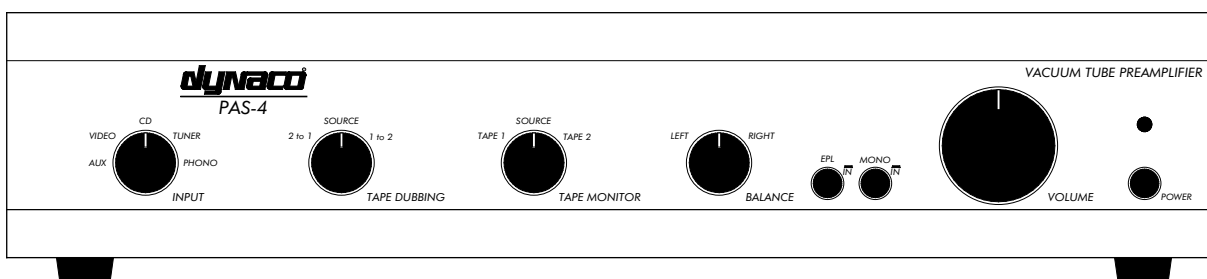


PAS-4

Vacuum Tube Preamplifier

Owner's Manual



PAS-4 Vacuum Tube Preamplifier

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Please read this manual thoroughly before operating your new PAS-4.

Introduction

Congratulations on your purchase of the Dynaco PAS-4 preamp. This preamplifier was designed to provide the highest combination of quality and value available, which is the Dynaco tradition.

Only very high quality components have been used in manufacturing the PAS-4. Examples of this are the low noise metal-film resistors, polypropylene film capacitors, and selected (tested) vacuum tubes. Likewise, the high quality rotary switches and potentiometers provide better performance and reliability than what is found in most other audio equipment.

Unique to this modern PAS-4 vacuum tube design is its power supply buffering circuitry - found in no other preamp of this class. We have included a separate buffer circuit for *each* of its six tubes, allowing each amplification stage to function more independently, (as if each has its own separate power supply). This contributes significantly to the extraordinary sonic clarity of the PAS-4.

The PAS-4 contains a true state-of-the-art phono preamp section. It provides a front panel switched "external processing loop" for use with a graphic equalizer or other signal processing equipment. It also includes full provisions for tape dubbing between two tape decks ("1 to 2" and "2 to 1").

You will find the PAS-4 to *sound* better than the large majority of other preamplifiers - both solid state *and* vacuum tube designs - regardless of price. Its flexibility and full-featured styling is without parallel in affordable preamps. Your PAS-4 was designed and built entirely in the USA. We are proud to offer this outstanding preamplifier to discerning audiophiles the world over.

Dynaco Engineering Group

Rear Panel Inputs and Outputs

Inputs - Phono

These inputs will accommodate "moving magnet" or high output "moving coil" cartridges which have output levels of 1.0mV or higher.

In the lower right hand corner of the rear panel is the preamp's chassis ground terminal. This thumbscrew is provided for attaching the separate ground wire often provided on turntables. (see Minimizing System Noise on page 11)

Inputs - Tuner, CD, Video, Aux., Tape 1 & 2

These inputs receive standard line (high level) input signals from other equipment. The Tape Inputs of the PAS-4 connect to Line Outputs (Play) on tape decks.

Tape Outputs

Signals sent to these outputs are at line level. (Phono signals are first amplified and equalized). Tape Outputs are unaffected by external processing circuits, the Mono switch, the Volume control, or the Balance control. The preamp's Tape Outputs connect to the tape deck(s) Line (Record) Inputs .

Preamplifier Main Outputs

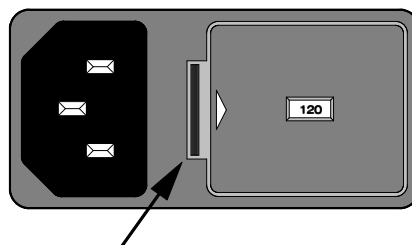
Two pairs of outputs are provided for your power amplifier(s). The two left channel RCA jacks are connected directly together inside of the PAS-4, as is the right channel pair.

