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MODEL SP15 AND SP15 REVISION A
PREAMPLIFIER
OWNER'S MANUAL

8-15-88

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PREFACE

Please take the time to carefully read this Instruction Manual prior to installation or use of your SP15 Preamplifier. Because it is a technically unconventional, highly advanced electronic instrument, there are several facts and procedures you should know before you place it in operation.

Just as you would not purchase and attempt to operate an expensive camera, computer system or high-performance automobile without first learning something about performance parameters and correct operating procedures, so too your SP15 Preamplifier requires some familiarization before you make it part of your music reproduction system. Your reward, in terms of maximum performance and a long service life, will be well worth the effort.

INTRODUCTION

Three years after the introduction of the reference-setting SP11 preamplifier Audio Research Corporation has introduced a worthy successor - the SP15.

Like the SP11, the new SP15 is a "hybrid" preamplifier using both vacuum tubes and semiconductors as gain devices. However, the SP15 uses only three tubes compared to the SP11's six; and whereas the SP11's tubes were employed in both phono and line sections, the SP15's tubes are confined to the phono section alone. As in the SP11, these tubes are not required to be selected, low-noise types.

The changes in the SP15 line section (as compared to the SP11) are not limited to choice of gain devices. Resistance to input overloads, reduction of inherent noise levels, resistance to inter-input crosstalk and dynamic headroom have all been achieved as a result of circuit redesign in this area.

Convenience features and controls remain similar to the SP11, but with some significant additions. The familiar "Gain" control has been replaced by a 5-position "Attenuator" switch having 6dB increments, resulting in better sonics while maintaining a useful selection of settings to match the output characteristics of both phono cartridges and CD players. Tape and dubbing functions remain identical to the SP11.

On the back of the SP15 are new provisions for either conventional (i.e. single-ended) or balanced output connection. Balanced connections can be made via the RCA jacks labelled "Direct" and "Invert," or by using the new industrial "XLR" connector provided.

Like the SP11, the SP15 is a two-chassis design isolating power supply functions from sensitive preamplifier circuits, reducing the opportunity for magnetic field effects to degrade sonic performance. A toroid power transformer minimizes mechanical buzz and "hum." See Installation Instructions for details on proper placement of the two chassis relative to one another.

The SP15 reflects a further evolution and refinement of the idea that state-of-the-art preamplifier performance can be combined with real-world user convenience and system flexibility. Care has been taken to optimize the sonic performance of a variety of popular input options -- video, compact disc, RF tuner and analog tape, as well as unsurpassed phono reproduction.

CONSTRUCTION AND TESTING

Like every Audio Research product, your SP15 preamplifier has been designed and carefully handcrafted in the U.S.A., using precision mechanical parts, electronic components and assembly procedures similar to those used in the manufacture of military electronics, aircraft electronics and scientific instruments. To assure performance standards, each SP15 is visually inspected at several assembly points, test run, electronically tested and sonically evaluated prior to shipment.

This time-consuming "perfectionist" approach to the design and manufacture of audio equipment is intended to provide you with the best in musical satisfaction and lasting value.

WARNINGS

1. To prevent fire or shock hazard, do not expose your SP15 to rain or moisture.
2. This unit contains voltages which can cause serious injury or death. Do not operate with covers removed. Refer servicing to your authorized Audio Research dealer or other qualified personnel.
3. The power cord on your SP15 is equipped with a standard three-prong grounding plug. If used normally, it will provide a safe earth ground connection of the chassis and all equipment plugged into its AC receptacles on the rear panel of the power supply chassis. Refer to the Section on Grounding Instructions for detailed information. (Units supplied to the United Kingdom will not have these receptacles.)
4. For continued protection against fire hazard, replace fuses only with the same type and rating of fuses as specified at individual fuse holders.

PACKAGING

Save all packaging in a dry place away from fire hazard. Your SP15 preamplifier is a precision electronic instrument and should be properly cartoned any time shipment is made. You may not have occasion to return your unit to the factory for service, but if that should prove necessary, or other occasion requiring shipment occurs, the original packaging will protect your SP15 from unnecessary damage or delay.

Note that your SP15 has been shipped with vacuum tubes installed in their proper high-retention sockets. You may do likewise if the complete original packaging is used for shipment.

