Price $5.00

INSTRUCTION MANUAL

MODEL D-110B

POWER AMPLIFIER

(Includes Model D-110)

audio research corporation
6801 SHINGLE CREEK PARKWAY
MINNEAPOLIS, MINNESOTA 55430

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N O T I C E

THIS INSTRUCTION MANUAL COVERS OPERATION OF BOTH MODEL D-110B AND D-110 POWER AMPLIFIERS. "D-110", AS USED THROUGHOUT THE TEXT, APPLIES EQUALLY TO BOTH MODELS.

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INTRODUCTION

Congratulations on your purchase. The D-110 solid state dual channel power amplifier was conceived and designed for audio perfectionists. "Analog Module" front end circuitry coupled to a unique linear output stage provides stable "high definition" performance.

The D-110 output stage utilizes a total of 32 power devices coupled to a special heat sink design. It will drive capacitive or inductive loads and withstand accidental shorts without the aid of protective circuitry. It is also self-biasing - no internal biasing or balance adjustments are used or needed. Sonic performance will not change with time or temperature.

WARRANTY

A limited 90-Day Warranty (from the date of purchase by the original purchaser) is provided by Audio Research Corporation. This warranty is subject to the conditions and limitations stated with the documents attached to the outer shipping carton.

ADDITIONAL LIMITED WARRANTY

A 3-Year Additional Limited Warranty Application is included with the documents attached to the outer shipping carton.

THIS ADDITIONAL LIMITED WARRANTY WILL NOT BE ISSUED OR EFFECTIVE UNLESS WITHIN THIRTY DAYS AFTER THE DATE OF SALE THE PURCHASER MAILS TO AUDIO RESEARCH THE APPLICATION FORM WHICH HAS BEEN COMPLETED, DATED AND SIGNED BY BOTH THE SELLING DEALER AND THE PURCHASER, TOGETHER WITH A COPY OF THE BILL OF SALE OR OTHER PROOF OF PURCHASE OF THE PRODUCT.

PACKAGING

Save All The Packaging - Your Audio Research component is a precision electronic instrument and should be properly cartoned any time shipment is made. You may never have occasion to return it to the factory for service, but if such should be necessary, or other occasion to ship it occurs, the original packaging may save your investment from unnecessary damage or delay.

ACCESSORIES

The following spare fuses are included with your D-110.

(1) AC line fuse
(2) DC supply fuses
(3) Speaker line fuses

WARNING

To prevent fire or shock hazard, do not expose this equipment to rain or moisture.

This unit contains voltages which may be dangerous. Do not operate this unit with covers removed. Refer servicing to qualified personnel.

CAUTION

For continued protection against fire hazard, replace only with same type and rating fuse.

SPECIFICATIONS

Power Output:	110 WATTS PER CHANNEL MINIMUM RMS (both channels operating) AT 8 OHMS FROM 1 Hz to 20 kHz WITH LESS THAN .1% TOTAL HARMONIC DISTORTION (.25% - D-110) Typical .02% at 1 kHz Typical 220 watts into 4 ohms, 130 watts into 8 ohms, 70 watts into 16 ohms at clipping (D-110B - both channels operating).		
Intermodulation Distortion:	Less than 0.1% at rated output (80Vp-p) and load, SMPTE method, 60 Hz and 7 kHz, 4:1	Noise:	Less than 50 microvolts equivalent input noise with shorted inputs (20 Hz to 20 kHz). Typically 95dB below rated output
Frequency Response:	.05 Hz to 100 kHz (-3dB), 1 W, 8 ohms	Speaker Output:	Single ended, dual channel
Input Sensitivity:	1.5 Volts for rated output	Damping Factor:	More than 500 (1 Hz to 20 kHz)
Input Impedance:	60K ohms (D-110B) 30K ohms (D-110)	Output Offset:	Less than 10 mV
Protection Components:	Thermal AC switch, AC line fuse, DC supply fuses Speaker line fuses	Power Requirements:	105-120/210-240 VAC 50/60 Hz, 1500 watts maximum momentary 550 watts @ rated power 300 watts @ idle
Dimensions:	19" (48 cm) W, 17 1/4" (43.6 cm) D, 10 1/2" (26.5 cm) H, rack mount panel. Handles extend 1 5/8" (4.1 cm) forward of the front panel	Weight:	92 lbs. (42kg) net, 107 lbs. (49kg) shipping

INSTALLATION

Mechanical:

To insure normal component life, this equipment must be operated in a horizontal position to receive proper ventilation. Never confine this device such as to inhibit proper cooling by natural convection through the ventilated enclosure and finned heat sink. If this equipment is to be operated within a confined space or rack-type cabinet, make certain that adequate inflow and outflow air is available to the built-in fans. The "ambient" operating temperature should never exceed 120°F or 50°C.

