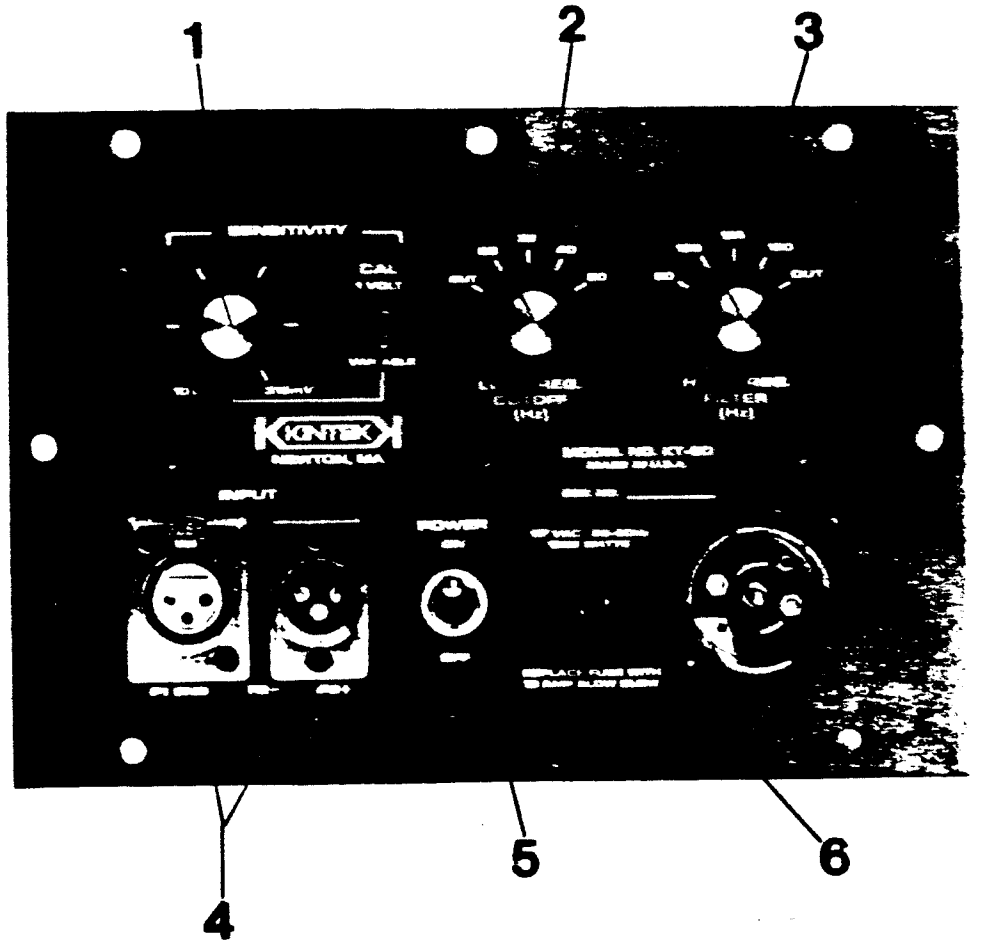


Figure 5.1. Rear Panel of the KT-90.

the "CAL" mode).

Power Requirements	120 VAC, 50 or 60 Hz, 1000 watts maximum consumption. Consult factory for operation with other line voltages.
Dimensions	30" H X 47" W X 24" D. (76.2 cm H X 119.4 cm W X 61 cm D).
Weight	240 pounds. (109.1 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.

5.4 Installation

5.4.1 Unpacking and Placement

Although bass frequencies in the range of the KT-90's output are not directional, it is recommended that the unit be positioned in the front of the theatre, as this location usually assists the balance of low frequencies and front-speaker information. Placing the KT-90 in a corner (or where two or more planes meet) reinforces the bass response of the unit.

The area in front of the KT-90 should be free of any solid obstructions; however, the unit may be placed behind all but the heaviest stage curtains and movie screens before its output is

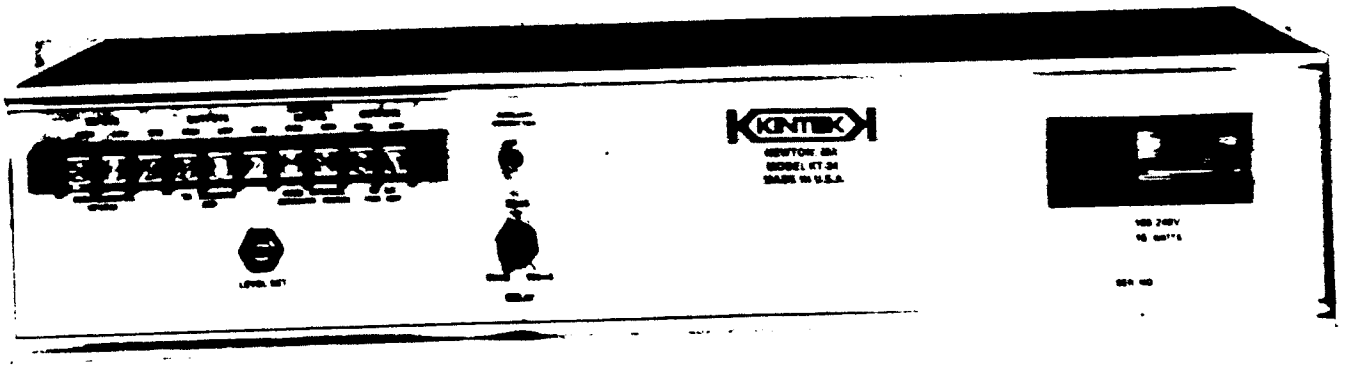


Figure 5.2. Rear Panel of the KT-24.

noticeably muted. Installations with multiple KT-90s can benefit from mutual radiation effects when the units are lined up next to each other. If possible, the rear of the KT-90 should be accessible so the control panel can be reached for future adjustments.

