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# Owner's Manual

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## Model PH2

PHONO PREAMPLIFIER

**audio research**  
HIGH DEFINITION®

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# Model PH2

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## Preface

Thank you for choosing the Audio Research PH2 Phono Preamplifier for your music system. Please take the time to carefully read this Instruction Manual prior to installation or use. Although it has a simple control layout and is operationally straightforward, there are several facts and procedures you should be aware of before placing it in operation.

## Introduction

In this age of digital recording and playback, the PH2 phono preamplifier allows the dedicated music collector to recover the musicality and magic of treasured LP's to a degree never before possible.

Sonically, the PH2 is the most revealing phono preamp ever manufactured by Audio Research in its 23-year history. Entirely solid-state in circuit topology and fully balanced input-to-output, the PH2 was designed with continuous reference to listening tests and the experience of recorded music, along with consistency of this experience and the goal of superb reliability.

The purpose of a phono preamplifier is simple: to deliver a pure line-level output to the inputs of the line-level preamplifier—which is why the control functions of the PH2 have been kept to a minimum. The "loading" sometimes necessary with particular phono cartridges is easily accomplished by soldering the necessary resistors to the terminal posts located on the bottom of the main circuit board. This "hard-wired" approach is still the best method sonically of achieving proper loading.

The gain stages of the PH2 use a variety of FET and MOSFET semiconductors to yield a total of 48 dB overall gain. The power supply is extensively regulated and employs 280-volt supply rails (a level more often associated with vacuum-tube equipment) and a low-noise toroidal power transformer. Mechanical shielding and careful internal layout within an oversized chassis minimize internal electromagnetic interference and noise.

The vast majority of today's phono cartridges are inherently balanced transducers. The PH2 takes advantage of this fact by providing a fully balanced signal path through its circuitry and out to the balanced inputs of a line-level preamp. Overall signal-to-noise ratio is measurably improved and, along with it, the retrieval of low-level detail (one of analog's strengths). Audio Research's patented cross-coupling and D.E.C. circuits also minimize sonic colorations and help insure absolute performance stability.

While most turntable manufacturers offer XLR output terminal blocks, Audio Research manufactures LitzLink 2 RCA-to-XLR and JIS-to-XLR adaptor interconnects for proper connection to the PH2's XLR inputs. See your Audio Research dealer for details.

## Construction and Testing

Like every Audio Research product, your PH2 phono 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 PH2 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 PH2 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 PH2 is equipped with a standard three-prong grounding plug. If used normally, it will provide a safe earth ground connection of the chassis.
4. For continued protection against fire hazard, replace A.C. line fuse located on rear panel of chassis only with the same type and rating as specified.

## Packaging

Save all packaging in a dry place away from fire hazard. Your PH2 phono 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 PH2 from unnecessary damage or delay.

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# Model PH2

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## Description of Controls

**Power Switch:** Supplies power from AC wall outlet to PH2 when in "Power" position.

**Mute/Operate Switch:** In "Mute" position the outputs of the PH2 are shorted to allow listening interruptions. The PH2 should *always* be put into "Mute" when the phono cartridge's stylus is cued up from, or especially cued down onto an analog LP, preventing a subsonic "Thump" from being amplified down the line, with sometimes disastrous results.

## Connections

**Input Connectors:** There is one set of XLR input connectors, which should be connected to your turntable/ tonearm cable. Input impedance is 47K ohms in parallel with 220pF capacitance. See "Input Impedance Adjustment" to change these values.

**Output Connectors:** There is one set of XLR output connectors which should be connected to line inputs (Direct, Aux, Spare, Tuner, etc.) of your line stage/preamplifier.

**NOTE:** A "passive" line stage is not recommended for use with the PH2 as it will not provide the gain necessary to amplify the output of the PH2 to adequate levels to the power amplifier.

Audio Research Litz Link #2 cables are available in RCA to XLR, J.I.S. to XLR, and XLR to XLR configurations. At the performance level of the PH2, high quality audio signal interconnect cables are critical to preserving maximum fidelity. Please consult your Audio Research dealer.