EQ (External Processing Loop)

"EQ Out" are line level outputs which can be connected to the inputs of an external signal processor such as an equalizer, time delay, or noise reduction unit. "EQ In" are for line level inputs coming from the signal processor outputs.

FUSE

AC Line Fuse: 2 Amp Fast-Blow - 100 or 115 VAC
 1 Amp Fast-Blow - 230 VAC



PUSH TAB TO RELEASE FUSE HOLDER

To remove the AC line fuse, use a small screwdriver to push forward the tab near the center of the Power Entry Module.

Always remove the power cord when accessing the AC line fuse.

Operation

Turn-On Delay and Visual Indicator

When you turn on the PAS-4, the lamp above the PWR (power) switch glows GREEN and a timer circuit is evoked which keeps the preamp outputs at zero volts during the warm-up period. This 45-second warm-up period allows the tube filaments to fully heat, the high-voltage section of the power supply to reach full potential, and for the preamp output circuitry to settle, (avoiding loud turn-on "thumps"). When warm-up is finished, the lamp turns to RED and the preamp outputs are operative.

When you turn off the PAS-4, the outputs immediately clamp to zero volts. Turning the preamp back on at this point will require, again, waiting through the warm-up period.

Input Selection

Your choice of a signal source is indicated by the INPUT switch position you select. This signal source is what you will hear. It is also sent to the Tape (recording) Outputs and the EQ Outputs, (as long as the TAPE MONITOR and TAPE DUBBING switches are both set to SOURCE).

Tape Deck Selection - Listening

You may bypass the INPUT switch selection by using the TAPE MONITOR switch, in which case the signal from the selected tape deck is what you will hear and what is sent to the EQ Out jacks.

When the TAPE MONITOR switch is turned to Tape 1 or Tape 2, what you hear is the signal from the tape deck playback head, not the original source signal (which is being recorded onto tape via the tape deck record head). This feature allows direct comparison of the signal source with taped replica without affecting the recording process. (If a tape deck does not have separate record and playback heads, then the signal you hear when using the TAPE MONITOR switch is the same signal being sent to the tape deck to be recorded.)

*The following controls affect all signals which are heard through the speakers.
They have no effect, however, on signals being recorded at the Tape Outputs.*

EQ Switch

Pushing IN the EQ switch inserts a signal processing device into the preamplifier signal path (if such a device is connected to the EQ Inputs and Outputs). This part of the signal path is then called the External Processor Loop (EPL). Such devices include equalizers, time delays or ambiance simulators, expanders, compressors, and noise reduction systems. When the EQ switch is in the OUT position, any equipment plugged into the EQ inputs is effectively removed from the preamplifier signal path. Therefore, an unpowered device connected to the EQ Inputs and Outputs will not deteriorate the PAS-4's performance (which can happen with some tape decks, as mentioned above).

Note: The EQ inputs can also be used as a second set of Auxiliary Inputs - (for a second tuner, second CD player, etc.) Therefore, the EQ switch itself can also function as an additional input selector.

Mono Switch

When this button is IN, left and right channel information is combined and the composite signal is fed to both left and right outputs. In this mode the sound image should appear to be centrally located between the loudspeakers. This switch is useful when listening to monophonic program material. It cancels the unwanted vertical phonograph modulations which are heard as noise from monaural records.

Balance Control

This adjusts the proportion of left and right channel signals going to the preamp's line level amplification stage (and therefore to the preamp's main outputs). Only the left channel signal will be heard with the Balance Control turned fully counter-clockwise, and only the right channel signal with full clockwise rotation. The function of the Balance Control is to compensate for unbalanced left and right channel signal *levels* (from phonograph records, for instance) or to compensate for non-symmetrical room acoustics (from furniture, wall reflections, etc.).