5.4.2 Precautions

Avoid placing the KT-90 near heat sources or where there is high humidity and water.

5.4.3 Connections

The KT-90's power amplifier can accept a balanced or unbalanced signal ranging from 316 mV to 10 V for full power output. Make all connections between the units with the AC power off.

Connection with the KT-24, balanced input.

1. Run an appropriate length of 2-conductor shielded cable between the KT-90 and KT-24; 22-gauge cable with foil wrapping is recommended.

2. Connect two leads to the adjacent high and low terminals on the KT-24 terminal strip marked "To LF PWR AMP." Attach the shield to the ground terminal.

Refer to Figure 5.2. Rear Panel of the KT-24.

3. The KT-90 power amplifier input requires an XLR connector for the female jack on the rear panel.

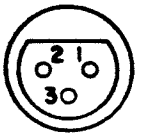
Refer to Figure 5.3. Pin Assignment for the KT-90 Input.

Wire the male XLR connector by following the same code. Do not

PIN 1 = GROUND = SHIELD

PIN 2 = LOW

PIN 3 = HIGH



FEMALE JACK

FIGURE 5.3. KT-90 PIN ASSIGNMENT

wire the metal connector case and input ground together.

Connection with other devices. Use balanced audio lines to avoid noise and hum pickup. The KT-90 is designed to reproduce frequencies between 20 Hz and 200 Hz.

Multiple KT-90 Installation. Inputs to several KT-90s should simply be wired in parallel using the output of the KT-24. Installations with several KT-90s can benefit from mutual radiation effects when the units are lined up next to each other.

AC Power. The KT-90 should be powered from its own line that is separate from the power lines for projectors, curtain motors, etc. A 3-wire or grounded AC line should be used. Do not use 3-to-2 adapter plugs to defeat the ground wire on the KT-90 power cord. A 15-amp slow-blow fuse or 15-amp circuit breaker should be used to feed the KT-90's circuit.

CAUTION: THE KT-90 SHOULD NEVER BE OPENED WHILE THE AC POWER IS ON, THAT IS, WHEN THE INTERLOCK IS DEFEATED. THIS UNIT IS LINE OPERATED: EXPOSED INSIDE WIRING HAS 120 VAC POTENTIAL WITH RESPECT TO OUTSIDE GROUNDS.

5.5 Operation

5.5.1 System Alignment

Refer to Section 1.5.1 for the full alignment procedure. Adjust projector optics, guide roller, and azimuth.

Low- and High-Frequency Adjustment.

Although the KT-90 is designed to reproduce frequencies from 20 Hz to 200 Hz, typical installations require the high-frequency control to be set at "100" and the low-frequency control at "Out." If necessary, different cutoffs can be set after the level of the KT-90 has been adjusted by following the procedure below. However, it is not recommended that during Kintek processing any frequencies above 125 Hz be allowed to pass through the KT-90 because of potential problems with dialogue cross talk. The frequency response of the system can be changed by playing a pink-noise loop and switching the controls to achieve a better balance with the other speakers.

Kintek B Chain Adjustment

1. On the rear panel of the KT-21, place the input and output range switches in the "low" positon. Set the output level control to maximum cw.

2. Place the selector in the "film" position on the KT-33. With the pink-noise loop running, adjust the master fader control to "normal."

3. On the KT-21, make sure the "enhance" button is pushed in and the expansion control is at the minimum (left) position. 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.

4. Turn down the master fader. Push the "operate" button on the KT-22.

5. Turn all KT-100 Power Amplifier input level controls to the full ccw (minimum) position. Turn on the KT-100s. Leave the KT-90 off.

6. Raise the center-channel (power amplifier "C") input level to the full cw position. Turn up the master fader until a moderate level of pink noise is heard from the center speaker.

7. Check the speaker for the proper operation of all drivers. Turn down the level control on the power amplifier.

8. Repeat Steps 6 and 7 for the left, right, and surround channels. To check the surround speakers, temporarily raise the surround level (front panel) and surround limit control (rear panel) on the KT-24. Repair speakers as necessary. Proper calibration of the Kintek System requires that all speakers be in proper working order and in phase with each other.

9. Turn down (full ccw) the master fader, surround level, surround limit, and surround power-amplifier level.

10. Raise (full cw) the left, center, and right amplifier levels.

11. With a pink-noise loop running and the operate button on the KT-22 pushed in, advance the master fader until there is a moderate level heard in the theatre.

12. Set the SPL meter on the fast C-weighted scale and place it 2 to 4 feet in front of the left speaker. Note the reading and repeat for the center and right speakers. All the speakers should be producing the same level. If it is necessary to match the center speaker's level with the left and right speakers, adjust the center-channel output control on the KT-22. Stop the pink-noise loop.

13. Measure the distance from the screen to the rear surround speaker. Add 10 feet. On the rear panel of the KT-24, set the delay to that number.

14. 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.

15. Set the master fader to "normal."

16. The level controls of the left, center, and right amplifiers channel should be at the full cw position.

17. 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.

18. Turn off all power amplifiers.

19. With the pink-noise loop still running, adjust the input level on the rear panel of the KT-24 so only the last two yellows LEDs are on.

