audio research corporation

MODEL SP-8 PREAMPLIFIER

OWNER'S MANUAL

HIGH DEFINITION SOUND EQUIPMENT

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INTRODUCTION

Congratulations on your purchase! Your SP-8 combines the highest possible musical fidelity with a new level of reliability and serviceability.

With the introduction of power amplifiers such as the D-40, D-79B, D-90 and D-120, and the availability of a number of brands of high performance recordings, pickups and speaker systems, the need for a new and higher level of preamplifier for the best systems has occurred.

After a significant amount of research and study we have determined that from a performance standpoint once again, the vacuum tube must be used.

For best results, only high quality turntables with stable pickup arms and cartridges should be used with this preamplifier.

We suggest that the SP-8 preamplifier will provide state-of-the-art reference indefinitely. We further suggest that inclusion of this unit in any otherwise good music reproducing system will effect more improvement than any other single component change.

For further discussion of performance and system requirements we encourage you to see your Audio Research dealer.

WARRANTY STATEMENT

A Limited 90-Day Warranty (from date of purchase by the original purchaser - must be within 2 years of date of manufacture) is provided by Audio Research Corporation. This includes vacuum tubes. This warranty is subject to the conditions and limitations stated within the documents attached to the outer shipping carton and is repeated in full on Page 7 of this manual.

WARRANTY REGISTRATION CAUTION

It is your responsibility to register your unit. While it is true that Audio Research Corporation will provide warranty service for 90 days even if you do not (proof of purchase, such as a photostatic copy of your bill of sale, will be required), you will lose the extended Limited 3-Year Warranty unless you register the unit within 30 days of the date of your purchase. Be sure to read our warranty statement for complete information about this. (Note that this extended warranty does NOT include vacuum tubes.)

It is also important to register your unit so that Audio Research Corporation can contact you, if the need arises, for any possible modification news, etc.

PACKAGING

Save all packaging. Your Audio Research® preamplifier 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 that should prove necessary, or other occasion to ship it occurs, the original packaging may save your investment from unnecessary damage or delay.

SP-8 INSTRUCTIONS

The front panel has a total of 4 controls and 4 switches:

GAIN: This controls volume or loudness, and is a special metal film segmented control with approximately 2dB steps and accurate tracking. Although useable results can be obtained with settings anywhere in the operating range, more convenient control, best sound quality and signal-to-noise ratio will be obtained if the input signal levels and amplifier input sensitivity allow normal listening to occur in the 11 o'clock to 2 o'clock range of the volume control.

In the case of some high efficiency speakers (such as Klipschorn, etc.) and/or high output cartridges, it may be found with some high gain amplifiers (that do not have an input volume control) that normal listening will occur with the gain control just barely on, or up to the 9 o'clock position. If this proves to be the case, there is provision internally to reduce the gain by 6dB. Contact your Audio Research dealer or ARC's Customer Service Department for instruction.

BALANCE: A conventional stereo control. Moves the sound from left to right or vice versa when rotated. Normally should remain centered.

MODE: Also a conventional stereo control. Allows operation as indicated.

INPUT SELECTOR: Chooses between various possible source material for listening choice.

The "phono" input is an RIAA compensated high gain input for use with most magnetic cartridges. The input is 50K ohms, with very low (40 pF) input capacitance. If your cartridge needs more capacitance, there is built-in provision to add whatever is required. Contact your Audio Research dealer or our Customer Service Department if you need help with this.

PRE-AMP ON SWITCH AND INDICATOR: Turns the unit on in the up position, and the associated green LED will light up indicating that power is reaching the unit. During the 2-minute warmup period of automatic mute the green LED will illuminate, indicating the unit is on; however, the unit will not operate.

OUTLETS ON: Turns the power receptacles on the rear chassis panel on in the up position, and the associated LED will light up indicating that they are on. This switch is specifically provided to allow the amplifier to be turned on after the preamplifier is "warmed up." A vacuum tube device requires up to several minutes to fully stabilize its operating parameters. Power amplifiers should be turned off with the outlet switch before the SP-8 is turned off to avoid turn-off thumps. The SP-8 mutes just after turn-off to minimize any excessive output surges.

MUTE OPERATE SWITCH: Shorts the output of the preamplifier for the warmup (and cooldown) period. Also, to allow changing records (and maintaining a previous gain setting), answering the telephone and the like.