Tape Deck Selection - Recording

The TAPE DUBBING switch determines which signals are sent to the tape decks for recording purposes. If the TAPE DUBBING switch is set to SOURCE, both tape decks receive the same signal - the one indicated by the position of the INPUT switch.

A copy of a tape can be made when the TAPE DUBBING switch is set to either '2 to 1' or '1 to 2'. (When this is done, the signal source selected by the INPUT switch is disconnected from both tape decks.)

When the TAPE DUBBING switch is set to '2 to 1', the output of tape deck #2 goes to the input of tape deck #1 to be recorded. When the TAPE DUBBING switch is set to "1 to 2", the output of tape deck #1 goes to the input of tape deck #2 to be recorded.

The TAPE MONITOR switch can be used to listen to the "source" tape deck (the original recording) or the "target" tape deck (the dubbed recording) while tape dubbing is being done. However, if the TAPE MONITOR switch is set to SOURCE, one can listen to any music signal selected with the INPUT switch *while tape dubbing is in progress*.

Note: Some older tape decks which do not have high impedance input circuitry can present non-linear loads to a preamp's Tape Outputs even when the tape decks are turned off. This can be a problem because the Tape Outputs are usually connected to which ever signal source has been selected by the INPUT switch. This "always present" non-linear load can degrade performance on most preamps.

With the PAS-4 there is a solution to the use of lower input impedance tape decks. Simply keep the TAPE DUBBING switch positioned to '1 to 2' or '2 to 1' when the deck is not in use. This disconnects the signal selected by the INPUT switch from both tape decks, as mentioned previously.

Tube Replacement

CAUTION: Before replacing tubes on your PAS-4 ensure the AC power cord is unplugged from its AC (wall) outlet (or that the AC power cord is unplugged from the back of the unit) **and** wait for three minutes to allow the high voltage power supply to discharge. Gloves may be worn when changing tubes. *Never touch live circuit elements in vacuum tube equipment because lethal voltages are present when these are turned on.*

The tubes in your PAS-4 *could* provide 5,000 to 10,000 hours of use. We recommend that these tubes be replaced after no more than 3,000 hours of use to avoid the slightly "muffled" sound or slight bass "roll-off" which can begin to occur with old tubes.

Microphonics (various "pinging" or "howling" sounds) is due to a tube being overly sensitive to physical vibrations. To avoid it, do not operate vacuum tube equipment on top of vibrating surfaces (such as loudspeakers). But if a tube is so sensitive that just having the preamplifier turned on causes the microphonic sounds, the tube will have to be replaced. It can happen that a tube becomes microphonic with age or that it is only microphonic before it warms up (or only after it warms up).

The most common type of problem in tube preamplifiers is excessive noise caused by a worn or faulty tube. The characteristics of this noise can vary a great deal. If a noise problem occurs with your PAS-4, 99% of the time it will be due to a faulty tube

The most likely source of tube noise in the PAS-4 is the phono section first stage tubes V1 (left channel) or V4 (right channel). Less likely, but to be suspected next, would be the phono stage second stage tubes V2 (left) or V5 (right). *If the undesirable noise increases as you turn up the volume control, the faulty tube is likely to be one of the phono section tubes.* The line stage tubes are V3 (left) and V6 (right). (Refer to the tube numbers printed adjacent to pin #1 of each tube on the printed circuit board.)

Note: When removing a tube, grasp the tube socket with one hand and the tube with the other hand. Move the tube (slightly) from side to side while pulling outward.

*The most certain method for confirming a faulty tube
is by substitution of a known good tube.*

An easy way to determine if a tube in any particular position is causing un-desirable noise is to swap the suspected tube with its counterpart in the opposite channel. If the noise jumps to the other channel, the tube you suspected is indeed faulty.

Alternate Tube Types

It is true that vacuum tubes made by different manufactures can actually sound different. The amount and type of sonic differences can be subtle or fairly obvious to a discerning listener. Also, tube reliability and longevity often varies according to manufacturer.