20. Make sure the master fader is on the "normal" position.

21. Turn on all power amplifiers. Leave the KT-90 off.

22. Raise the level on the surround amplifier channel to the full cw position. All other power amplfier levels should be at the full cw position and left there.

23. With the pink-noise loop running, a measurement of 75 dBc should be read on the meter in the center of the seating area. Repeat steps 17 to 22 if another level is measured.

24. On the rear panel of the KT-24, make sure the surround limit is turned down (full ccw). On the front panel, turn up the surround level to "5." Raise the surround limit on the rear panel until the level in center of the seating area increases from 75 dBc to 77 dBC.

<u>On early kt-24's without a surround limit control on the rear panel:</u> Simply adjust the front surround level control until the level in the center of the seating area increases from 75 dBc to 77 dBc. Place a red arrow on the KT-24 front panel to indicate the position of the surround level.

25. Turn off all power amplfiers. Reinstall the caps in the proper access holes.

26. With the pink-noise loop running, raise the low-frequency level control on the front panel of the KT-24 to 3 o'clock. The master fader should still be in the "normal" position.

27. On the KT-90 behind the screen, turn down (full ccw) the sensitivity control.

28. Set the high-frequency control to "100" and the low-frequency control to "out."

29. Be sure the SPL meter will not be "hearing" ambient noise from projectors, air conditioners, or traffic sounds, which should register less than 55 dBc in the center of the seating area. Turn on the KT-90. Adjust the sensitivity control for an SPL level of 75 dBc in the center of the seating area.

30. Return to the booth. Turn on all power amplifiers. Push in the bypass button on the KT-24. Advance the master fader until a level of 85 dBc is measured in the center of the seating area.

31. Set the selector on the front panel of the KT-31 to "all." Observe the VU meter on the KT-31 while setting the meter adjust control on the rear panel of the KT-33. Adjust for a reading of -6 dB on the meter.

32. Push in the "surround with low frequency" button on the front

of the KT-24.

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

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

35. Set the fader for a normal listening level in theatre. The master fader setting should be in the 10 to 1 o'clock range. 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.

36. 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.

Please Note: Do not increase the surround level more than two marks beyond the red arrow; otherwise, the system will be out of balance.

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 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 this level to give the optimum balance in the theatre.