## Input Impedance Adjustment

For the best sonic performance from your phono pickup cartridge, it should connect to the proper load impedance as recommended by the cartridge manufacturer. Your PH2 comes wired with 47K ohms and 220pF for many high-output, moving-coil and moving magnet cartridges. A kit of precision load resistors is supplied with your PH2 for the load requirements of 30, 60, 100, 200 or 800 ohms moving-coil cartridges. Consult your cartridge manufacturer or dealer to determine the optimum load impedance for your needs. You may wish to connect the load resistors at the output of your turntable, rather than in the PH2, especially if you may be using more than one turntable or cartridge, with different load requirements.

The use of precision fixed resistors provides better load accuracy and sonic performance at lower cost than adjustable or switchable loads. Audio Research can supply audiophile grade non-standard load resistor and capacitor values upon request accompanied by US\$10.00 to cover order processing costs (certified funds or money order).

The differential circuitry of the PH2 requires the soldering of load resistors to both the negative and positive halves of each channel. Solder the desired resistors (two, or four per channel in parallel, as required) to the turret terminal posts located on the bottom of the main circuit board near the inputs (see illustration).

First, wrap the resistor leads one-half to three-quarters turn, then solder in place using the special alloy solder supplied with the resistors. Connect the desired resistor combination between the negative and center posts, and the positive and center posts for both channels.

For 30 ohms loading: add brown-green-black-gold resistors.

For 60 ohms loading: add orange-orange-red-gold resistors.

For 100 ohms loading: add a double (paralleled) set of brown-black-black-black resistors.

For 200 ohms loading: add brown-black-black-black resistors.

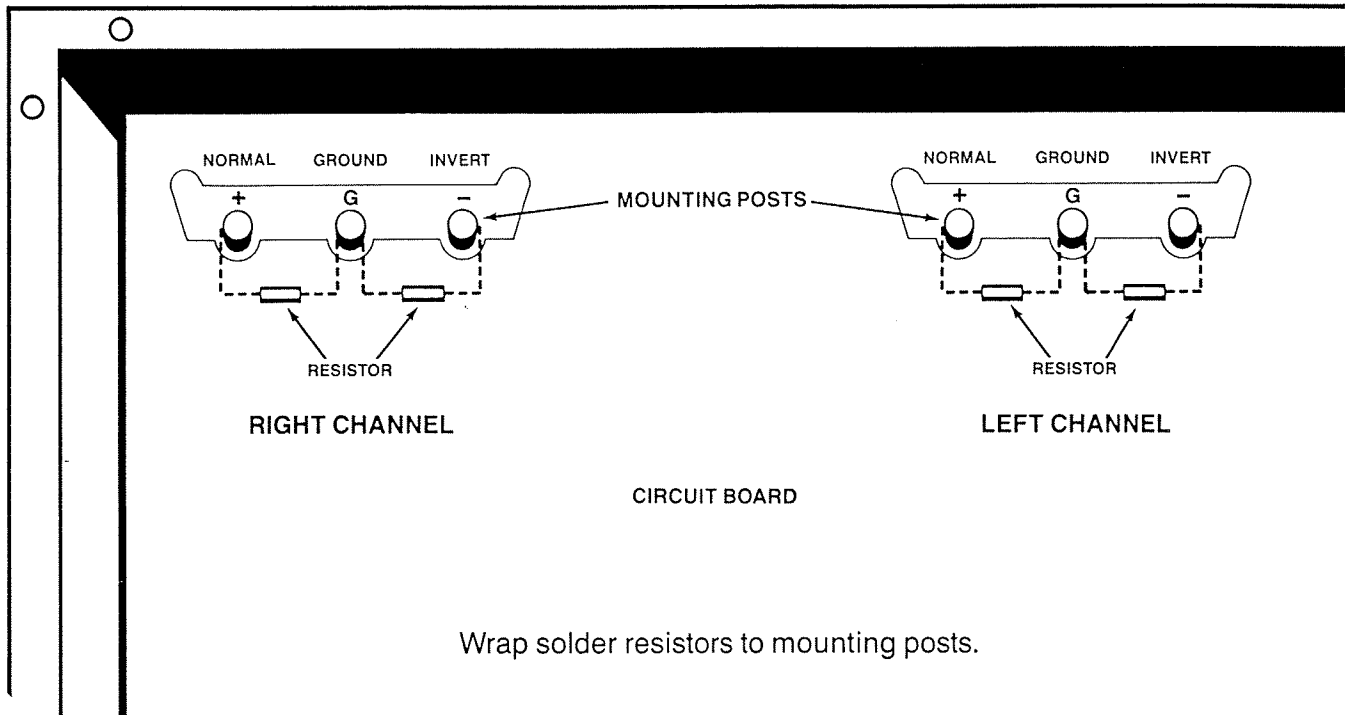
For 800 ohms loading: add a double (paralleled) set consisting of blue-grey-brown-black and brown-black-black-brown resistors.