It is normal for the heat sink assembly to run warm to the touch after "warm-up" or thermal equilibrium. All components within are operated at safe conservative levels and are part of a unique high performance design.

Electrical:

Proceed with system wiring as outlined below:

1. Connect the left and right channel loudspeakers to the amplifier "output" binding posts located on the rear panels to each side of the heat sink assembly. For convenience and/or reference, the left rear panel should be used for "left" channel wiring connections and the right rear panel for "right" channel connections. Use lamp cord or two conductor wiring according to the following table (Special speaker wires, such as "FMI Gold," "FMI Brown," "Monster Cable," etc., will significantly improve performance over "lamp cord" type wires):

Wire Guage (AWG)	Maximum Distance -vs- Impedance (16 ohm)	(8 ohm)	(4 ohm)
14	16 ft.	8 ft.	4 ft.
12	24 ft.	12 ft.	6 ft.
10	40 ft.	20 ft.	10 ft.
8	64 ft.	32 ft.	16 ft.

   Make sure that the speakers are "phased" properly, i.e., identical wiring and connections for each channel between amplifier and speaker terminals. The black binding posts are ground and the red are "hot."

   Note: The D-110 is a NON-INVERTING amplifier, i.e., the output signal at the hot or red terminal is in-phase with the input signal. This is of no consequence except in bi- and tri-amplified systems where the amplifiers and their respective speakers must be phased properly.

2. Connect the left and right channel audio inputs on the rear panels to the main left and right outputs respectively of the preamplifier or electronic crossover. Use only high quality shielded phono cables. Avoid inexpensive cables which use "weak" or soft metal grounding shells as they may introduce hum and/or noise into the system. Best results will be obtained with the latest version FMI audio interconnect cables or equivalent.

3. Finally, with the power switch on the preamplifier in the "off" position, connect the line cord plug into a switched outlet or Audio Research RPR-1 Remote Power Receptacle. Keep the line cord away from preamp phono input cables.

4. Monaural Connection:

The outputs of the D-110 may be bridged for monaural (balanced output) operation with increased power output capability. Proceed as follows:

a) Remove the top cover.

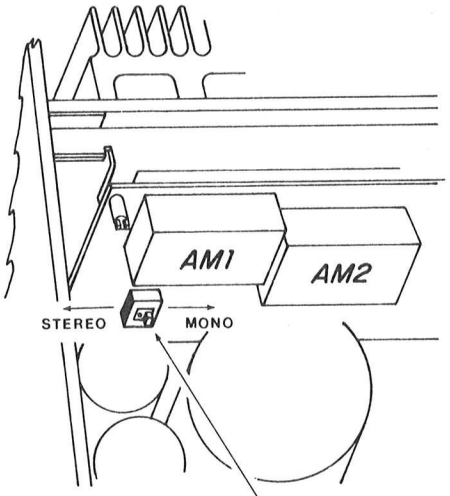
b) Move the printed circuit slide switch shown below toward the center of the board until a white dot appears in the "switch window" and a detent stop is felt.

c) Replace the top cover.