INPUT MONITOR: Primarily aimed for use with tape recorders, but may be used with any line level signal source where bypassing the input selector is desirable.

The rear panel has 4 power receptacles, a fuse holder, a ground terminal, 4 output jacks, 12 input jacks and a pair of banana jacks:

RECEPTACLES: There are two unswitched outlets which may be used for turntables and the like, where switching is not needed or wanted. There are also two outlets, relay controlled, capable of providing power to large amplifiers and the like. Incidentally, the "click" you hear internally when activating the receptacle switch is the relay operating. (The line cord is a 3 conductor, #14 guage, providing ample safe grounded pwoer to these 3 outlets.)

It should be noted that the SP-8 line cord grounds the convenience outlet grounds only. The preamplifier chassis is not connected to the line cord ground in order to minimize system ground loops.

FUSE: Always use the same size and type as indicated on the rear of the chassis for safety. For best results use Buss MDL or MDX fuses.

OUTPUT CONNECTORS: Main outputs should be connected to your power amplifier inputs. Tape outputs should be connected to your tape recorder AUX inputs.

INPUT CONNECTORS: These are all clearly marked and are all 50K ohms.

GROUND TERMINAL: To be used for "grounding" associated input equipment, such as tonearms, turntables and the like. Should not be connected to tape recorders and/or amplifiers.

"CHASSIS" AND "B-" BANANA JACKS: Special emphasis has been placed in the design of this product to reduce and/or eliminate "hum," "TVI," "RFI" and "CB" type interferences.

For normal use a jumper MUST be placed between these connectors. Otherwise, severe hum and/or oscillation will occur.

Special off-chassis construction is employed to accomplish these interference reduction methods, and this connection is the only one from the "common" or "B-" circuit to the chassis so that it can act as a shield to outside interferences.

For rack cabinet mounting, when ground connections are used (via inputs/outputs), this jumper may be removed to allow only one shield ground path, thereby eliminating what is known as "ground-loop" induced hum. Note that this may or may not necessarily be helpful in a given system.

If your SP-8 is ever removed from the rack, be sure to remember that a jumper MUST be reinstalled.

Discussion, feature and specification sheets are also included herewith to provide you with additional information you may want or need.

A schematic diagram, complete with voltages, references, values, etc., is also included. These three items should provide all the basic information you will need.

SERVICING

First of all, a very serious caution: This unit contains over 500 volts of DC, with sufficient voltage and current available to be lethal. So, please, do not poke around inside the unit. Refer any needed service to a qualified technician. (Even with the unit turned off, a charge remains in the energy storage capacitors for some time.)

Basically, this unit is constructed to the highest commercial standards and should require a very minimum amount of service over the years.

The vacuum tubes furnished with your SP-8 are quality tubes, and should not have to be changed for approximately two thousand hours of use. Tubes can fail, however, and the following service hints are offered:

If excessive noise should develop in the phono section only, it is most likely V1.

If degraded sound should occur in the phono section only, it is most likely V2.

V3 is not normally critical, although occasionally excessive hum can be caused by failure of this tube.

If excessive noise developes in the high level section (ie: inputs other than phono), it is most likely V4.

If degraded sound developes in the high level section, it is most likely V5.

V6 is also not normally critical, although it also can introduce hum.

If tube changing is to be done, the unit should be disconnected from the amplifier and turned off while the change is made.

DISCUSSION OF THE SP-8 MUTING PROVISIONS

The SP-8 has 4 provisions to guard against possible misuse of the exceptional dynamic range and wide bandwidth that it offers. The SP-8 is not subject to damage itself, but some power amplifiers and speakers are more limited in their ability to withstand signal extremes. These provisions, both manual and automatic, are designed to give a flawless listening experience with unprecedented realism, while giving protection against operator error or other improper conditions beyond the operator's control.

1. OUTLET SWITCH to allow the power amplifier to be off during warmup or shutdown of the SP-8. A minimum of 5 minutes warmup time is recommended to insure optimum performance.

2. MUTE/OPERATE SWITCH to manually disable the SP-8 outputs during any moving of the tone arm or switching of equipment. This will minimize stress on your power amplifier even when it is off.