5.6 Theory of Operation.

5.6.1 Flow Chart

5.6.2 Schematic and Board Layouts

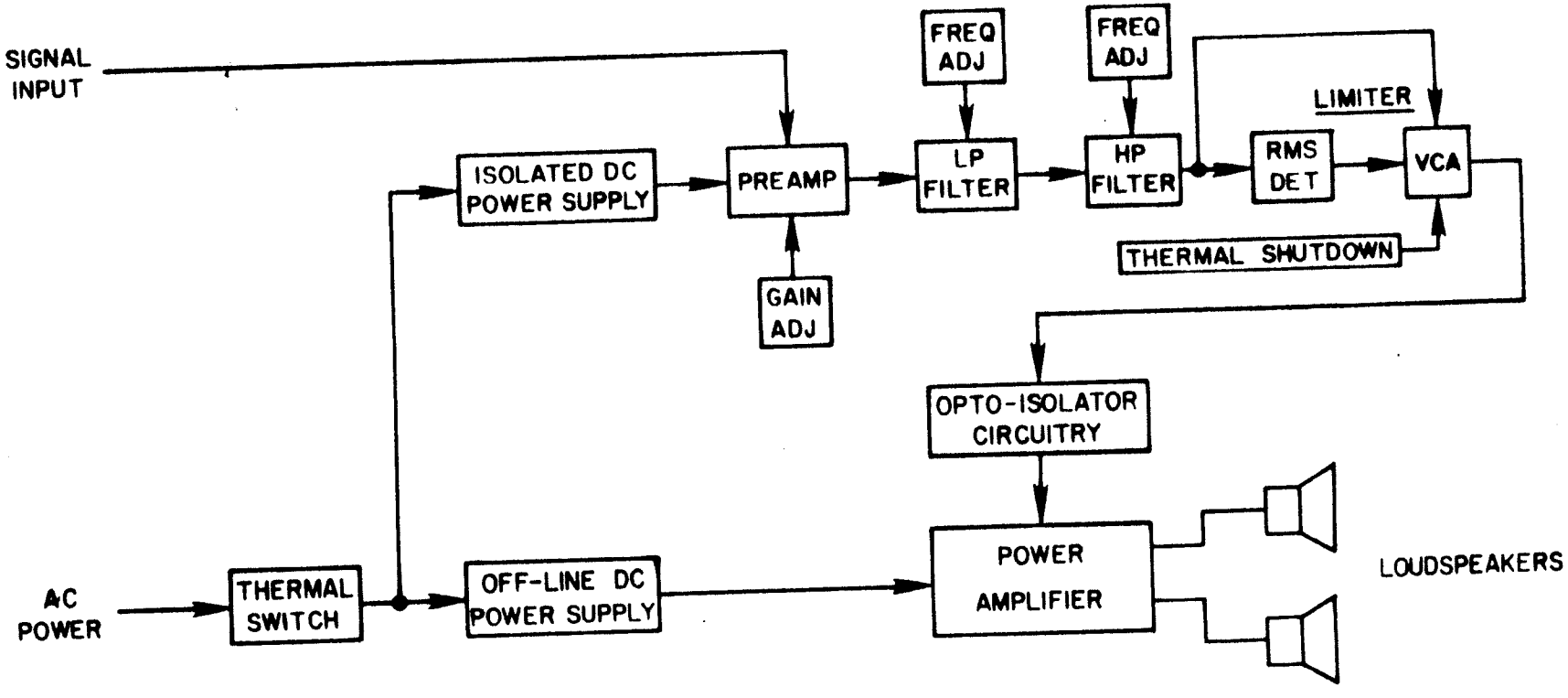