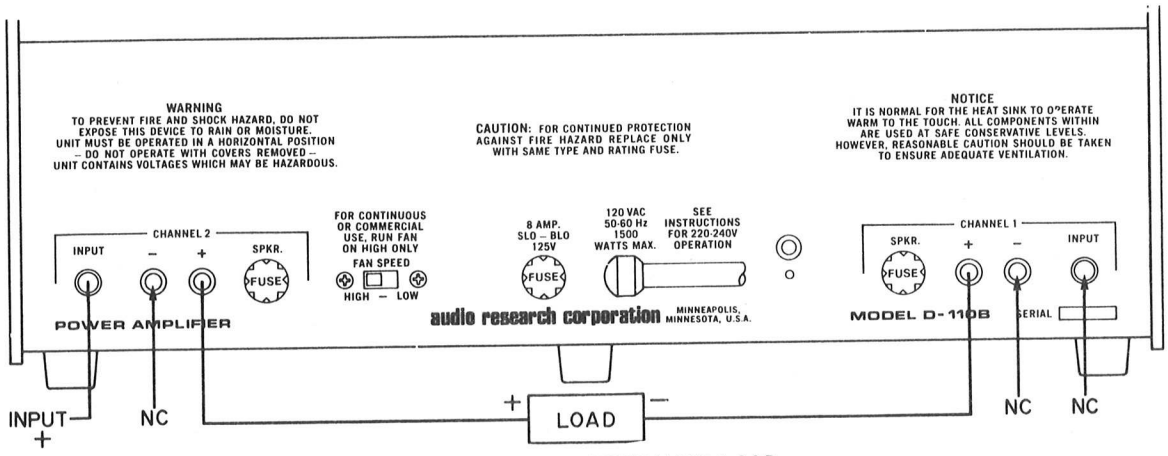
d) Connect an 8 ohm (minimum recommended impedance) load or greater between the "red" output terminals as shown in the figure below.

Note: Do not use less than an 8 ohm load in the bridged output configuration, except for music reproduction into loudspeaker loads, then 4 ohm loads are permitted.

e) Connect the "signal" shielded audio cable to the Channel 2 input as shown. Input and output signal polarities are also shown in the figure below.



INTERNAL MONAURAL SWITCH LOCATION



8 OHM MINIMUM IMPEDANCE LOAD

MONAURAL (BRIDGED) OPERATION CONNECTIONS

OPERATION

Once the D-110 has been properly connected into the system as instructed in the previous section, proceed to operate as follows:

1. Turn "system" power switch "ON." Turn the D-110 power switch "ON." The AC voltage meter should illuminate indicating that the D-110 is "on." Each of the "power" meters contain a left and right pilot lamp which also serves as a "fuse out" indicator for positive or negative DC power to the output stages, respectively.

2. Adjust the preamplifier for desired source and volume level.

   Note that it is perfectly normal for the heat sink assembly to run quite warm to the touch after thermal equilibrium is reached. The quiescent power dissipation of the output stage is distributed between 32 high power devices - each operating at a safe, conservative level.

3. Speaker Fuses

   Front panel DC supply fuses provide "output" protection against any catastrophic failure. However, for maximum speaker protection a speaker fuse holder is provided to protect against high power levels or any possible catastrophic failure. A suitable fuse value can be calculated using the following equation:

$$I = \sqrt{\frac{P}{Z}}$$

where: I = fuse value in amperes
P = Continuous power rating of speaker (CAUTION - only use continuous average power rating as supplied by the speaker manufacturer.)
Z = nominal speaker impedance

example: What value fuse is required to protect an 8 ohm speaker rated at 35 Watts, continuous?

$$I = \sqrt{\frac{35}{8}} = \sqrt{4.375} = 2.09 \text{ Amps}$$

Therefore, use a 2 Ampere fast-blow type fuse.

4. AC Line Fuse Replacement

   In the event of an output overload, catastrophic failure or power line transient, the AC line fuse may blow. This fuse is accessible at the rear panel and should be replaced with the spare fuse included in the original packaging or equivalent. Bussman type SLO-BLO fuses are recommended, since they withstand high turn-on surge currents better than most other brands.

   Note: D-110 and early D-110B units used 5 Amp line fuses. If line fuses tend to blow at turn-on, replace with Bussman type SLO-BLO 8 Amp fuses (4 Amp for 240 VAC) as on later D-110B units.

5. DC Supply Fuse Replacement

In the event of abusive output overload or catastrophic failure, one or both of the DC supply fuses for each channel may blow. This is normal in the event of such an overload and will simply necessitate the replacement of the fuse(s) located on the front panel. There are (2) fuses for each channel (±50 VDC supplies). The left hand pair of fuses is for channel 1, etc.

TURN OFF THE AC POWER BEFORE REPLACING ANY OF THE FUSES.