3. WARMUP TIMER that mutes the SP-8 outputs for approximately 2 minutes after the power switch is turned "ON," to ensure circuit stabilization before the outputs come "ON."

4. IMPROVED POWER SUPPLY to tolerate power line disturbances or "brown-outs" down to 100VAC or less, without degredation of circuit performance.

The automatic muting operates as follows:

1. The manual mute switch always disables both outputs and overrides any automatic provisions, even when the SP-8 is turned off. (The "Operate" position of the manual mute switch is functional only after the unit is no longer in automatic mute mode.)

2. The 2-minute warmup timer will restart automatically if the power is temporarily interrupted for 0.2 seconds or more, which is sufficient time to disturb the heater temperature in the tubes.

3. The automatic muting of the SP-8 is designed to be effective only against all kinds of power line interruptions and power supply failures. It will not mute against subsonic signal transmissions from your turntable, etc. Proper fusing of speakers is essential to protect against excessive audio level or power amplifier faults.

4. The muting is accomplished without clicks by "soft-switching" photocouplers, with pure resistive photoconductive elements. No electrical contacts or moving parts are used in the audio path to insure no degredation of sonic performance. All photocoupler lamps are light-emitting diodes to provide essentially infinite service life.

5. Qualified service personnel may wish to disable the warmup muting and output sensor muting for testing purposes. This may be done by reconnecting the output leads to the other side of the photocouplers.

SUMMARY OF SP-8 FEATURES

As expected with a product of this caliber, the SP-8 offers many outstanding features to the audiophile perfectionist.

AUTOMATIC MUTING: A two-minute warmup timer insures muting of undesirable subsonic output during circuit stabilization. No troublesome relays or electrical contacts are used. (Note that there is no visual indication of automatic muting as, for example, in the SP-6C.)

MANUAL MUTING: A front panel mute switch is included for repeat settings, interruptions, etc.

HIGH ACCURACY, CLOSE TRACKING, SEGMENTED GAIN CONTROL: A metal-film stereo volume control assures trouble free, close tracking volume selection in 2dB steps (guaranteed 1.5dB tracking, .5dB typical).

GAIN "RANGE": An internal wiring change allows for better gain matching or high efficiency loudspeakers, high output cartridges, transformers, etc.

SEPARATE FRONT PANEL POWER RECEPTACLE SWITCH: A front panel switch operates two relay-controlled outlets with a 1600 watt capacity for power amplifiers and other outboard devices.

SPECIAL OFF-CHASSIS CONSTRUCTION: The special isolated ground construction floats all inputs and outputs from the chassis. Special rejection filters are also included to minimize or eliminate RFI, TVI and CB interference.

SONICALLY SELECTED COMPONENTS: Exclusive use of quality tubes, special metal film resistors and multiple shunt capacitors provide optimum sonic accuracy.

OTHER FEATURES INCLUDE: A rear panel provision for disconnecting the common ground from the chassis so that rack mount installations may be accomplished without ground loop induced hum. Front and rear panels are of two-color anodized aluminum construction for permanent finish and lettering. Industrial grade components and construction are used for long service life.

This unit is offered with a limited warranty as follows:

1. Warranty. Audio Research warrants the product designated herein to be free of manufacturing defects in material and workmanship, subject to the condition hereinafter set forth, for a period of three (3) years from the date of purchase by the original purchaser. To obtain this Warranty, THE ORIGINAL PURCHASER MUST MAIL TO AUDIO RESEARCH WITHIN THIRTY (30) DAYS OF THE DATE OF PURCHASE THIS WARRANTY REGISTRATION FORM COMPLETED, DATED AND SIGNED BY BOTH THE PURCHASER AND THE SELLING DEALER TOGETHER WITH A COPY OF THE BILL OF SALE OR OTHER PROOF OF PURCHASE OF THE PRODUCT. Audio Research will then validate the Warranty and return the validated Warranty to the purchaser.

2. Conditions. This Warranty is subject to the following conditions and limitations. The Warranty is void and inapplicable if the product has been used or handled other than in accordance with the instructions in the owner's manual, abused or misused, damaged by accident or neglect or in being transported, or the defect is due to the product being repaired or tampered with by anyone other than Audio Research or an authorized Audio Research repair center. The product must be packed and returned to Audio Research or an authorized Audio Research repair center by the customer at his or her sole expense. A RETURNED PRODUCT MUST BE ACCOMPANIED BY A WRITTEN DESCRIPTION OF THE DEFECT AND A PHOTOCOPY OF THIS VALIDATED WARRANTY. Audio Research reserves the right to modify the design of any product without obligation ot purchasers of previously manufactured products and to change the prices or specifications of any product without notice or obligation to any person.

