Preliminary Manual 1.4

Dynaco PAS-3 Series II

Vacuum Tube Preamplifier

DYNACO
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DYNACO PAS-3 Series II

PHONO PREAMP SECTION

Maximum Output: 7 Vrms, 20 Hz - 20kHz at recording output

Total Harmonic Distortion: Less than 0.009% 1 kHz, 2Vrms

Frequency Response: +0, -0.2 dB, 20 Hz - 20 kHz RIAA Equalization Accuracy: + 0, -0.1 dB, 20 Hz - 20 kHz Full Power Bandwidth: -3dB, 5 Hz - 150 kHz Sensitivity: 10 millivolts for 0.5V at recording output.

Maximum Input Signal 1 kHz: 200 Millivolts; [2 V @20 kHz]

Gain: 34dB@1 kHz

Input impedance: 47,000 ohms in parallel with 220 pF.

Signal to Noise, weighted: >90dB below 2.0 volt output. Slew Rate: 12 volts per microsecond

LINE AMPLIFIER SECTION

Rated Output: 5 Vrms, 10 Hz - 80 kHz Maximum Output: 12 Vrms, 20 Hz - 20 kHz

Total Harmonic Distortion: Less than 0.006%, 1kHz, 2Vrms

Frequency Response: +0, -0.1 dB, 20 Hz - 20 kHz. Full Power Bandwidth: -3dB, 2 Hz - 100 kHz. Sensitivity: 50 millivolts for 0.5V rms output

Maximum Input Signal 1 kHz: 14 Vrms; volume control -20dB

Gain: 20dB

Input Impedance: Greater than 25,000 ohms

Signal to Noise Ratio (weighted): >95 dB below maximum output

Slew Rate: 12 volts per microsecond

Rise Time: 2.5 microseconds maximum, Phono in/Line out, 10 Vp-p, 1 kHz square wave; load is 10,000 ohms in parallel with 10 nF
Crosstalk: down 80dB, any input to any output, terminated
Separation: greater than 72 dB 1 kHz: greater than 42 dB@20kHz
Gain Tracking Error: less than 0.5 dB

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GENERAL SPECIFICATIONS

Inputs: Phono, Tuner, Compact Disc, Video, Auxiliary, 2 Tape recorders, EPL (external processor loop).

Outputs: 2 Tape, 2 Line, EPL (external processor loop).

Controls: "A" Taper Audio Volume, Balance, Input Selector; Monitor Selector, Mono-Stereo, External Processor Loop (EPL), Power, Tape Dubbing.

AC Supply Voltage: 100 - 130 and 200 - 260 VAC, 50/60 Hz

Power Supply Capacitance: (3) 150 mfd @450V; 6,800 mfd @35V.

Power Consumption: 20 watts.

AC Outlets: Provided by optional **PS-1** power strip powered via 12V "REMOTE RELAY."

Size: 17" wide x 3.75" high (with feet) x 10.25" deep. Shipping weight: 14 lbs. Net weight: 12 lbs. **MADE IN USA.**

INTRODUCTION

Congratulations on your purchase of the DYNACO PAS-3 Series II preamp. Your PAS-3 II has been designed and built to deliver the highest combination of value and quality of any tube preamplifier available today. The PAS-3 II is a completely new vacuum tube design.

While a totally new design, the Series II has in common with its illustrious predecessor (the original PAS-3X) the same striking simplicity of operation, conservative design, full-featured operation, Spartan beauty, and Dyna tradition of *value*. Your PAS-3 II preamp is **CONCEIVED, DESIGNED & BUILT IN THE USA.**

Though priced far less than many other tube preamps, the PAS-3 II includes as "standard" a true *state-of-the-art phono preamp section*. (Dynaco does not believe in severing music lovers from, or charging extra for, the ability to play phonograph records.) Note also that the PAS-3 II makes full provisions for *tape "1-to-2" and "2-to-1" dubbing* for the home recordist. This kind of flexibility and full-featured styling is without parallel in affordable vacuum tube preamps.

Different sonics in different systems is an issue routinely raised by the audio press when reviewing tube preamps of other manufacture. In this regard, the PAS Series II really shines. *Consistent results in combination with other components* becomes a reality with the PAS-3 Series II . Interactive ill-effects are dramatically reduced in the Series II due to its *extremely low output impedance*. Frequency response and distortion aberrations, resulting from the input impedance of associated equipment, are practically nonexistent.

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CIRCUIT & DESIGN NOTES

The PAS-3 II project was originally conceived as an "update" of the classic PAS3X. However, it rapidly became apparent that the old design had too many limitations for the 1990s. Some of these limitations are as follows:

1. The *phono stage* was incapable of driving its own RIAA feedback network with a flat frequency response in the low end, and incapable of driving it without introducing distortion. Driving today's "real world" loads—commonly two tape decks plus the high level stage -- compounds the problem.