ACCESSORIES

A 15" ground strap, with toothed lugs on both ends (for reducing radio interference from powerful nearby broadcasting stations in some metropolitan areas) is enclosed. See Grounding Instructions for information on proper installation.

TUBE COMPLEMENT

Three (3) 6DJ8 vacuum tubes are used in intermediary gain stages in the phono section of the SP15. These are supplied pre-installed at locations V1, V2 and V3 on the main preamplifier circuit board. See Servicing for information on replacement tubes.

GENERAL DESCRIPTION

The SP15 is constructed on two chassis, utilizing aircraft-quality connectors and an interconnect cable forty-eight (48") inches long. The unit is divided into an active amplification chassis (SP15) and a power supply chassis (SP15PS). A custom interconnect cable of longer length is available from Audio Research at additional cost, although some degradation of performance will occur as the cable lengthens.

POWER SUPPLY CHASSIS: The separate power supply assembly (SP15PS) contains the on-off switches and convenience receptacles, keeping all AC power isolated from the active chassis.

INTERCONNECT CABLE: The interconnect cable utilizes gold-plated machined connections of aircraft quality. Each connector is keyed. That is, it can only be inserted in its mating socket in one position, to assure proper connection. Take care to align the connectors precisely before rotating the locking ring, so that no contact pins are damaged by forced misalignment.

Clockwise rotation of the locking ring until a slight "click" is felt assures proper locking of the connector for continuous use.

While it will not harm the power supply to operate it without being connected to the active amplification chassis, we recommend that you do not operate it in this way, to prevent any possibility of shock hazard. Note that while both the sockets and the cable connectors are "polarized," some chance of electrical shock could exist under certain conditions with the sockets exposed.

ACTIVE CIRCUIT CHASSIS: The separate "active" chassis contains both the high-gain, RIAA equalized, magnetic phono preamplifier and the "line" level circuitry, plus all of the inputs, outputs and various function controls.

Extensive use has been made of state-of-the-art audio materials, including such items as polypropylene and polystyrene dielectric capacitors, metal film resistors, wire-wound resistors, proprietary point-to-point internal wiring, gold-plated input and output connectors, heavily gold-plated switches, and other high-quality components.

Each of the levels of circuitry amplification is provided with its own electronic regulation in the form of a "capacitance multiplier," providing essentially "zero" impedance power supplies with essentially infinite isolation between circuit sections. Thus, the active circuitry is allowed to operate near theoretical performance levels.

DESCRIPTION OF CONTROLS — PREAMPLIFIER

ATTENUATOR SWITCH: A segmented switch used to attenuate the output of preamplifier Line Section "A" (see Schematic block diagram) in 6dB increments, down to -24dB. Should be used in conjunction with Level Control to minimize output noise and maximize sonic quality.

GAIN CONTROL: A segmented control used to attenuate the input to preamplifier Line Section "A" (see Schematic block diagram). Allows essentially unlimited signal input range while preserving optimum use of Attenuator Switch. (Use as "volume" control.)

For maximum sonic quality: Rotate Attenuator clockwise to maximum setting, then use Gain Control to adjust volume. (Actually, this switch has very little sonic degradation.)

NOTE: Mute between records. Activate Mute and turn Gain down when switching inputs or impedance for maximum protection.

BALANCE CONTROL: When rotated, adjusts the relative sound levels of the left and right channels. A detent at the 12 o'clock position marks the point of equal balance. Rotating the knob to the right decreases the level of the left channel proportionally, shifting the sonic image to the right. Rotating the knob to the left shifts the sonic image to the left.

MODE CONTROL: Allows selection of various single-channel (mono) and two-channel (stereo) listening modes. Detents mark each selection option during rotation of knob. "Mono" reproduces identical sonic information on both right and left channels. "Reverse" switches left-channel information to the right, right-channel information to the left. "Stereo" is the normally preferred mode for most program material, producing the most realistic sonic image. "Left" cancels all right-channel information in the Stereo mode, and presents left-channel information to both channels. In the same way, "Right" cancels all left-channel information, etc.

INPUT SELECTOR: Detents mark selection of various source material options: "Phono" for phonograph record turntables; "Tuner" for AM/FM radio tuners; "CD" for compact digital disc players; "Video" for input from Beta or VHS videotape recorder/players; and "Auxiliary" for any additional high level source: tape, tuner, CD, video, etc.