3. Remedy. In the event the above product fails to meet the above Warranty and the above conditions have been met, the purchaser's sole remedy shall be to return the product to Audio Research or an authorized Audio Research repair center where the defect will be rectified without charge for parts or labor, except vacuum tubes (see 6 below).

4. Limited to Original Purchaser. This Warranty is for the sole benefit of the original purchaser of the covered product and shall not be transferred to a subsequent purchaser of the product.

5. Duration of Warranty. This Warranty expires on the third anniversary of the date of purchase. During the first ninety (90) day period following the date of purchase by the original owner, the Audio Research Limited 90-Day Warranty supersedes this Warranty.

6. Vacuum Tubes. Vacuum tubes and replacement thereof are warranted for the original 90-day period only.

7. Miscellaneous. ANY IMPLIED WARRANTIES RELATING TO THE ABOVE PRODUCET SHALL BE LIMITED TO THE DURATION OF THIS WARRANTY. THE WARRANTY DOES NOT EXTEND TO ANY INCIDENTAL OR CONSEQUENTIAL COSTS OR DAMAGES TO THE PURCHASER. Some states do not allow limitations on how long an implied warranty lasts or an exclusion or limitation of incidental or consequential damages, so the above limitations or exclusions may not apply to you. This Warranty gives you specific legal rights, and you may also have other rights which vary from state to state.

SP-8 SPECIFICATIONS (AC line set @120V 60Hz for these specifications)

Frequency Response:
High level section: ±.25dB, 5Hz to 30Hz
-3dB points below 1Hz and above 100kHz
Magnetic phono: ±.25dB of RIAA, 30Hz to 40kHz

Harmonic Distortion:
Less than .01% at 2V RMS output, 20Hz to 20kHz (Typically less than .0005% in midband

Intermodulation Distortion:
Less than .002% at 2V RMS output

Gain:
Magnetic phono input to tape output: 34dB High level inputs to tape output: 0dB
Magnetic phono input to main output: 60dB High level inputs to main output: 26dB

Input Impedance:
50K ohms, all inputs (Magnetic phono may have any value from 10 ohms to 100K ohms substituted. Also has provision to add to the 40pF input capacitance for matching certain magnetic cartridges.)

Output Impedance:
1000 ohms main output and tape output. Recommended minimum load for maximum audio quality 20K ohms and .001uF maximum capacitance.

Maximum Inputs:
Magnetic phono, 900mV at 1kHz. (3.5V RMS, 10kHz) High level inputs essentially overload-proof.

Rated Outputs:
2V RMS 5Hz to 30kHz, all outputs; 60K ohm load (main output capability is 60V RMS output at 1/2% THD at 1kHz into a 100K ohm load with 3V RMS high level input)

Power Supplies:
Electronically-regulated supplies utilizing both vacuum tube and solid state elements. Line regulation better than .01%

Noise:
High Level
(1) 250uV RMS maximum residual unweighted wideband noise at main output with gain control minimum (86dB below 5V RMS output)
(2) More than 90dB below 1V RMS input (less than 20uV equivalent input noise)
Magnetic Phono
5uV equivalent input noise, wideband RMS (-66dB reference 10mV input)
(Approximately 1uV above 200Hz or -80dB reference 10mV input)

Tube Complement:
2 - 6DJ8 or equivalent dual triodes 1 - 12BH7A
4 - reference grade E83CC or equivalent triodes 1 - 12AX7/ECC83

Power Requirements:
100-125VAC 60Hz (190-240VAC 50Hz) 60 Watts

Dimensions:
19" (48 cm) W x 5 1/4" (13.4 cm) H (standard rack panel) x 10 1/4" (26 cm) D. Handles extend 1 5/8" (4.1 cm) forward of front panel. Rear chassis fittings extend 7/8" (2.3 cm).