## Input Capacitance Adjustment

The PH2 has a total input capacitance of 220 Picofarads. Different value capacitors can be added to match the requirements of your moving magnet cartridge. Observe the polarity as shown in the diagram when adding capacitors.

# Model PH2

## Bottom View, Rear Corner



## Installation Instructions

While the PH2 does not dissipate an unusual amount of heat, it is important that it 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 if extended operation (longer than one hour) is contemplated.
2. Do not stack the PH2 on top of other equipment. Not only will this prevent proper ventilation, but hum may be introduced into the phono circuits from the proximity of the power transformer of the other equipment.
3. Do not place or operate unit on a soft or irregular surface such as a rug. This will prevent the unit from having proper ventilation.
4. Do not operate 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 and above the PH2.
6. In a cabinet or rack-mount installation which has an enclosed back, an exhaust fan is desirable so as not to operate the PH2 in overheated ambient air. Operation for long periods of time in hot ambient air will increase the chance of failure of component parts.

## Operating/Start-Up Procedure

1. Make sure Power Switch is set to "Off" position.
2. Secure connections between turntable, PH2, and line stage amplifier.
3. Plug 3-prong power cord into a grounded AC wall receptacle.
4. Turn Power Switch to "On." The green Power LED will glow dimly for approximately 60 seconds while the power supply stabilizes, indicating operation of the automatic muting circuit. After this warm-up period the LED will brighten (when the Mute/Operate switch is set to "Operate"), indicating that your PH2 is ready for operation.

**NOTE:** The PH2 may be left on continuously for maximum performance; when not in use simply use the "Mute" switch. The PH2 draws less wattage continuously than a 70 watt light bulb.

## Cleaning

To maintain the visual appearance of your PH2, 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.

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# Limited Warranty

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## 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), and CD players or transports, which are warranted for two (2) years from date of purchase (four (4) years from date of shipment).

### 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 (second for CD players and transports) of the date of purchase or no later than the fifth anniversary (fourth for CD players and transports) of the date of shipment to the authorized Audio Research dealer, whichever comes first.

## Warranty Outside the U.S.A.

Audio Research has authorized distribution in many countries of the world. In each country, the authorized importing retailer or distributor has accepted the responsibility for warranty of products sold by that retailer or distributor. Warranty service should normally be obtained from the importing retailer or distributor from whom you purchased your product.

### 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, or two (2) years in the case of CD players and transports. Vacuum tubes are warranted for 90 days. After the first year, 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); this period of warranty is two (2) years in the case of CD players and transports. 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**

5740 Green Circle Drive, Minnetonka, Minnesota 55343-4424

ATTN: Customer Services.

In the unlikely event of service required beyond the capability of the importer, Audio Research will fulfill the conditions of the warranty. Such product must be returned at the owner's expense to the Audio Research factory, together with a photocopy of the bill of sale for that product, a detailed description of the problem, and any information necessary for return shipment.

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# Specifications

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## Model PH2

**FREQUENCY RESPONSE:**  $\pm$ .15db of RIAA, 10Hz to 60 HZ, 3dB points below 0.5Hz and above 150kHz

**DISTORTION:** Less than .005% at .25V RMS 1kHz output

**GAIN:** 48dB (balanced differential) at 1kHz (MC & MM compatible)

**SWITCHES (2):** Power, Mute

**INPUT IMPEDANCE (Balanced):** 47K ohms (Provisions for balanced loads any value below 47K ohms or added input capacitance for matching certain magnetic cartridges.)

**OUTPUT IMPEDANCE (Balanced):** 700 ohms. Recommended load 50K-100K ohms and 100pF. (20K ohms minimum and 2000pF maximum)

**MAXIMUM INPUTS:** 300mV RMS at 1kHz (1500mV RMS, 10kHz).

**RATED OUTPUTS:** .25V RMS Balanced 10Hz to 60kHz (output capability is 100V RMS output at 1/2% THD at 1kHz)

**POWER SUPPLIES:** Electronically-regulated low and high voltage supplies and electronic decoupling. Shielded toroid transformer. Line regulation better than .01%.