Vacuum tube manufacturers are still introducing new versions of older tube designs. These new designs are commonly labeled with partly or wholly new part numbers. Furthermore, different vacuum tube manufacturers often use different part numbers for their own versions of "equivalent" tubes. Distributors sometimes substitute tubes from different manufacturers and/or substitute tubes with alternate part numbers *without informing their customers first*.

Some audiophiles feel strongly about which manufacturer and/or particular version of vacuum tube to use for specific applications. The tubes installed on your new PAS-4 have been selected to provide the best sound and long life.

As of this writing, vacuum tubes are still produced by manufacturers in Germany (Siemens), Russia (Sovtek), Czechoslovakia (Telsa), China (Sino), Yugoslavia (EI), and in England. Your dealer can recommend U.S. tube distributors, if needed.

Alternate tube part numbers which can be used on the PAS-4:

Designator	Common Part Numbers	Alternate Part Numbers
V1, V4	12AX7	ECC83
V2, V3, V5, V6	6DJ8	ECC88, 6922, 7308

If tube replacement becomes necessary, Dynaco can supply you with new vacuum tubes and/or a list of specifically recommended tubes for the PAS-4.

Note: Because it is possible for oxidation to build up on vacuum tube pins, it is a good idea to remove and clean them with a small (brass bristle) wire brush once a year. At this time it is also recommended to clean the tube pins with contact cleaner. Contact cleaner leaves a thin coating on the pins which helps prevent oxidation. The contact cleaner can either be sprayed directly onto the tube pins (don't get any on the glass part of the tube) or can be sprayed on a clean cloth which is then used to wipe the tube pins.

Minimizing Noise in the System

Hum is caused by amplification of the 50 or 60 Hz AC power line signal that is transmitted via the magnetic fields around power transformers and power cables. RF interference usually comes from inadequate shielding of cables or components. If any of these types of noises are encountered, one or more of the following pointers concerning proper component positioning and grounding may be of use:

- Ensure that each system component, especially the preamplifier, is located far enough away from the other components so that they will not pick up hum from them, and that the AC power cables are not in close proximity to audio cables.
- Ensure that all audio cables are securely pushed into their respective jacks. A faulty audio cable, although rare, can be a source of hum if its outer shield is broken or disconnected from an RCA plug at one end of the cable.
- *The best "system grounding scheme" is to have your preamplifier well grounded to an earth ground point and function as the system's main ground reference. Other system components are then quite adequately grounded by being connected to the preamplifier's ground via their audio cables.* Using this grounding scheme can be as simple as just plugging the preamplifier's power cable into a three prong AC outlet. However, if the AC outlet itself does not provide a really "good" ground, the preamplifier power cable can be plugged into a three-to-two prong adapter and a wire can be run from the tab on the adapter to the nearest cold water pipe.
- Another solution to AC power cable "ground loop" hum problems is to plug the AC power cables from all of the system components into a common "socket strip" (available from most hardware stores).
- If RF noise (usually an AM radio station or CB transmission) is a problem in your area, an AC power filter can be purchased into which some or all of your system power cords can be plugged. This is done if the RF is coming in through the building's AC wiring. However, if RF gets into the system via your turntable, you may have to use tonearm cables with better shielding. (This is tested by unplugging the turntable from the system and putting "shorting plugs" in the preamplifier's phono inputs before listening again.) RF noise is sometimes eliminated by simply moving the turntable or other components to another location in the room.
- Hum from a turntable is usually traced to an adjacent power transformer or a missing or improper ground. Check to see that the turntable motor is grounded via a wire to the preamplifier's grounding post - (or try removing this wire from the ground post if it is already connected there).

Warranty

For three years from the date of purchase (one1 year for tubes) Dynaco will repair, for the original owner, any defect in materials or workmanship that occurs in normal use, without charge for parts or labor.