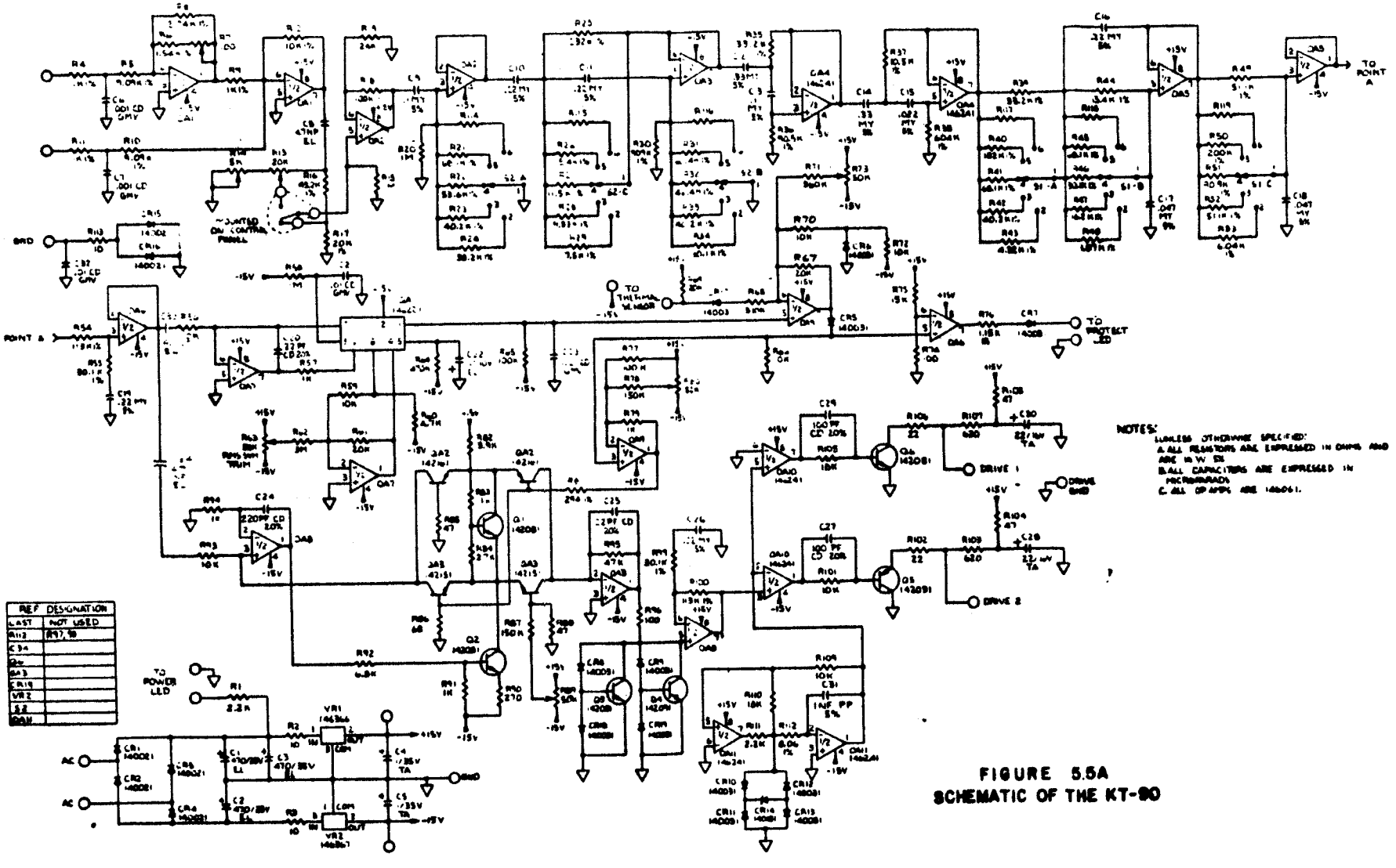
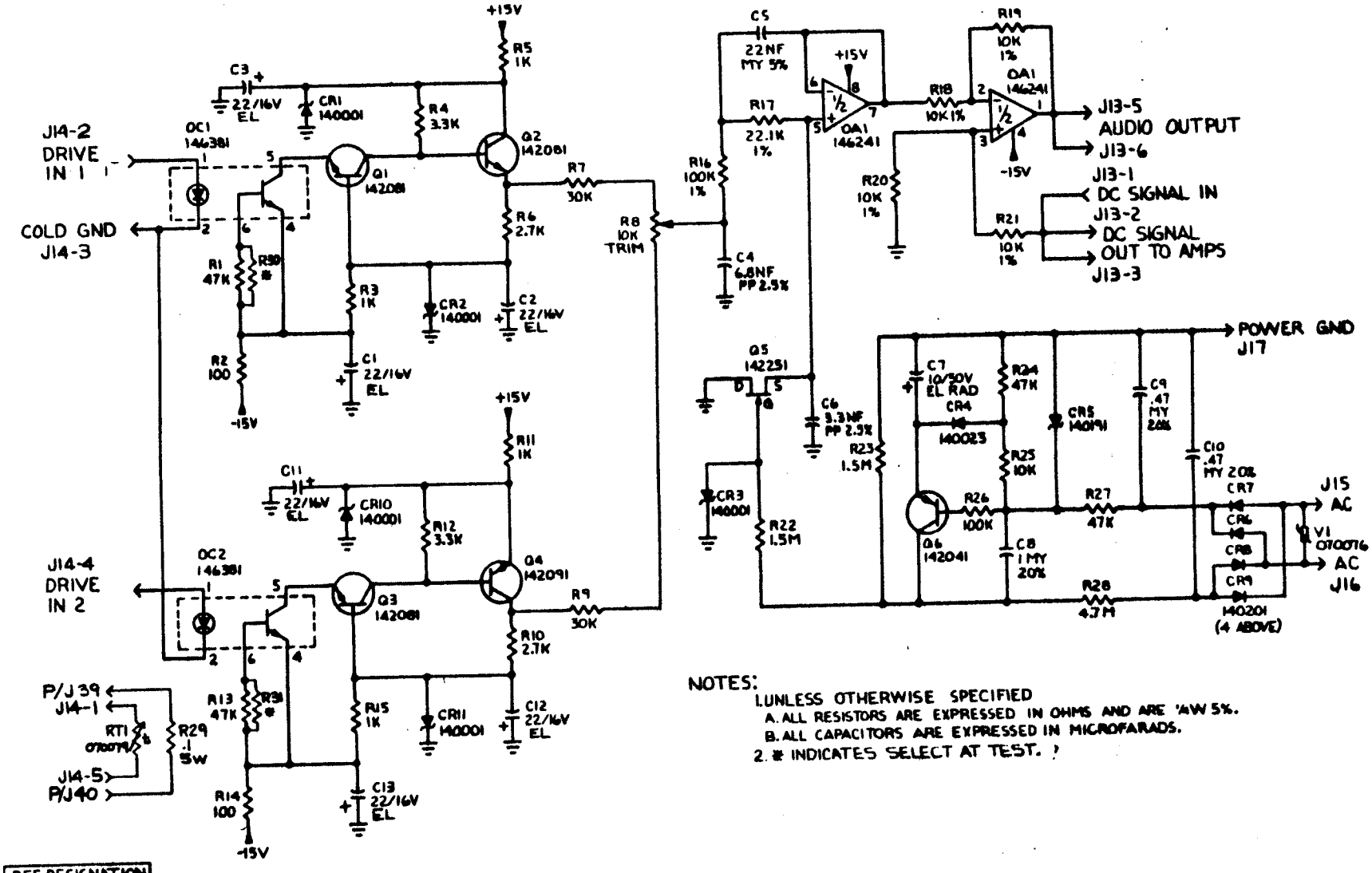