**NOISE:** 0.15uV equivalent balanced input noise, IHF weighted, shorted input (77dB below 1mV input)

**POWER REQUIREMENTS:** 100-135VAC 60Hz (200-270VAC 50/60Hz) 65 watts

**DIMENSIONS:** 19" (48 cm) W x 5 $\frac{1}{4}$ " (13.4 cm) H (standard rack panel) x 11 $\frac{3}{4}$ " (29.8 cm) D. Handles extend 1 $\frac{5}{8}$ " (4.1 cm) forward of front panel. Rear chassis fittings extend 7 $\frac{1}{8}$ " (2.3 cm).

**WEIGHT:** 13 lbs. (5.9 kg) Net; 23 lbs. (10.5 kg) Shipping

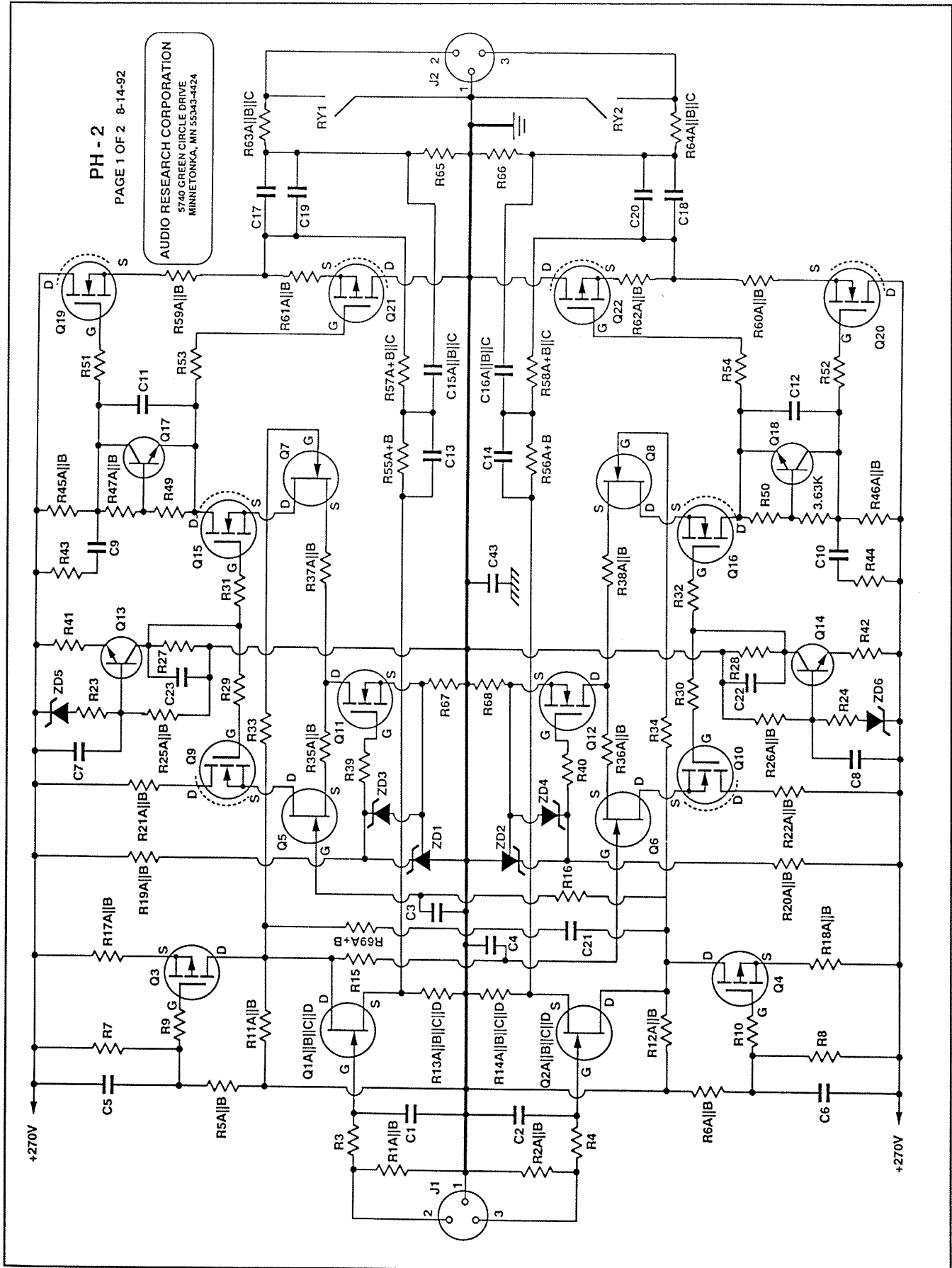
Specifications subject to change without notice.