INPUT IMPEDANCE SELECTOR: Allows front panel selection of impedance to match a wide range of moving-magnet (MM) and moving-coil (MC) phono pickup cartridges. Standard detent positions include:

47K ohm for MM cartridges
100 ohm for MC cartridges
30 ohm for MC cartridges
10 ohm for MC cartridges
3 ohm for MC cartridges

The switch used for this impedance control is a special, multi-gang, heavily gold-plated unit designed to minimize sonic degradation of microvolt-level analog signals. It progressively adds or deletes resistors in parallel to establish the proper matching impedance. You will note that this switch is much more "firm" or "stiff" in operation than the other SP15 switches. This is a necessary result of its multi-contact construction for this special low-level switching function.

Note: "Custom" impedance matching values for particular cartridges other than those listed at the control -- e.g. 10K, 800 ohms, 400 ohms, etc. -- can be factory-installed at a nominal charge. Contact the Customer Service Department at Audio Research for detailed information and estimated cost.

MONITOR SWITCH: In "Monitor" position, this switch bypasses the Input Selector and presents the (output) signal from a tape recorder connected to the "Tape 1" or "Tape 2" inputs on the rear panel. In the "Source" position, the program source is controlled by the Input Selector (Phono, Tuner, CD, etc.).

Note that the signal present at the "Tape 1" and "Tape 2" output connectors is not affected by this switch. Whatever is selected by the Input Selector will be present at all times at the Tape Output connectors.

The Monitor Switch is not usable when the Bypass Switch is activated.

COPY/NORMAL SWITCH: In the "Normal" position, the signal source selected by the Input Selector is presented at the Tape Outputs. When two tape recorders are used in the system and tape copying or dubbing is desired, move the switch to the "Copy" position. This allows you to tape from one deck to another and simultaneously listen to another program source. "Copy" connects the Tape Outputs to the "Tape 1" or "Tape 2" inputs as selected by the 2-1/1-2 Switch.

TAPE 2/TAPE 1 SWITCH: Used with the Copy/Normal Switch. Selects either "Tape 1" or "Tape 2" inputs and connects the choice to the Tape Outputs when "Copy" position is selected. Position "2-1" connects the outputs of tape recorder #2 to the inputs of tape recorder #1; and Position "1-2" connects the outputs of tape recorder #1 to the inputs of tape recorder #2.

POWER LED: Green light indicates unit is on and receiving power from the power supply.

AUTO MUTE LED: Green light indicates operation of the automatic muting circuitry by varying in intensity at approximately 1.5-second intervals. Activates during first 45 seconds (approximate) of warm-up and during low-power conditions. Not affected by manual Mute Switch.

MUTE/OPERATE SWITCH: In "Mute" position, shorts the output of the preamplifier to allow listening interruptions for telephone answering or other reasons. This switch should always be activated between listening uses, in addition to turning the Gain (volume) Control counter-clockwise. These two simple precautions will prevent inadvertent misuse of your SP15 and help protect against damage to your power amplifier and/or speakers by unexpected transient signal pulses (tone arm mishandling, etc.).

INVERT/NORMAL SWITCH: In "Invert" position, inverts phase of the audio signal. Restores absolute phase or polarity to program material exhibiting out-of-phase characteristics. (Some phono cartridges and amplifiers are phase inverting and some records are recorded out-of-phase.)

BYPASS SWITCH: In "Bypass" position, directly connects the Attenuator to the output of either the RIAA compensated phono amplification circuitry or a selected line-level source (such as CD). The "Balance" and "Mode" Controls, as well as the "Monitor" Switch are removed from the active circuit path when this switch is in operation. The Bypass Switch is provided for use with audiophile-quality program material or whenever maximum fidelity to the input signal is desired.

FILTER SWITCH: Subsonic phono filter to attenuate ultra-low-frequency impulses caused by record warps, stylus/tonerarm resonance or other vibrational feedback reaching the turntable. In "Filter" position, uses a 6dB per octave rolloff (to eliminate ringing) with transition to 12dB per octave.

CONNECTIONS - PREAMPLIFIER

POWER INPUT CONNECTOR: For connection of power cable between power supply and preamplifier. Note that preamplifier connector is male configuration. Insert female cable connector carefully, then turn lock-ring to secure.