Note: The D-110 has been designed to deliver maximum output current under any output voltage conditions. This feature is essential for proper performance with complex or reactive speaker loads. Sound-degrading loadline or VI limiting circuitry has not been employed within the D-110. Instead, multiple high power devices safely handle any output condition or load that may exist under normal output conditions without the need for protective "circuitry." Only simple DC supply fusing against sustained abusive output loads has been employed.

GENERAL RECOMMENDATIONS

1. The D-110 is designed to operate on line voltages from 105 VAC to 125 VAC, 50-60 Hz. For optimum performance and rated power output, however, a line voltage of 115 to 120 VAC should be maintained at the power cord plug. The above voltages are doubled for 240 VAC wiring.

2. Provide adequate ventilation for the amplifier to insure maximum component life. Refer to the INSTALLATION section for proper cooling requirements.

3. To minimize system ground loops and noise pick-up, tie or twist the left and right shielded audio input cables together and "position" for minimum interference. In some rack mounted systems it may be necessary to electrically isolate the front panel and/or line cord ground.

GENERAL PRECAUTIONS

1. For "optimum" performance, do not overload the speaker outputs. The minimum impedance load should be 4 ohms in the stereo mode or 8 ohms in the bridging (monaural) mode. Use a series-parallel combination for multiple speaker loads so that 4 ohms minimum is presented to the amplifier in the stereo mode and 8 ohms in the monaural mode.

2. Always position the amplifier for optimum cooling.

3. Avoid abusive loads or testing - a blown fuse will only result and necessitate replacement.

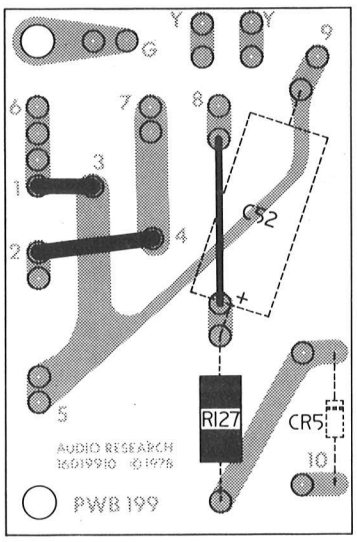
4. Always disconnect the AC power cord before replacing a blown fuse.

5. Never parallel or "strap" the output terminals of each channel together - refer to page 4 for monaural connection.

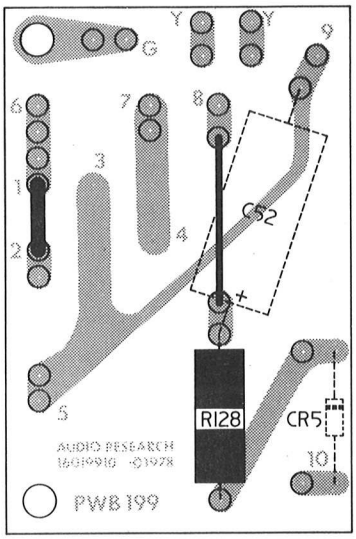
LINE VOLTAGE CONVERSION

Your D-110 Power Amplifier is shipped wired for the power line voltage indicated on the rear panel or on the tag on the power cord. If a line voltage conversion is ever required and re-wiring of the amplifier becomes necessary, observe the following procedure:

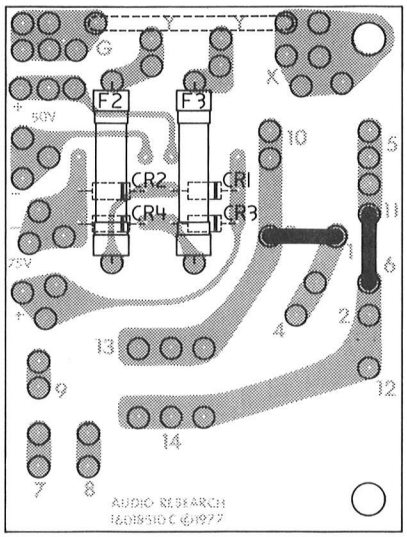
1. Unplug the D-110 from AC power source.
2. Remove the bottom cover.
3. Rewire the (4) jumpers for the power transformer primary wiring as shown below.
4. Change the power relay resistor for the desired line voltage:
   For 120VAC use R127 600 ohm 5 watt resistor.
   For 240VAC use R128 3300 ohm 7 watt resistor.
   CAUTION: Make sure C52 is connected as shown.
5. Change the line fuse for the desired line voltage:
   For 120VAC use 8A Bussman SLO-BLO.
   For 240VAC use 4A Bussman SLO-BLO.
6. Replace the bottom cover.