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# Model PH2 Schematics

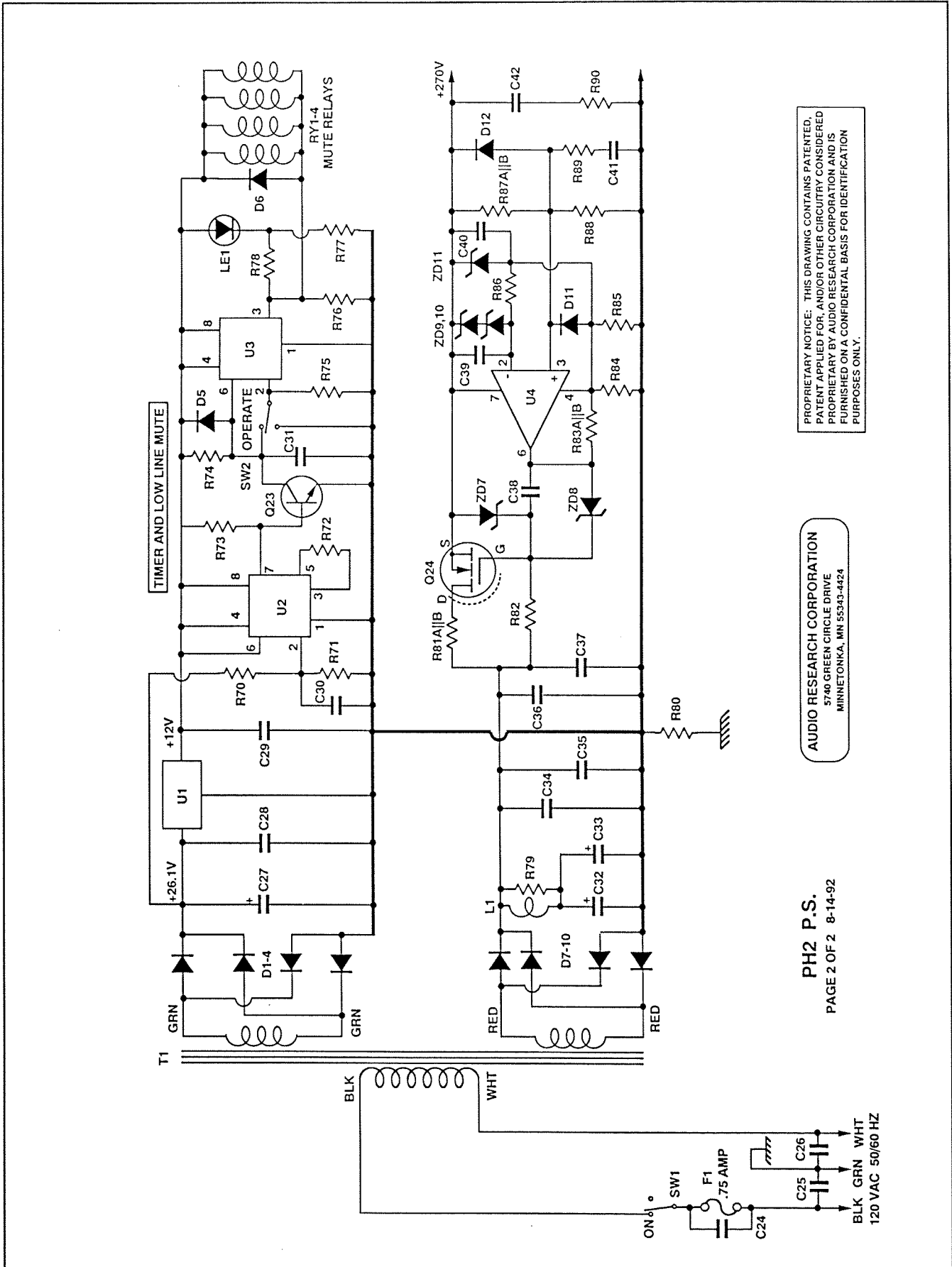
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AUDIO RESEARCH CORPORATION  
5740 GREEN CIRCLE DRIVE  
MINNETONKA, MN 55343-4424