FIGURE 5.4. FLOW CHART OF THE KT-90.



REF DESIGNATION	
LAST	NOT USED
R113	R97, 98
C34	
D4	
RA3	
CR19	
VR2	
Q3	
RAM	

FIGURE 5.5A
SCHEMATIC OF THE KT-90

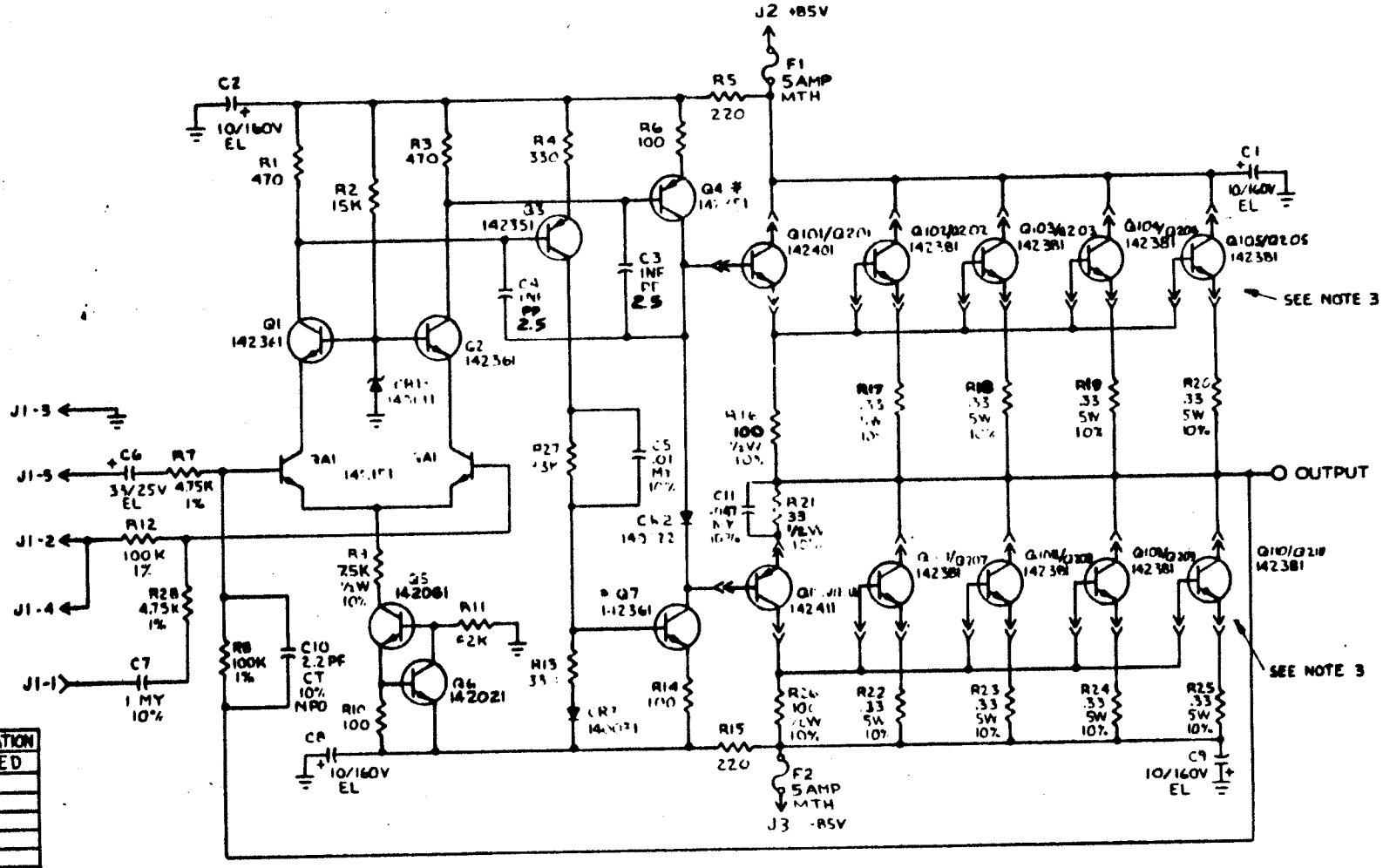


NOTES:

1. UNLESS OTHERWISE SPECIFIED
   A. ALL RESISTORS ARE EXPRESSED IN OHMS AND ARE ¼W 5%.
   B. ALL CAPACITORS ARE EXPRESSED IN MICROFARADS.
2. # INDICATES SELECT AT TEST.