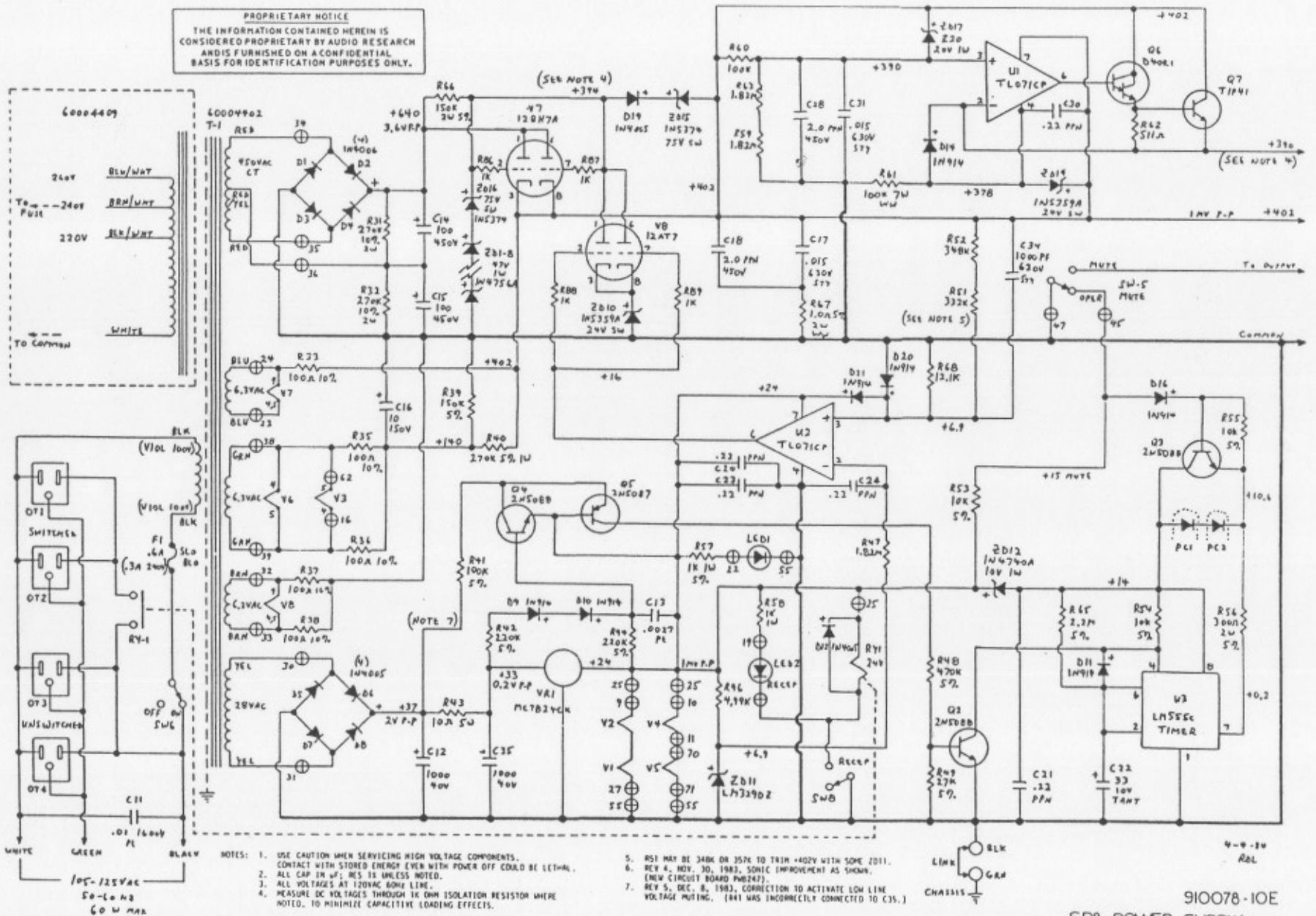
Weight:
22 lbs. (10 kg) Net, 30 lbs. (13.75 kg) Shipping