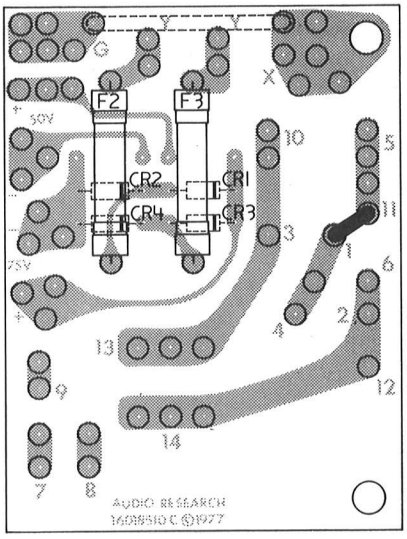
120V RELAY BOARD
PWB 16019910



240V RELAY BOARD
PWB 16019910



120V POWER INTERCONNECT



240V POWER INTERCONNECT

SYSTEM DIAGNOSTICS

In case of difficulty after connecting the D-110 into your system, a list of common system problems and possible causes is provided below to aid in troubleshooting:

Symptom	Possible Cause
Both channels dead	- Power not applied to amplifier - Blown line fuse - Improper or defective interconnect wiring - Defective signal source
One channel dead	- Blown supply fuse(s) - Defective or improper interconnect wiring - Balance control or mode switch on preamplifier not set properly - Defective signal source
Hum or noise	- System ground loop - Poor interconnect wiring - Defective audio cable - Excessive lead length - Defective signal source
Distortion	- Low AC line voltage - Incorrect speaker wiring - Defective signal source - Blown supply fuse(s)

FACTORY SERVICE

In the event that service becomes necessary, the D-110 must be returned to your dealer or to the factory with return authorization. Please contact your dealer for a return authorization form. The original equipment packaging should be used any time shipment is made.

All shipments to the factory must be prepaid and insured for full value. All factory serviced equipment will be returned surface freight collect. In the event that chargeable repairs are required, you will be contacted prior to the return of your equipment.

PROPRIETARY NOTICE

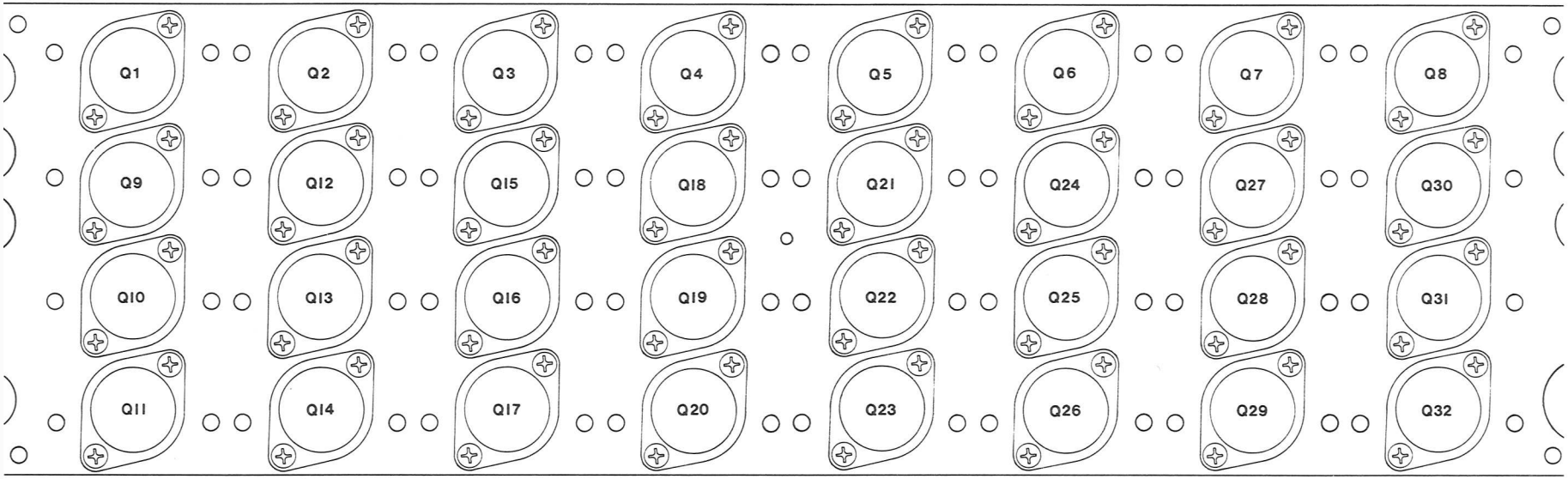
THESE PRINTS CONTAIN PATENTED AND/OR OTHER INFORMATION CONSIDERED PROPRIETARY BY AUDIO RESEARCH CORPORATION, AND ARE FURNISHED ON A CONFIDENTIAL BASIS FOR IDENTIFICATION PURPOSES ONLY.