It is the owner's responsibility to provide transportation to the authorized Dynaco service representative who will perform warranty service, and to present proof of purchase in the form of a dated sales slip when requesting service.

Excluded from this warranty is damage that results from abuse, misuse, accidents, shipping, repairs or modification by anyone other than an authorized Dynaco service representative. This warranty is void if the serial number has been removed or defaced. This warranty gives you specific legal rights, and you may also have other rights - which vary from state to state.

If service is required, contact the dealer from whom you purchased the amplifier. If that is not possible, write Dynaco, giving us:

- ✓ Your name and address
- ✓ Make and model of your amplifier
- ✓ The amplifier's serial number
- ✓ When and where you purchased it (copy of sales slip)
- ✓ Description of the problem
- ✓ Whether you have the original carton and fillers or need new ones

DYNACO strongly recommends using only its performance checked pre-tested vacuum tubes. Each tube is guaranteed to perform properly in its intended application for ONE YEAR. Orders for tubes may be paid for by personal check or money order. Please also include \$4.00 for shipping and handling.

Dynaco

A Division of Panor Corporation
125 Cabot Court
Hauppauge, New York 11788

(516) 434-1200
(516) 434-1457 FAX

PAS-4 Specifications

Phono Section

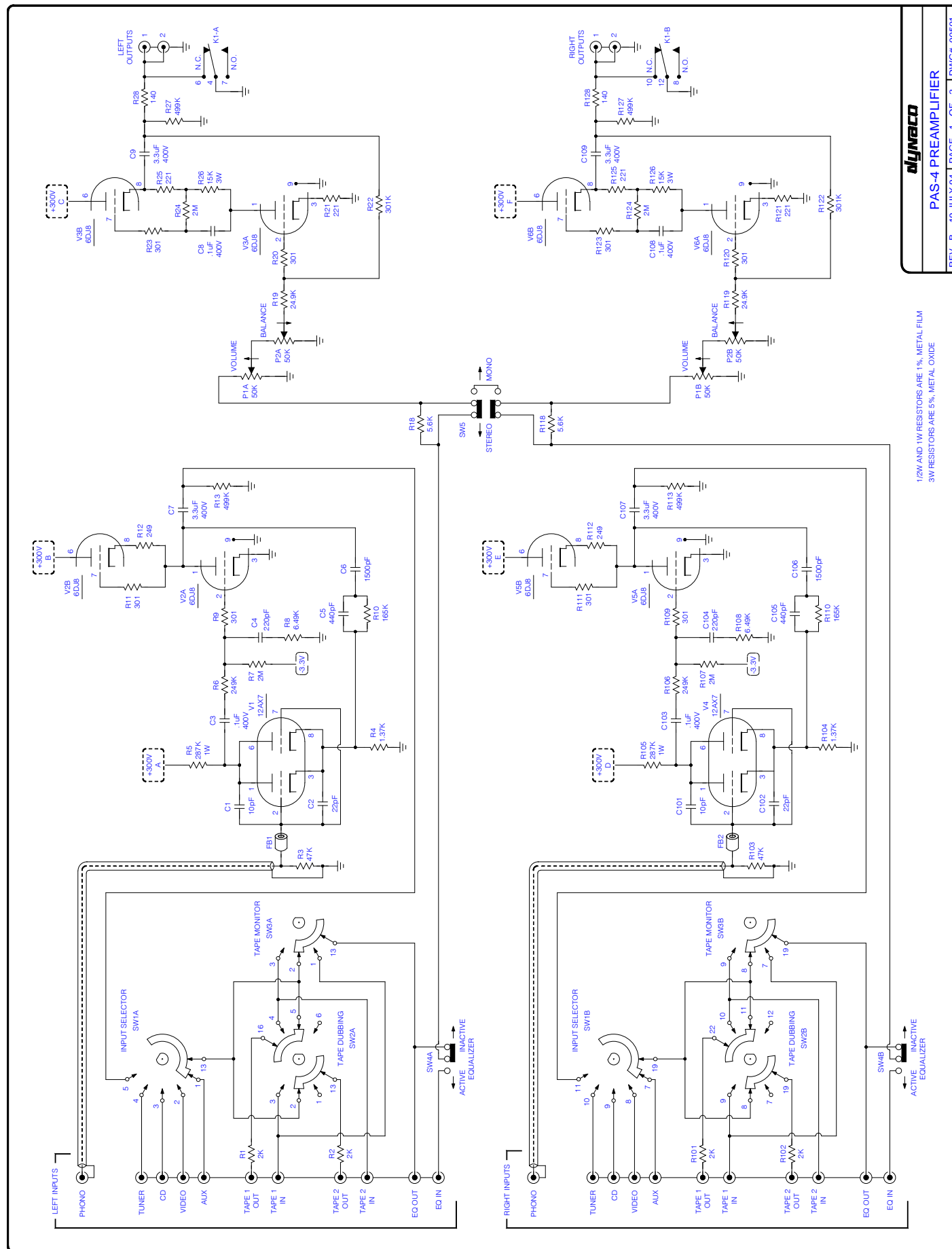
GAIN:	40 dB
RIAA ACCURACY:	+/- .5 dB from 20 Hz to 20 kHz
PHONO OVERLOAD:	500mV RMS @ 1kHz
MAXIMUM OUTPUT CAPABILITY:	60V RMS @ 1kHz
THD:	50V RMS @ 20kHz (for 1% THD) less than .025% @ 2V RMS Output
INPUT IMPEDANCE:	47k shunted by 10pF
TAPE OUTPUT IMPEDANCE:	2k
NOISE:	-86 dB below 10mV RMS Input
ABSOLUTE PHASE:	Non-Inverting
TUBE COMPLEMENT:	2ea 6DJ8 (6922); 2ea 12AX7 (ECC83)