SP-8 PREAMPLIFIER

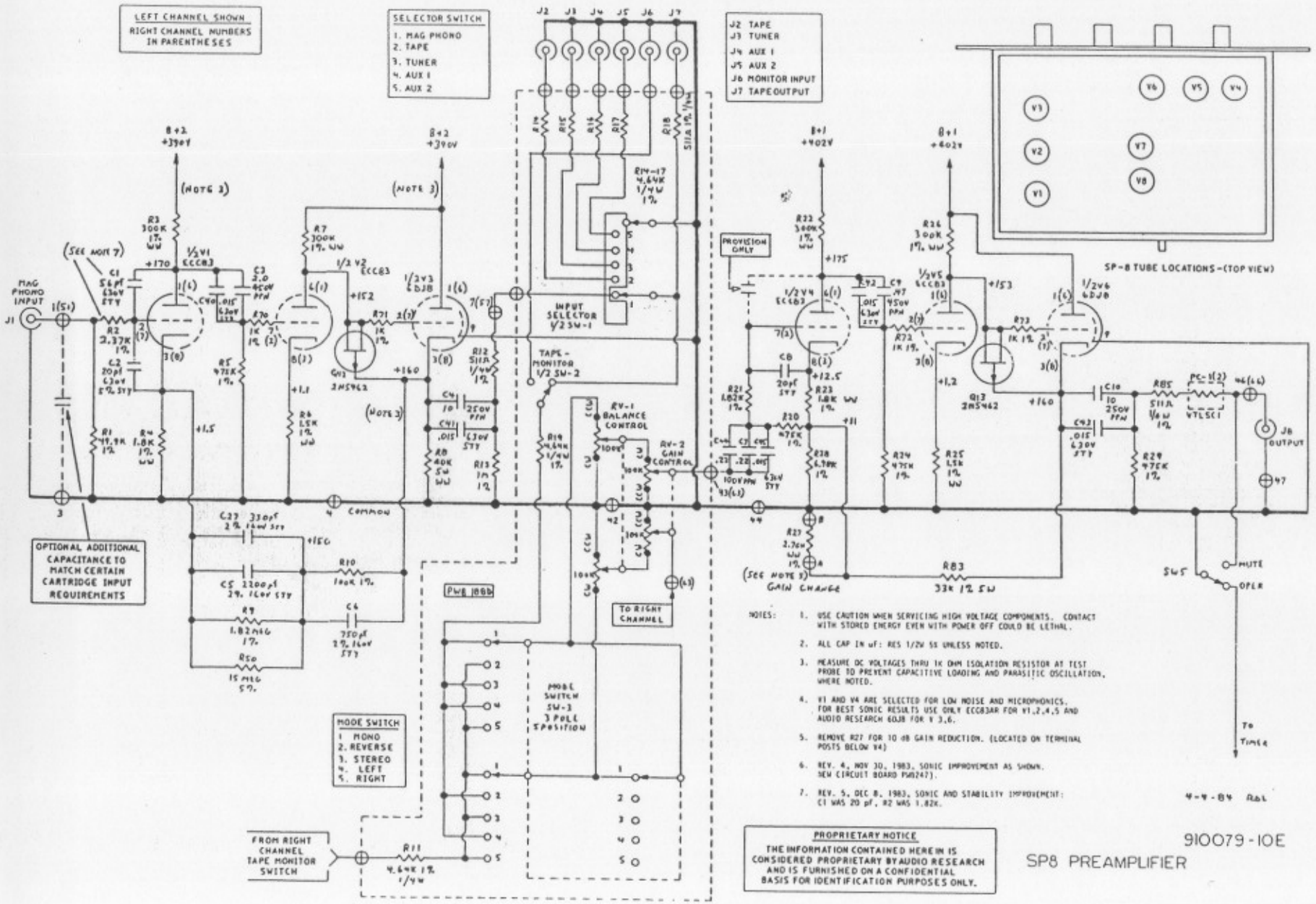
SCHEMATIC & PARTS LIST

Rev. E
4-4-84

audio research corporation
6801 SHINGLE CREEK PARKWAY
MINNEAPOLIS, MINNESOTA 55430



NOTES:
1. USE CAUTION WHEN SERVICING HIGH VOLTAGE COMPONENTS. CONTACT WITH STORED ENERGY EVEN WITH POWER OFF COULD BE LETHAL.
2. ALL CAP IN uF; RES IN UNLESS NOTED.
3. ALL VOLTAGES AT 120VAC 60HZ LINE.
4. MEASURE DC VOLTAGES THROUGH 1K OHM ISOLATION RESISTOR WHERE NOTED. TO MINIMIZE CAPACITIVE LOADING EFFECTS.
5. RS1 MAY BE 348K OR 357K TO TRIM +402V WITH SOME Z011.
6. REV 4, NOV. 30, 1983, SONIC IMPROVEMENT AS SHOWN. (NEW CIRCUIT BOARD PWB247).
7. REV 5, DEC. 8, 1983, CORRECTION TO ACTIVATE LOW LINE VOLTAGE MUTING. (R41 WAS INCORRECTLY CONNECTED TO C35.)