# Model PH2 Schematics



PROPRIETARY NOTICE: THIS DRAWING CONTAINS PATENTED, PATENT APPLIED FOR, AND/OR OTHER CIRCUITRY CONSIDERED PROPRIETARY BY AUDIO RESEARCH CORPORATION AND IS FURNISHED ON A CONFIDENTIAL BASIS FOR IDENTIFICATION PURPOSES ONLY.

AUDIO RESEARCH CORPORATION  
 5740 GREEN CIRCLE DRIVE  
 MINNETONKA, MN 55343-4424

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# Model PH2 Parts List

Schematic Symbol	Quantity	ARC Part	Description	Schematic Symbol	Quantity	ARC Part	Description
<b>C</b>				<b>R</b>			
<b>CAPACITORS</b>				<b>RESISTORS</b>			
C 1,2,9,10	8	53220201	CAP. 220 PF ±2.5% 630V PPN	R 1A,1B,2A,2B,47B,48B	12	42499403	RES. 49.9K 1% MK-3 50PPM
C 3,4	4	53150202	CAP. 150 PF 2 1/2% 630V PPN	R 3,4,15,16,33,34,59A-62A,59B-62B	29	42100203	RES. 100 OHM 1% MK-3 50PPM
C 5-8,11,12,22,23,28-30,38-40	22	53220507	CAP. .22 UF 10% 160V	R 5A,5B,6A,6B,19A,19B,20A,20B,25A	28	42475503	RES. 475K 1% MK-3 50PPM
C 13,14	4	53960301	CAP. .0096 UF (SEL. 53100412)	R 25B,26A,26B,65,66			
C 15,16	4	53220201	CAP. 220 PF ±2.5% 630V PPN	R 7,8	4	42215503	RES. 215K 1% MK-3 50PPM
C 15A,15B,15C,16A,16B,16C	12	53338401	CAP. .0327 UF (FROM 3-53100412)	R 9,10,29-32,39,40,51-54,69A,69B	28	42274103	RES. 27.4 OHM 1% MK-3 50PPM
C 17,18	4	53100412	CAP. .01UF 600V	R 11A,11B,12A,12B,27,28,73	13	42100403	RES. 10K +/-1% MK-3 50PPM
C 19,20	4	53500607	CAP. 5 UF 200V	R 13A-13D,14A-14D	16	42162203	RES. 162 OHM 1% MK-3 50PPM
C 21,43	4	53560201	CAP. 560 PF +/-2.5% 630V	R 17A,17B,18A,18B	8	42274405	RES. 27.4K 1% MK-8 50PPM
C 24	1	52200400	CAP. .02 UF 20% 300VAC/2000VD	R 21A,21B,22A,22B,45A,45B,46A,46B	16	42750405	RES. 75K 1% MK-8 50PPM
C 25,26	2	52500300	CAP. .005 UF 20% CERAMIC DISC	R 23,24,80	5	42100103	RES. 10 OHM 1% MK-3 50PPM
C 27	1	50100908	CAP. 1000 UF 63V	R 35A-38A,35B-38B,43,44	20	42499203	RES. 499 OHM 1% MK-3 50PPM
C 31	1	51330702	CAP. 33 UF +/-10% 16V	R 41,42	4	42182303	RES. 1.82K 1% MK-3 50PPM
C 32,33	2	50100802	CAP. 100 UF 450V	R 47A,47B,55B,56B	8	42392303	RES. 3.92K 1% MK-3 50PPM
C 34,35	2	53100608	CAP. 1.0 UF 1-20% 425V TYPE V	R 49,50,89	5	42332203	RES. 332 OHM 1% MK-3 50PPM
C 36,37,41	3	53100406	CAP. .01 UF +/-10% 630V	R 55A,56A,	4	42402303	RES. 4.02K 1% MK-3 50PPM
C 42	1	53200602	CAP. 2 UF +/-10% 450V	R 57A,58A,57B,58B	8	42150613	RES. 1.5 MEG 1% MK-4 50PPM
				R 57C,58C	4	42127505	RES. 127K 1% MK-8 50PPM