INPUT CONNECTORS: All are clearly marked to indicate use. All high level inputs are 50K ohms impedance. Remember that impedance of "Phono" input is controlled by setting of front panel Impedance Control. Note that inputs for two (2) tape recorders are provided, as well as inputs for tuner, compact disc, video and a spare line-level input.

MAIN OUTPUT CONNECTORS: There are two (2) sets of output connectors which are connected internally in parallel. One set should be connected to your electronic crossover or power amplifier. The additional set is provided for connection to an additional amplifier for remote or "background" use, or for "bi-wire" amp systems (where separate power amplifiers are used for bass and treble, but no electronic crossover is used).

Minimum total load for the output connectors should not be less than 20K ohms for maximum sonic performance.

Note: At the performance level of the SP15, high-quality audio signal interconnect cables are critical to preserving maximum fidelity. Audio Research Litzlink RFI-shielded or unshielded interconnect cables are highly recommended for connection to your power amplifier and to other ancillary equipment. See your authorized Audio Research dealer for recommended lengths and prices.

TAPE OUTPUT CONNECTORS: Two (2) sets are provided. Tape outputs should be connected to your tape recorder's "AUX" or "LINE" inputs. These outputs supply a low-impedance source of whatever is selected by the Input Selector Control on the front panel. Level is non-variable and approximately 1dB less than selected input source.

DIRECT OUTPUT CONNECTOR: Provides the most direct signal path by feeding the signal directly from the SP15's output stage, thus bypassing phase inverting circuitry and Phase Inverting Switch. Provides the highest possible signal output quality, but with less total system control flexibility.

INVERTING OUTPUT CONNECTOR: Bypasses Phase Inverting Switch for signal fidelity equal to that provided by "DIRECT" outputs, while providing inverted signal phase.

All input/output connectors have heavy gold plating and connect "ground" before "hot." (On disconnect, "hot" is first.)

BALANCED OUTPUT CONNECTORS: For those who want to operate their preamplifier and power amplifier(s) in "balanced" mode, two "XLR"-type, gold-plated output connectors are provided. These connectors are provided simply as a convenience option for the SP15 owner, and should not be interpreted as an endorsement of "balanced" vs. "single-ended" design concepts. Either mode can offer superior performance, depending upon execution and installation variables (length of interconnects, RF intrusion, etc.). Most SP15 owners will in fact hear "trade-offs" between balanced and conventional system connections, depending primarily on the performance of the ancillary equipment used.

DESCRIPTION OF CONTROLS - POWER SUPPLY

PREAMP-ON SWITCH: Initiates power to preamplifier. Function indicated by green LED to right of switch.

OUTLETS-ON SWITCH: Initiates power to three (3) grounded receptacles on rear panel of power supply chassis. Function indicated by green LED at left of switch. (Note that one additional grounded receptacle, unswitched, is also provided on the rear panel.)

CONNECTIONS - POWER SUPPLY

POWER RECEPTACLES: Four (4) grounded receptacles are provided, rated for a total of 1600 watts. There is one (1) unswitched outlet which can be used for a turntable or other equipment where switching is not needed or wanted. There are three (3) switched outlets, relay controlled, capable of providing power to amplifiers and other ancillary equipment. (For maximum sonic quality it is recommended that large power amplifiers of 100 watts output or more be connected directly to a separate external outlet.) The "click" heard upon activating the front panel receptacle switch is the relay operating.

The line cord is a #16-gauge, 3-conductor cable, providing ample safe grounded power to the rear panel receptacles. It should be noted that the SP15 line cord not only grounds the convenience outlets, but also the preamplifier chassis as well.

FUSES: For maximum safety and protection of your warranty, always use the same size and type of fuses as indicated on the back of the chassis.

POWER OUTPUT CONNECTOR: For connection of large, aircraft-style power cable between power supply and preamplifier. Note that power supply connector is female configuration. Insert male cable connector carefully, then turn lock-ring to secure.

GROUNDING INSTRUCTIONS

A fifteen inch (15") ground strap, with toothed lugs on both ends, is supplied with your SP15. Its primary function is to reduce radio interference from powerful nearby broadcasting stations in some metropolitan areas. If your listening location is not troubled by strong radio interference, you will not need to connect this strap.