NOTES:

1. USE CAUTION WHEN SERVICING HIGH VOLTAGE COMPONENTS. CONTACT WITH STORED ENERGY EVEN WITH POWER OFF COULD BE LETHAL.
2. ALL CAP IN uF: RES 1/2W 5% UNLESS NOTED.
3. MEASURE DC VOLTAGES THRU 1K OHM ISOLATION RESISTOR AT TEST PROBE TO PREVENT CAPACITIVE LOADING AND PARASITIC OSCILLATION, WHERE NOTED.
4. V1 AND V4 ARE SELECTED FOR LOW NOISE AND MICROPHONICS. FOR BEST SONIC RESULTS USE ONLY ECC83AR FOR V1,2,4,5 AND AUDIO RESEARCH 6DJ8 FOR V 3,6.
5. REMOVE R27 FOR 10 dB GAIN REDUCTION. (LOCATED ON TERMINAL POSTS BELOW V4)
6. REV. 4, NOV 30, 1983. SONIC IMPROVEMENT AS SHOWN. NEW CIRCUIT BOARD PWB247).
7. REV. 5, DEC 8, 1983. SONIC AND STABILITY IMPROVEMENT: C1 WAS 20 pF, R2 WAS 1.82K.

4-4-84 RBL

910079-10E

SP8 PREAMPLIFIER

SP-8 PARTS LIST

COMPONENT	QUAN.	DESCRIPTION	VALUE	RATING	TOL.	ARC PART NO.
V1,2,4,5	4	ECC83AR				32001300
V3,6	2	6DJ8				32001100
V7	1	12BH7A				32001200
V8	1	12AT7				32000900
D1-4	4	1N4006	1A	800V		30502200
D5-8,12,19	6	1N4005	1A	600V		30500400
D9,10,11,14,16 20,21	7	1N914		100V		30500900
ZD1-8	8	1N4756A Zener	47V	1W		30503200
ZD10,14	2	1N5359A Zener	24V	5W		30503500
ZD11	1	LM329DZ Zener Ref.	6.9V			31000700
ZD12	1	1N4740A Zener	10V	1W		30500300
ZD15,16	2	1N5374A Zener	75V	5W		30502900
ZD17	1	Z20 Zener	20V	1W		30503700
LED1,2	2	LED Green				34300100
Q2,3,4	3	2N5088 Trans	NPN			30003100
Q5	1	2N5087 Trans	PNP			30003000
Q6	1	D40K1 Trans	Darl NPN			30005200
Q7	1	TIP41 Trans				30005000
Q12, 13	4	2N5462 FET	P-Chan			30005900
RV1	1	Balance Control	100K	LinTaper	10%	45100525
RV2	1	Gain Control	100K	LogTaper	10%	45100528
VR1	1	MC7824CK	24V	1A		31001200
U1,2	2	TL071CP Op Amp				31001900
U3	1	LM555CN Timer				31000800
PC1,2	2	VTL5C1 Photocoupler				34400100
R1	2	Metal Film	49.9K	1/2W	1%	42499403
R2	2	Metal Film	2.37K	1/4W	1%	42237302
		Metal Film	1.82K	1/2W	1%	42182303
R3,7,22,26	8	Wirewound	300K	0.2W	1%	43300501
R4,23	4	Wirewound	1.8K	1W	1%	43182300
R5,20,24,29	8	Metal Film	475K	1/2	1%	42475503
R6,25	4	Wirewound	1.5K	2W	1%	43150302
R8	2	Wirewound	40K	5W	3%	43400400
R9,47,59,63	5	Metal Film	1.82Meg	1/2W	1%	42182603
R10,60	3	Metal Film	100K	1/2W	1%	42100503
R11,14-17,19	10	Metal Film	4.64K	1/4W	1%	42464302
R12,18,62,85	7	Metal Film	511	1/4W	1%	42511202
R13	2	Metal Film	1Meg	1/2W	1%	42100603
R21	2	Metal Film	1.82K	1/2W	1%	42182303
R27	2	Wirewound	2.70K	2W	1%	43270301
R28	2	Metal Film	6.98K	1/2W	1%	42698303
R31,32	2	Carbon	270K	2W	10%	40270505
R33,35-38	5	Carbon	100	1/2W	10%	40100203
R39	1	Carbon	150K	1/2W	5%	41150503
R40	1	Carbon	270K	1W	5%	41270504
R41	1	Carbon	100K	1/4W	5%	41100502
R42,44	2	Carbon	220K	1/4W	5%	41220502
R43	1	Wirewound	10	5W	5%	43100104
R46	1	Metal Film	4.99K	1/2W	1%	42499303
R48	1	Carbon	470K	1/4W	5%	41470502
R49	1	Carbon	27K	1/4W	5%	41270402
R50	2	Carbon	15Meg	1/2W	5%	41150703
R51	1	Metal Film	332K	1/2W	1%	42332503
R52	1	Metal Film	348K	1/2W	1%	42348503
R53-55	3	Carbon	10K	1/4W	5%	41100402