REF DESIGNATION	
LAST	NOT USED
R31	
C15	
Q6	
CR11	
OC2	
V1	
J17	
RT1	

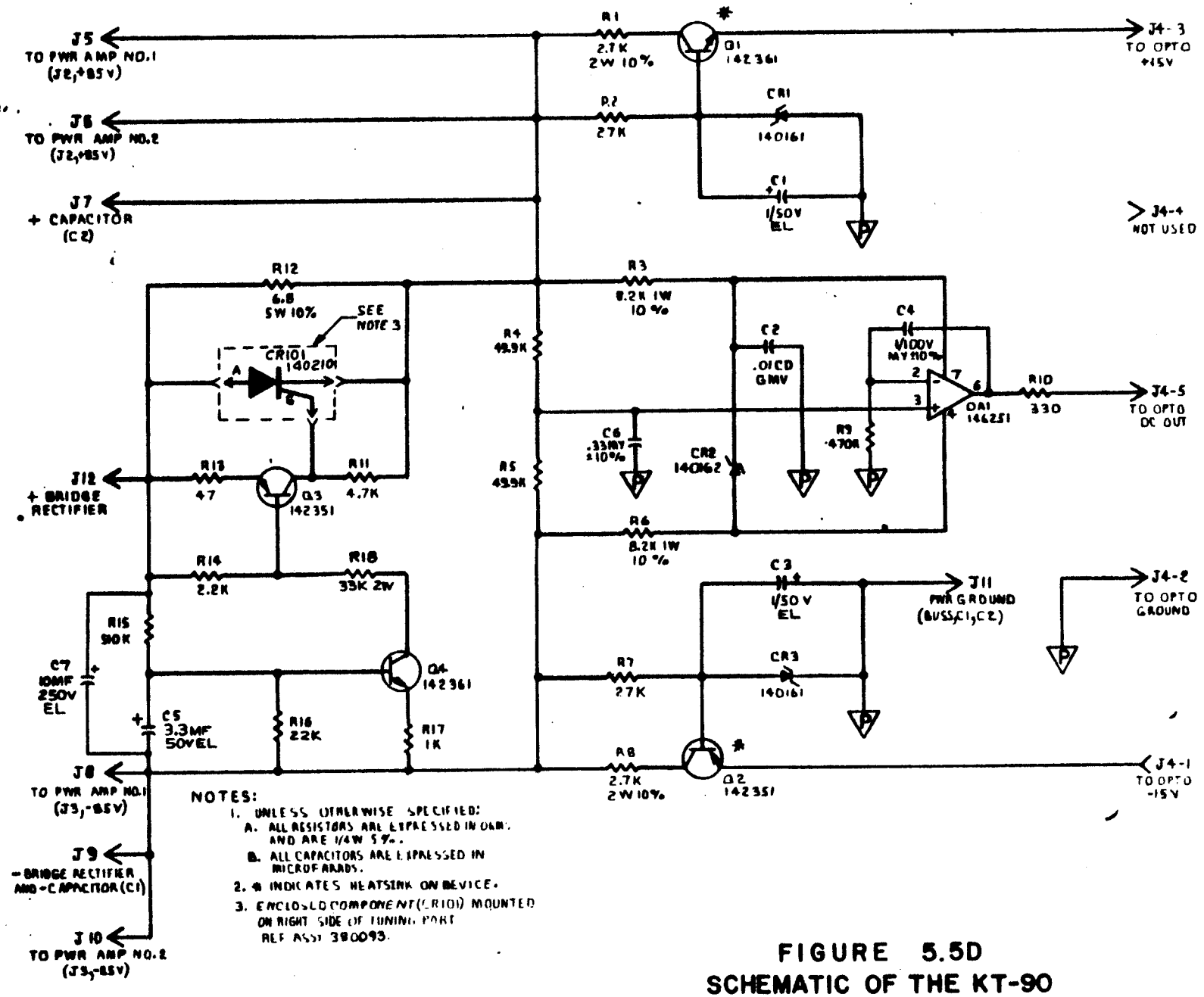
FIGURE 5.5B
SCHEMATIC OF THE KT-90



REF DESIGNATION	
LAST	NOT USED
R28	
C11	
Q7	
CR3	
QA1	
F2	
J3	
Q110	
Q210	

NOTES:
1. UNLESS OTHERWISE SPECIFIED:
   A. ALL RESISTORS ARE EXPRESSED IN OHMS AND ARE ½W 5%.
   B. ALL CAPACITORS ARE EXPRESSED IN MICROFARADS.
2. * DENOTES HEATSINK ON DEVICE
3. ENCLOSED COMPONENT AREAS MOUNTED ON [illegible] PORT, REF DES [illegible] 380033
   REF DES USED ON RIGHT SIDE OF PORT FOR POWER AMP BOARD #1, WILL BE Q101 THRU Q110.
   REF DES USED ON LEFT SIDE OF PORT, FOR POWER AMP BOARD #2, WILL BE Q201 THRU Q210.

FIGURE 5.5C
SCHEMATIC OF THE KT-90



NOTES:

1. UNLESS OTHERWISE SPECIFIED:
   A. ALL RESISTORS ARE EXPRESSED IN OHMS AND ARE 1/4W 5%.
   B. ALL CAPACITORS ARE EXPRESSED IN MICROFARADS.
2. * INDICATES HEATSINK ON DEVICE.
3. ENCLOSED COMPONENT (CR101) MOUNTED ON RIGHT SIDE OF TUNING PORT REF ASSY 380093.