The preferred mounting configuration for the SP15 preamplifier and SP15PS power supply unit is side by side on a common surface, with the power supply on the left. With this arrangement the phono inputs on the SP15 are best isolated from any magnetic fields or hum from the toroid transformer in the left side of the SP15PS. In this configuration the ground strap connects between two cover screws on adjacent rear corners of the two units. Tighten the screws to ensure a solid electrical connection.

The SP15 may also be mounted above the SP15PS, but a space at least one foot between the units is recommended for lowest possible hum. Connect the ground strap between the bottom of the SP15 and the top of the SP15PS.

In installations requiring greater spacing between units, a longer ground strap may be substituted, with somewhat less effectiveness in reducing radio interference.

It may be possible under some conditions to detect a slight sonic improvement by connecting the ground strap.

The power cord on your SP15 is equipped with a standard three-prong grounding plug which, if used normally, will provide a safe earth ground connection of the chassis and all equipment plugged into its AC receptacles.

Safety: The SP15 is constructed using an isolating power transformer with 4KV insulation. However, for absolute protection, do not defeat the ground power plug. This provides power line grounding of the chassis to provide absolute protection from electrical shock.

INSTALLATION INSTRUCTIONS

While the SP15 does not dissipate an unusual amount of heat, it is important that both units have a reasonable airflow to assure long, trouble-free operation. In addition, the following installation guidelines will help insure maximum sonic performance as well as reliable service.

1. Upright and horizontal mounting is required for both units if extended operation (longer than one hour) is contemplated.
2. Do not "stack" the units one on top the other. Not only will this prevent proper ventilation, but "hum" will be introduced into the phono circuits from the proximity of the power transformer.
3. Do not place or operate either unit on a soft or irregular surface such as a rug. This will prevent the units from having proper ventilation.
4. Do not operate either unit without the top and bottom covers installed. These are required both for safety as well as shielding from interference (except in service operations, obviously).
5. If rack mounting is employed, use Audio Research Rack Mount Ventilators (RMV-3) below, between and above the units.
6. If side-by-side mounting is employed, place the power supply to the left of the active chassis, so as to provide maximum spacing of the power transformer from the hum sensitive phono input circuitry.

7. In a cabinet or rack-mount installation which has an enclosed back, an exhaust fan is desirable so as not to operation the SP15 or its power supply in overheated ambient air. Operation of vacuum tube equipment for long periods of time in hot ambient air will shorten tube life and increase chance of failure of other component parts.

OPERATING PROCEDURE

START-UP:

1. Make sure power switch and receptacle power switch on SP15PS are set to "off" position; Mute Switch should be in "mute" position and "Gain" Control should be at minimum (full counter-clockwise rotation).

2. Make sure power interconnect cable is properly and securely connected between active chassis and power supply.

3. Secure all rear-panel connections between SP15, power amplifier(s) and input sources. Note: Given the advanced performance capabilities of the SP15, it is extremely important that the highest-quality interconnects be used for connection to ancillary electronics. Audio Research Litzlink brand interconnects, in either unshielded or RFI-shielded configurations, are strongly recommended. Your Audio Research dealer can assist you in determining optimal lengths for your system.

4. Plug 3-prong powerline cord from rear of SP15PS into AC wall receptacle.

5. Turn Power Switch on SP15PS to "On." Turn receptacle Power Switch to "on" as necessary. Green LED will blink for approximately 45 seconds while power supply stabilizes, indicating operation of automatic muting circuit. When LED ceases flashing but remains on, your SP15 is ready for operation.

Note: For superior sonic performance, a warm-up period of approximately one hour, 15 minutes is recommended. In addition, your SP15 may be safely left "on" continuously for maximum performance at all times, but at the expense of higher maintenance costs (more frequent tube replacement).

6. Rotate input selector to source desired; set switch options to positions desired.

7. If "Phono" has been selected, make sure impedance is properly matched to your phono cartridge via the front-panel selector.

8. Activate input source, then deactivate Mute Switch and adjust "Attenuator" and "Gain" controls as necessary

MUTING PROVISIONS:

The SP15 has several provisions to help protect against misuse of the exceptional dynamic range and wide bandwidth that it offers. It 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 not to interfere with a flawless listening experience of unprecedented realism, while giving reasonable protection against warm-up surges and power line interruptions. However, for absolute protection of associated equipment some operator understanding, and responsibility, is required.