<b>D</b>				<b>R</b>			
<b>DIODES</b>				<b>RESISTORS</b>			
D 1-4	4	30500400	IN4005 GENERAL INSTRUMENT	R 63A-63C,64A-64C	12	42100314	RES. 1K 1% MK-5 50PPM
D 5,6,11,12	4	30500910	1N916B	R 67,68	4	42357203	RES. 357 OHM 1% MK-3 50PPM
D 7-10	4	30502200	IN4006	R 70	1	42100503	RES. 100K +/-1% MK-3 50PPM
				R 71	1	42237403	RES. 23.7K 1% MK-3 50PPM
<b>F</b>				<b>R</b>			
<b>FUSES</b>				<b>RESISTORS</b>			
F 1	1	34500250	FUSE, MDQ 6/10 A	R 72	1	42768403	RES. 76.8K 1% MK-3 50PPM
				R 74	1	42100603	RES. 1 MEG 1% MK-3 50PPM
				R 75	1	42100703	RES. 10 MEG 1% MK-3 50PPM
				R 76	1	42237203	RES. 237 OHM 1% MK-3 50PPM
				R 78	1	42100303	RES. 1K 1% MK-3 50PPM
				R 81A,81B	2	42200205	RES. 200 OHM +/-1% MK8 50PPM
				R 82	1	42158513	RES. 158K 1% MK-4 50PPM
				R 83A,83B	2	42392403	RES. 39.2K 1% MK-3 50PPM
J 1	2	23201970	XLR CONNECTOR (Female)	R 84,85	2	42100505	RES. 100K 1% MK-8 50PPM
J 2	2	23201910	SP15 MIC CONN. CH. MNT.	R 86	1	42499303	RES. 4.99K 1% MK-3 50PPM
				R 87A	1	42255403	RES. 25.5K 1% MK-3 50PPM
				R 87B	1	42357403	RES. 35.7K 1% MK-3 50PPM
				R 88	1	42280513	RES. 280K 1% MK-4 50PPM
				R 90	1	43100002	RES. 1 OHM 2W 5% W.W.
<b>L</b>				<b>RY</b>			
<b>INDUCTORS</b>				<b>RELAYS</b>			
L 1	1	61000170	CHOKE, 5.5 UH	RY 1,2	4	64101000	RELAY, 12V REED S1P 1200 OHM
<b>LE</b>				<b>SW</b>			
<b>PANEL INDICATOR</b>				<b>SWITCHES</b>			
LE 1	1	34300102	L.E.D. COLLAR & RETAINING RING	SW 1,2	2	24100730	TOGGLE SWITCH SILVER, SATIN
<b>Q</b>				<b>T</b>			
<b>TRANSISTORS</b>				<b>TRANSFORMERS</b>			
Q 1A-1D,2A-2D	16	30006534	FET, WHITE ORANGE YELLOW	T 1	1	60007700	XFR. SP9/14 (120V) TOROID
Q 3,4,21,22	8	30009001	FET, GREEN VIOLET				
Q 5-8	8	30006602	FET, VIOLET RED				
Q 9,10,15,16,19,20,24	13	30006761	FET, ORANGE YELLOW BROWN				
Q 11,12	4	30007901	FET, RED ORANGE				
Q 13,14	4	30010000	2SA1306				
Q 17,18	4	30003100	TRANSIST.,2N5088,2N5209,2N5210				
Q 23	1	30002800	TRANSISTOR,2N4401				
				<b>U</b>			
				<b>INTEGRATED CIRCUITS</b>			
				U 1	1	31002900	MC 7812 CT MOTOROLA
				U 2,3	2	31000801	TIMER
				U 4	1	31002200	MC34071P
				<b>ZD</b>			
				<b>ZENER DIODES</b>			
				ZD 1,2	4	31002600	ZENER DIODE, TL431CLP ADJ
				ZD 3,4,7	5	30500300	IN4740A
				ZD 5,6,9,10	6	31000705	LM329DZ GREEN
				ZD 8	1	30504210	IN5535A (KNOX ONLY)
				ZD 11	1	30503500	IN5359 B