Line Section

GAIN:	18.5 dB
FREQUENCY RESPONSE:	2 Hz to 150 kHz (nominal) (-3 dB, 20 k ohm load)
MAXIMUM OUTPUT:	40V RMS (for 1% THD)
THD:	.025% @ 2V RMS Output
INPUT IMPEDANCE:	25k nominal (all inputs)
OUTPUT IMPEDANCE:	40 ohms
NOISE:	-90 dB below 2V RMS Output
ABSOLUTE PHASE:	Inverting
SLEW RATE:	40 V/ μ s
TUBE COMPLEMENT:	2ea 6DJ8 (6922)

Electrical / Mechanical

POWER REQUIREMENTS:	100, 115, or 230 VAC @ 50/60 Hz
POWER CONSUMPTION:	45 Watts
DIMENSIONS:	17" Wide, 3.75" High, 12" Deep
NET WEIGHT:	12 lbs.
SHIPPING WEIGHT:	14 lbs.

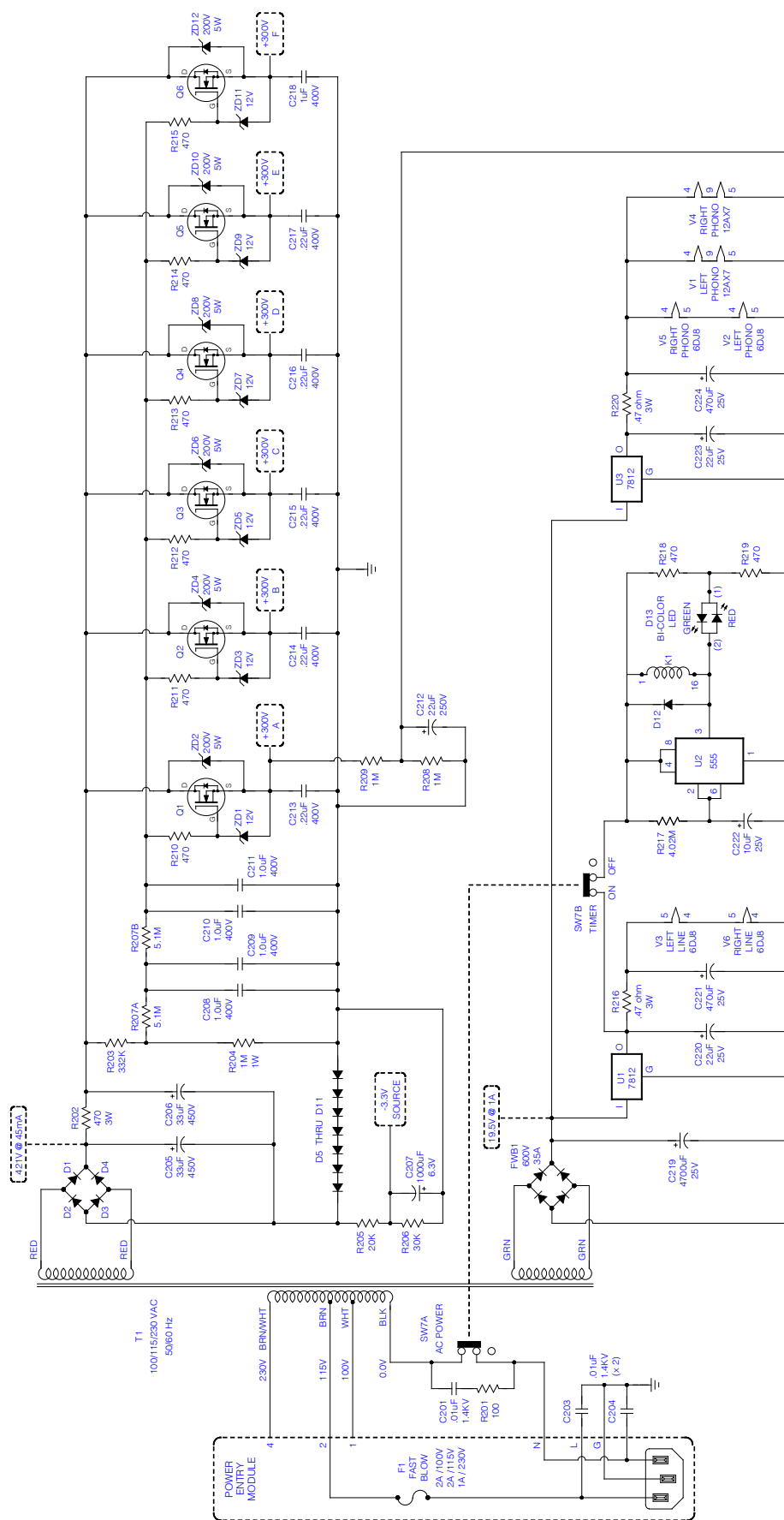


1.2W AND 1W RESISTORS ARE 1% METAL FILM
3W RESISTORS ARE 5% METAL OXIDE

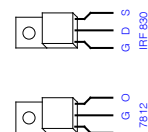
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PAS-4 PREAMPLIFIER