Initial "settling" time of all circuit parameters within the SP15 requires approximately 10 minutes. The automatic muting circuitry timer is adjusted for about 45 seconds. (This is because recurrent interruption "settling" time is much less. You would not want to wait for 10 minutes each time such an interruption occurred.)

The Mute/Operate Switch allows manual disabling of the SP15 outputs during any moving of the tonearm or switching of equipment. Use of this switch will minimize stress on your amplifier even if it is "off." It is also highly recommended that manual muting be employed during the initial 10 minute warm-up period as well as during turnoff for maximum protection.

While it is true that the automatic muting will provide reasonably adequate protection against speaker burnout during these periods, it has limitations. Consider the following: Suppose the power amplifier is "on" (although this should not be) when the SP15 is turned on (without manual muting). There is a finite period of time prior to the energizing of the automatic muting circuitry which will allow a few milliseconds of warm-up settling at the output. The result is sonic and subsonic output to the amplifier and speaker. While this won't normally cause loudspeaker or amplifier failure, it will be sonically unpleasant. Again, at the 45 second point of the automatic timer "releases" the output, and since full stabilization has not yet occurred, the sonic unpleasantness is repeated. Although this is normally adequate "protection," utilization of the manual mute provision will completely avoid this stress to your speakers, as well as the associated sonic unpleasantness.

Some solid-state power amplifiers have a DC offset present at their input connections. (This, of course, should not be.) Operation of the manual muting switch with such an amplifier connected will result in a "click" or "pop" in your loudspeaker (commensurate in level with the amount of the offset) each time the switch is activated. Repair or replacement of such amplifiers is suggested.

The automatic muting operates as follows:

1. The manual mute switch always disables both outputs and overrides any automatic provisions, even when the SP15 is turned off. (The "Operate" position of the manual mute switch is functional only when the unit is not in the automatic mute mode.)
2. The 45 second warm-up timer will restart automatically if the power is temporarily interrupted for 0.2 seconds or more. Note: Power supply regulation of the SP15 is effective down to 95VAC without serious sonic degradation.
3. The automatic muting of the SP15 is designed to be effective only against 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 by shunt relays activated by the automatic timer circuit, or manually via the Muting Switch. This design insures minimal sonic degradation.

SHUT DOWN:

1. Set "Mute" Switch to "mute" position.
2. Rotate the "Gain" Control counter-clockwise to minimum setting.
3. Deactivate power amplifier(s).
4. Deactivate all input sources.
5. Set SP15PS Power Switch and Receptacle Power Switch to "Off" position.

SERVICING

Because of its careful design and exacting standards of manufacture, your SP15 should normally require only minimal routine service to maintain its high level of performance.

CAUTION: Your SP15 contains sufficient levels of voltage and current to be lethal. Do not tamper with a component or part inside the unit. Even with the power turned off, a charge remains in the energy storage capacitors for some time. Refer any needed service to your authorized Audio Research dealer or other qualified technician.

The three (3) vacuum tubes inside your SP15 are quality 6DJ8 types, and with normal use should not have to be changed for approximately 5000 to 10,000 hours of use. Replacement 6DJ8 tubes need not be low-noise or matched for gain characteristics. However, good, high transconductance tubes from Audio Research will provide superior sonic performance.

At the back of this Manual you will find a schematic diagram for your SP15 which is fully annotated with operating voltages and component parts values. Your service technician will require this information when servicing your unit.

Note: Contact enhancers - such as the commercial preparation "Tweek" -- are not recommended for use on vacuum tube contact pins. With continual exposure to heat and air, these substances can form gummy, dust-collecting residues which actually reduce contact and degrade sonic performance. Proper external use of these preparations -- on interconnect plugs, speaker connections, etc. -- is subject to the discretion of the owner.

CLEANING

To maintain the visual appearance of your SP15 preamplifier, occasionally wipe the front panel and top cover surfaces with a soft, damp (not wet) cloth to remove dust. A mild, non-alkaline soap solution may be used to remove fingerprints or similar smudges. Cleaners containing abrasives should not be used as they will damage the "brushed" grain of the front panel finish.