FIGURE 5.5D
SCHEMATIC OF THE KT-90

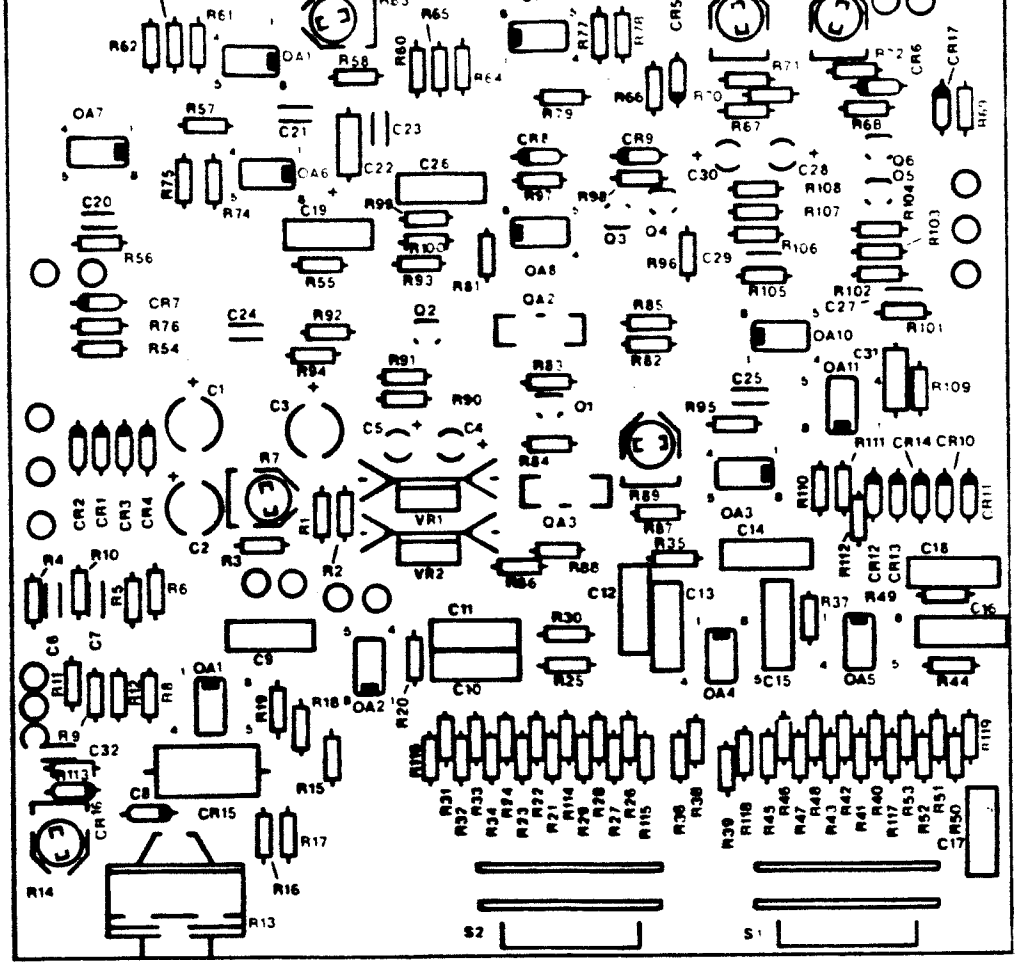


FIGURE 5.6A
BOARD LAYOUT OF THE KT-90

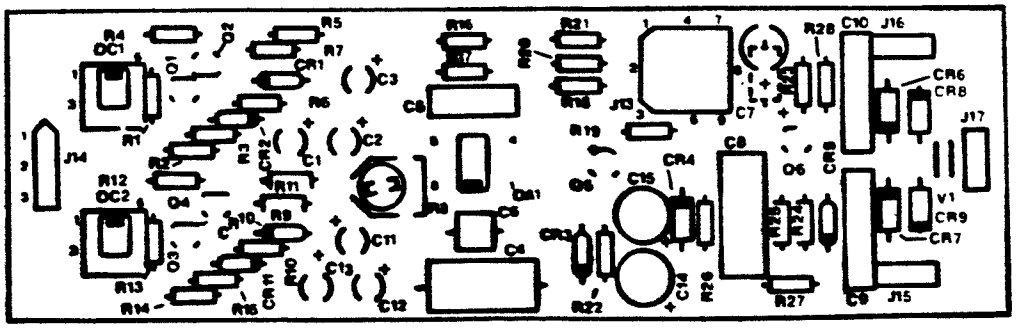


FIGURE 5.6B
BOARD LAYOUT OF THE KT-90

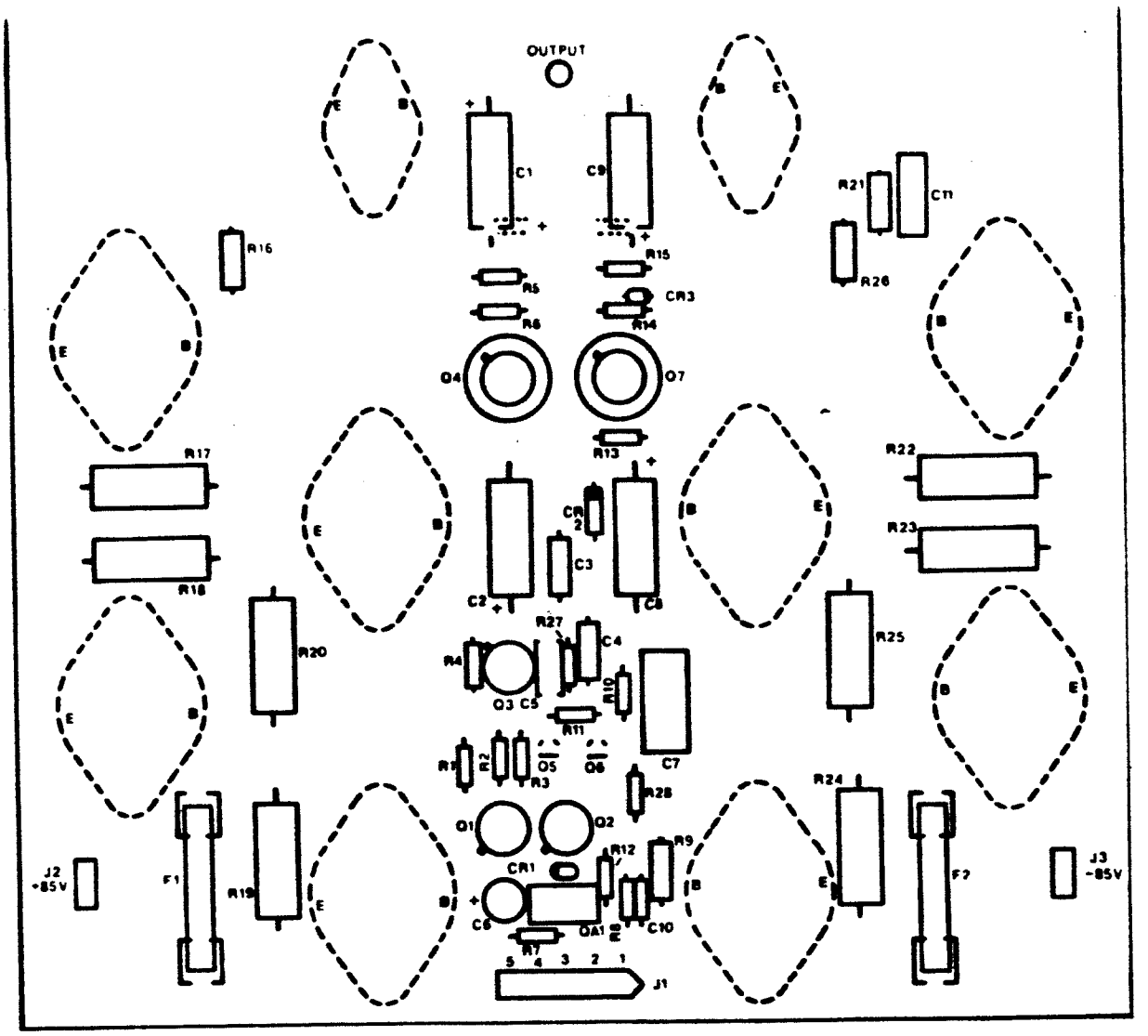


FIGURE 5.6C
BOARD LAYOUT OF THE KT-90

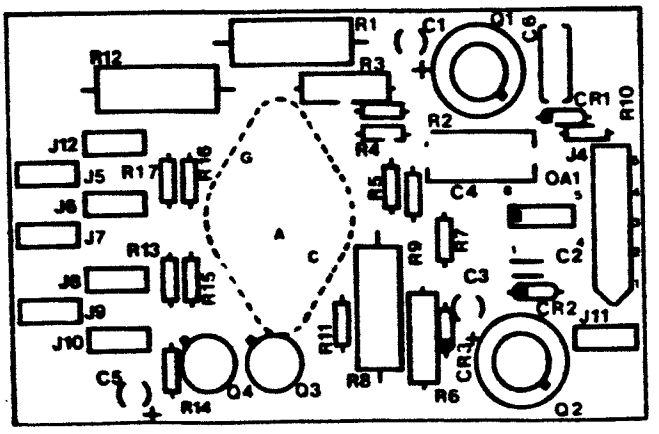


FIGURE 5.6D
BOARD LAYOUT OF THE KT-90