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FRONT VIEWS



D1-D12 = 1N4007
ZD1, 3, 5, 7, 9, 11 = 1N5242B
ZD2, 4, 6, 8, 10, 12 = 1N5388B
Q1-Q6 = IRF 830

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PAS-4 PREAMPLIFIER

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PAS-4 PC Board Parts List

DESCRIPTION	DESIGNATORS
Resistors	
100 ohm, 1/2W, metal film	R201
140 ohm, 1/2W, metal film	R28, 128
221 ohm, 1/2W, metal film	R21, 25, 121, 125
249 ohm, 1/2W, metal film	R12, 112
301 ohm, 1/2W, metal film	R9, 11, 20, 23, 109, 111, 120, 123
470 ohm, 1/2W, metal film	R210, 211, 212, 213, 214, 215, 218, 219
1.37K, 1/2W, metal film	R4, 104
2.0K, 1/2W, metal film	R1, 2, 101, 102
5.6K, 1/2W, metal film	R18, 118
6.49K, 1/2W, metal film	R8, 108
20K, 1/2W, metal film	R205
24.9K, 1/2W, metal film	R19, 119
30K, 1/2W, metal film	R206
47K, 1/2W, metal film	R3, 103
165K, 1/2W, metal film	R10, 110
249K, 1/2W, metal film	R6, 106
301K, 1/2W, metal film	R22, 122
332K, 1/2W, metal film	R203
499K, 1/2W, metal film	R13, 27, 113, 127
1M, 1/2W, metal film	R208, 210
2M, 1/2W, metal film	R7, 24, 107, 124
4.02M, 1/2W, metal film	R217
5.1M, 1/2W, metal film	R207A, 207B
287K, 1W, metal film	R5, 105
1M, 1W, metal film	R204
.47 ohm, 3W, metal oxide	R216, 220
470 ohm, 3W, metal oxide	R202
15K, 3W, metal oxide	R26, 126
Capacitors	
10pF, 630V, polystyrene	C1, 101
22pF, 630V, polystyrene	C2, 102
220pF, 400V, polypropylene 5%	C4, 5A, 5B, 104, 105A, 105B
1500pF, 400V, polypropylene 5%	C6, 106
.01uF, 1.4 kV, ceramic disc	C201, 203, 204
.1uF, 400V, polypropylene	C3, 8, 103, 108
.22uF, 400V, polypropylene	C213, 214, 215, 216, 217, 218
1.0uF, 400V, polypropylene	C208, 209, 210, 211
3.3uF, 400V, polypropylene	C7, 9, 107, 109

PAS-4 PC Board Parts List (cont.)

DESCRIPTION	DESIGNATORS
Capacitors (cont.)	
10.uF, 25V, alum electrolytic	C222
22uF, 25V, alum electrolytic	C220, 223
22uF, 250V, alum electrolytic	C212
33uF, 450V, alum electrolytic	C205, 206
470uF, 25V, alum electrolytic	C221, 224
1000uF, 6.3V, alum electrolytic	C207
4700uF, 25V, alum electrolytic	C219
Semiconductors	
1N4007 (1A, 1kV)	D1 thru D12
1N5242B (12V, 1/2w Zener)	ZD1, 3, 5, 7, 9, 11
1N5388 (200V, 5w Zener)	ZD2, 4, 6, 8, 10, 12
3506 (35A, 600 PIV Bridge Rectifier)	FWB1
7812 (Regulator)	U1 ,3
555 (Timer)	U2
LED, Bi-Color, (red/green)	D13
IRF 830 (N-Channel FET)	Q1 thru Q6
Tubes	
12AX7 (ECC83)	V1, 4
6DJ8 (6922)	V2, 3, 5, 6
Switches	
Switch, pushbutton, 2 pole / 2 position	SW7 (AC power)
Switch, pushbutton, dual 2 pole / 2 position	SW4/ 5 (stereo/mono, EQ)
Switch, rotary, 2 pole / 5 position P/N 333125	SW1 (input selector)
Switch, rotary, 4 pole / 3 position P/N 333124	SW2 (tape dubbing)
Switch, rotary, 2 pole / 3 position P/N 333124	SW3 (tape monitor)
Misc.	
50K, dual VOLUME potentiometer	P1
50K, dual BALANCE potentiometer	P2
Relay (DPDT) P/N DS2YE-S-DC12V	K1
Ferrite Beads	FB1, 2
Fuse, fast-blow, 2A for 100 or 115VAC - 1A for 230VAC	F1
RCA Jack Assembly - 2x2 P/N RJ-PCM-204	JA1, 2, 3, 4, 5, 7
RCA Jack Assembly - 1x2 P/N RJ-PCM-102	JA6
PC Board	17-0382-B