FET REPLACEMENT INSTRUCTIONS

MATCHING: The color code on the replacement FET must be identical to the old FET. When ordering replacement FETs, always specify color code, Q number (see schematic) and SP15 serial number.

For proper sonic performance, Q4 and Q5 FETs use trim resistors that are matched to each individual FET, using a proprietary Audio Research test procedure. When replacing a defective FET, it is usually necessary to change to the new 1% trim resistor(s) supplied with the replacement FET.

If the new trim resistors have identical resistance color code values to the old trim resistor(s), they will not need replacing. Check resistors on both top and bottom of the circuit board, since parallel combinations are often used. It is not necessary that left and right channels have identical trim resistors, since the FETs vary slightly within a color coded type. For best sonic results do not use types of resistors other than those supplied by Audio Research.

STATIC WARNING: Mosfets are susceptible to damage from static discharge, or excessive gate voltage during installation. To minimize damaging leakage voltages, use an ungrounded soldering iron, or one that is grounded to the chassis of the SP15. Also, touch the soldering iron to the circuit board pads first, and then flow the solder around the Mosfet pins. Avoid contact of the soldering iron to the gate pin alone before it is firmly soldered into the circuit. Make sure any gate-to-source protective devices in the circuit are not defective. They may be measured for diode conduction in circuit with a suitable ohm meter.

CHECKOUT: To ensure proper performance of the circuit after FET replacement, verify proper DC operating point of the source terminals of Q5, Q8, Q11 or Q14. They should be within 20 volts of the values indicated on the schematic, measured with a 1K isolation resistor in series with the voltmeter probe tip.

The matched replacement FETS and resistors will generally perform identically to the original parts. If for any reason the sonic performance of the SP15 is not fully as good as it was originally, please contact Customer Service for further assistance.

Remember to allow one (1) hour warm-up time after each shut-down for best sonic results. Also, the SP15 performs best at normal, stable, room temperature with covers on, in a well-ventilated, non-turbulent (no nearby fans) area.

3-YEAR LIMITED WARRANTY TERMS AND CONDITIONS

1. LIMITED WARRANTY. Audio Research warrants the product designated herein to be free of manufacturing defects in material and workmanship, subject to the conditions hereinafter set forth, for a period of three (3) years from the date of purchase by the original purchaser or no later than five (5) years from the date of shipment to the authorized Audio Research dealer, whichever comes first, excepting vacuum tubes which are warranted for 90 days only (See 6).
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. Audio Research will pay return freight of its choice. A RETURNED PRODUCT MUST BE ACCOMPANIED BY A WRITTEN DESCRIPTION OF THE DEFECT AND A PHOTOCOPY OF THE ORIGINAL PURCHASE RECEIPT. This receipt must clearly list model and serial number, the date of purchase, the name and address of the purchaser and authorized dealer and the price paid by the purchaser. Audio Research reserves the right to modify the design of any product without obligation to 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 under this Limited Warranty 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).
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 or no later than the fifth anniversary of the date of shipment to the authorized Audio Research dealer, whichever comes first.
6. VACUUM TUBES. Vacuum tubes are warranted for the original 90-day period only.
7. DEMONSTRATION EQUIPMENT. Equipment used by an authorized dealer for demonstration purposes is warranted to be free of manufacturing defects in materials and workmanship for a period of three (3) years from the date of shipment to the dealer. Vacuum tubes are warranted for 90 days. Demo equipment needing warranty service must be packed and returned to Audio Research by the dealer at his sole expense. Audio Research will pay return freight of its choice. A returned product must be accompanied by a written description of the defect on an AUDIO RESEARCH RETURNED GOODS AUTHORIZATION form. Dealer-owned demonstration equipment sold at retail within three (3) years of date of shipment to the dealer is warranted to the first retail customer to be free of manufacturing defects in materials and workmanship for the duration of the 3-Year Limited Warranty remaining (as measured from the date of shipment of the equipment to the dealer). Vacuum tubes are not warranted for any period under these conditions of sale. In the event warranty service is needed under these conditions,

the owner of the equipment must provide a copy of his purchase receipt, fulfilling the requirements described under "2. Conditions" above. 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. Audio Research will pay return freight of its choice.

8. MISCELLANEOUS. ANY IMPLIED WARRANTIES RELATING TO THE ABOVE PRODUCT 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.