SP-8 PARTS LIST

COMPONENT	QUAN.	DESCRIPTION	VALUE	RATING	TOL.	ARC PART NO.
R56	1	Wirewound (M. Film)	300	2W	5%	43300200
R57,58	2	Carbon	1K	1W	5%	41100304
R61	1	Wirewound	100K	7W	5%	43100500
R65	1	Carbon	2.2Meg	1/4W	5%	41220602
R66	1	Metal Film	150K	2W	2%	46150500
R67	1	Wirewound	1.0	2W	5%	43100002
R68	1	Metal Film	12.1K	1/2W	1%	42121403
R70,71,86,87	6	Metal Film	1K	1/4W	1%	42100302
R72,73,88,89	6	Metal Film	1K	1/2W	1%	42100303
R83	2	Wirewound	33K	5W	1%	43330400
C1	2	Polystyrene	56pF	630V	2.5%	53560102
		Polystyrene	20pF	630V	5%	53200101
C2,8	4	Polystyrene	20pF	630V	5%	53200101
C3,18,28	4	Polypropylene	2uF	450V	10%	53200602
C4,10	4	Polypropylene	10uF	250V	10%	53100700
C5	2	Polystyrene	2200pF	160V	2.5%	53220302
C6	2	Polystyrene	750pF	160V	2.5%	53750200
C7,20,21,23 24,30,44	9	Polypropylene	.22uF	100V	10%	53220506
C9	2	Polypropylene	.47uF	450V	10%	53470509
C11	1	Polyester	.01uF	1600V	10%	53100403
C12,35	2	Electrolytic	1000uF	40V		50100904
C13	1	Polyester	.0027uF	200V	10%	53270301
C14,15	2	Electrolytic	100uF	450V		50100802
C16	1	Electrolytic	10uF	150V		50100703
C17,31,40-43,45	12	Polystyrene	.015uF	630V	5%	53150404
C22	1	Tantalum	33uF	10V	10%	51330700
C27	2	Polystyrene	330pF	160V	2.5%	53330200
C34	1	Polystyrene	1000pF	630V	5%	53100301
F1 120V	1	Fuse, Slo-Blo	0.6A	250V		34500220
240V			0.3A	250V		34500120
T1	1	Transformer		120V		60004402
		Transformer		100V		60004403
		Transformer		240V		60004409
OT1-4	4	AC Receptacle				23201300
SW1	1	Input Selector Sw.	2Pole	5Position		24001000
SW2	1	Tape Monitor Sw.	DPDT	Gold		24100400
SW3	1	Mode Switch	3Pole	5Position		24000700
SW5	1	Mute-Operate Sw.	DPDT	Gold		24100400
SW6	1	On-Off Switch	DPDT	Silver		24100700
SW8	1	Receptacle Sw.	DPDT	Silver		24100700
RY1	1	Relay 24V	SPST	N.O.		64100600
J1-J16	16	Phono Jack				23201000

NOTE: Resistor values are in "ohms" except "K" = x 1,000; "Meg" = x 1,000,000