MODEL D-110B POWER AMPLIFIER

SERVICE INFORMATION

audio research corporation
6801 SHINGLE CREEK PARKWAY
MINNEAPOLIS, MINNESOTA 55430

D-110B
HEAT SINK ASSEMBLY (TRANSISTOR MOUNTING SIDE)

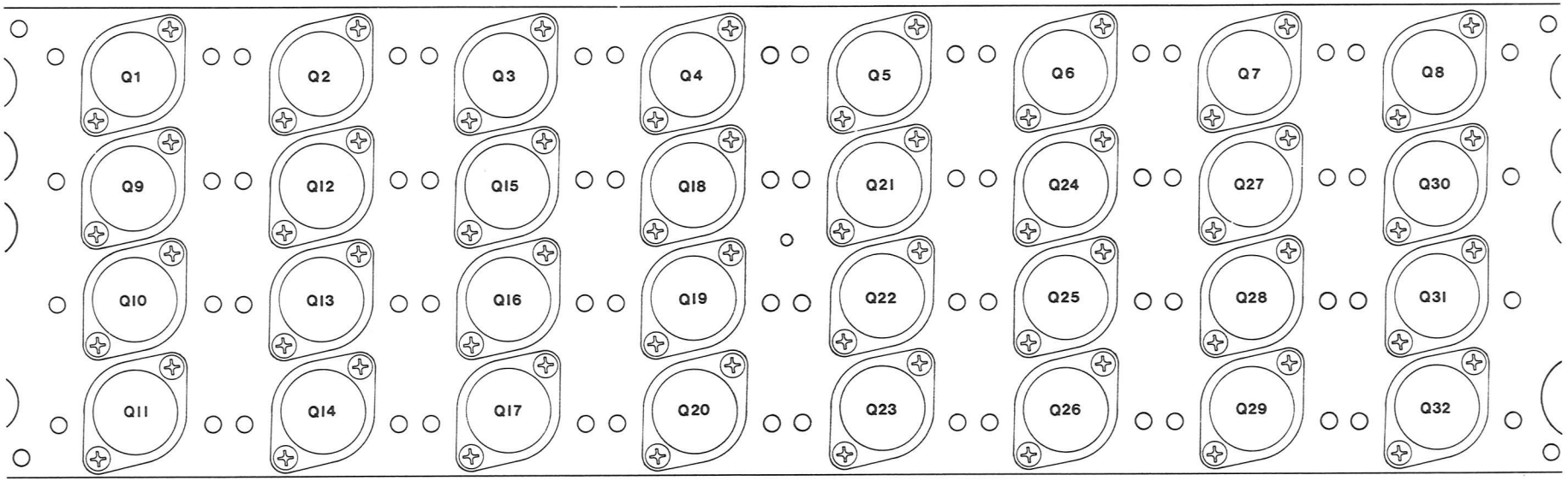


NOTES:

1. All devices mounted on P/N 23001400 insulators.
2. All 6-32 mounting screws tightened to 6 in.-lbs. torque.
3. Q1,2,7,8 are Audio Research P/N 30002400. } Matched Set
4. Q3,4,5,6 are Audio Research P/N 30002500. }
5. Q9-14,27-32 are Audio Research P/N 30002700. } Matched Set
6. Q15-20,21-16 are Audio Research P/N 30002600. }

D-110

HEAT SINK ASSEMBLY (TRANSISTOR MOUNTING SIDE)



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6. Q15-20,21-26 are Audio Research P/N 30002600.

} Matched Set