9. WARRANTOR. Inquiries regarding the above Limited Warranty may be sent to the following address:

Audio Research Corporation
6801 Shingle Creek Parkway
Minneapolis, MN 55430

WARRANTY OUTSIDE THE USA

Audio Research has formal distribution in many of the countries of the free world. In each country the Audio Research Importer has contractually accepted the responsibility for product warranty. Warranty should normally be obtained from the importing dealer or distributor from whom you obtain your product.

In the unlikely event of service need beyond the capability of the Importer, Audio Research does, of course, back up the warranty. Such product would need to be returned to Audio Research, together with a photostatic copy of the bill of sale.

SP15 SPECIFICATIONS

Frequency Response:

High level input: ± 1 dB, 0.2Hz to 100kHz
-3dB below 0.1Hz and above 200kHz
Phono input: $\pm .2$ dB of RIAA 20Hz to 40kHz
 ± 1 dB of RIAA, 1.0Hz to 100kHz

Harmonic Distortion:

Less than .005% at 2V RMS output, 5Hz to 20kHz (Typically less than .001% at midband, phono or line input)

Intermodulation Distortion:

Less than .003% at 2V RMS output

Gain: (at 1kHz, Bypass mode):

Phono input to tape output: 46dB (0.2V output from 1mv input)
Phono input to main output: 75dB (0.175mv input for 1V output)
High level input to main output: 29dB (36mv input for 1V output)

Inputs (7):

Phono, Tuner, C-D, Video, Spare, Tape 1, Tape 2

Outputs (7):

Tape 1, Tape 2, Main 1, Main 2, Direct, Invert, Balanced

Filter:

25Hz Hi-pass phono subsonic 6dB/octave rolloff (to eliminate ringing) with transition to 12dB/octave at 10Hz. Front panel switchable, phono only

Controls (6):

Gain, Attenuator, Balance, Mode, Input, Impedance

Switches (8):

Tape Monitor, Copy, Tape 1/2, Tape 1to2 / 2to1, Mute, Invert Phase, Bypass, Filter

Input Impedance:

Phono: Front panel selectable 47K, 100, 30, 10, 3 ohms
Phono Input Capacitance: 150pF at 10kHz
High Level: 20K ohms or higher, depending on switch functions

Maximum Input Level Undistorted:

Phono: 350mV RMS at 1kHz, 1200mV RMS at 10kHz
(0.1 second maximum duration, 6dB less if continuous)
High Level: 25 Volts RMS

Output Impedance:

200 ohms main, direct, invert outputs
500 ohms tape output
Recommended load 60K-100K ohms and 100pF (20K ohms minimum, 1000pF maximum)

Rated Output:

2V RMS 1Hz to 100kHz main, direct, invert outputs
(Maximum 80V RMS output at 0.2% THD at 1kHz into 60K ohm load with 2.85V RMS high level input)

Phase:

Tape outputs, direct output: Non-inverting
Invert Output: Inverting
Main Outputs (2): Selectable non-inverting or inverting. All outputs may be used simultaneously

Noise (IHF Weighted, shorted input):

Balanced: Non-Inverting and Inverting
Output (Gain down) 6uV (110dB below Rated Output)
Input (High Level): 3uV equivalent input (110dB below 1V input)
Phono: 0.15uV equivalent input (76dB below 1mV input)

Tube Complement (Hybrid FET/Tube Audio Circuit, Solid-State Power Supply):

3 - 6DJ8/ECC88

Power Requirements:

95-135VAC 60Hz (Export 190-270VAC 50/60Hz) 130 Watts maximum

Dimensions: (Each Chassis, EIA Rack Panel Mounting)

19" (48 cm) W x 5 1/4" (13.4 cm) H x 10 1/4" (26 cm) D
Handles extend 1 5/8" (4.1 cm) forward of panel. Interconnect cable extends 4" behind rear of chassis

Weight: (2 Cartons)

SP15: Net 14 lbs. (6.4 kg); Shipping 23 lbs. (10.5 kg)
SP15PS: Net 15 lbs. (6.8 kg); Shipping 23 lbs. (10.5 kg)
TOTALS: Net 29 lbs. (13.2 kg); Shipping 46 lbs. (21.0 kg)