By adding a *cathode follower*, the output impedance of the phono stage has been reduced dramatically. This has resulted in a significant reduction in distortion without any increase in the amount of feedback employed. Probably of equal significance is that the *loading effect* of tape decks, which would adversely impact distortion and frequency response, has been virtually eliminated.

2. The *high level stage* had the same output impedance problems as the phono stage. This was made worse with the type of tone controls used in the original PAS. The tone controls were effectively half in series with the output and half in series with the feedback network. If the load from the power amplifier was not exactly what the preamp was set up for, the frequency response would suffer.

Like the phono stage, the high level stage of the PAS-3 Series II has a cathode follower for all the same reasons. We differ here a little from many of the old classic preamps in respect to the method of connecting the cathode follower. Many designs connected it after the feedback—being satisfied with the buffering and the lower output impedance of 600 ohms that resulted. Connecting the cathode follower in the feedback can result in low frequency phase/stability problems that appear similar to motor boating. *However, Dynaco uses a unique hookup to the follower that eliminates this problem, reduces the distortion from the follower, and lowers the output impedance even further.*

3. The *power supply* has also been upgraded. The filament supply is now regulated which will result in longer filament life and a noticeable reduction in hum, especially from the phono stage.

The *high voltage supply* has more efficient and longer lasting *silicon rectifiers* in place of the 12X4 tube. The supply is also *regulated*, which eliminates the effects of line voltage variations on circuit performance. The amount of *filter capacitance* has been dramatically increased as well.

4. The *parts quality* of some older Dynaco equipment was acceptable but marginal—selection usually being a function of Dyna's goal of very low selling price. The higher grade parts used in the PAS-3 II should yield an even longer lasting product. Specifically, the replacement of ceramic capacitors and carbon resistors in the feedback with *high quality precision components* along with selected tubes and circuit improvements should give the user a satisfying product that will last a very long time without significant deterioration in measured or audible performance.

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USING YOUR PREAMPLIFIER

At the center of a high quality audio system, your PAS-3 II preamp serves to coordinate the signals between your sound sources - compact disc, tape recorders, record player, FM (and video) tuners, and the power amplifier which drives your loudspeakers. The ideal preamp should be attractive and easy to use, yet flexible enough to accommodate a wide range of system configurations. It should contribute a minimum of noise or distortion while providing adequate signal amplification (gain).

The PAS-3 II achieves these objectives handily, providing gold plated back panel RCA jacks for record player with magnetic cartridge (PH), two tape recorders (TAPE FUNCTION), a tuner (TUN), and three additional high level stereo inputs for a compact disc player (CD), video audio (VID), and auxiliary (AUX). It also includes inputs and outputs for an external signal processor (EPL) such as a graphic equalizer, time delay device, or noise reduction unit. The performance of the Series II PAS preamp is exemplary, and its discrete components are of high quality to ensure long life and ongoing musical pleasure.

Low noise and distortion were always hallmarks of the original PAS. The PAS Series II goes the "world's best-selling tube preamp" one better — noise is essentially inaudible in the absence of a signal, and distortion of all types, both steady state and transient, is at or near the threshold of the finest test equipment.

Sonic transparency and inner musical detail of the PAS-3 II will be immediately obvious to listeners. The PAS-3 II excels in its freedom from music "traffic jams" — where detail and identity of *individual* instruments and voices is severely blurred or lost in a sense of congested undifferentiated sonic chaos (particularly during loud passages). Credible recordings played through your PAS-3 II (with good companion equipment) will reveal detail and nuances you likely didn't realize were present in your source material.

Exceptional interchannel balance at all frequencies is maintained with close tolerance components, and RIAA phono equalization is engineered to very narrow limits, maintaining accurate phase relationships and correct spatial perspectives, as well as exceptional unit-to-unit manufacturing consistency. The components in the PAS-3 II have been selected for their superb audio performance as well as for their reliability.

POWER CONNECTIONS

As assembled, units are normally configured for 120 VAC, 50-60 Hz, as in the USA, unless they are specially identified on the carton and on the rear of the chassis. However, the standard power transformer supplied with the PAS-3 II is a *dual voltage* 120/240V [50/60Hz] international type.

The "stiff" power supply regulation of the PAS-3 II provides full performance even in situations when line voltages from your power company vary from normal. Power is supplied to your PAS by way of a modern plug-in style *IEC power cord*. While this cord is already the standard in computer terminals and monitors, Dynaco is one of a relative few audio manufacturers to provide the consumer with this modern and easy way to adapt his audio system for use worldwide. In minutes it is possible to change the voltage and fit your unit with an IEC cord terminated with the plug you require. (Because of present back panel space limitations, Dynaco does not use this connector on the ST70 II.)

VOLUME CONTROL

The volume control on the PAS-3 II is worthy of special mention. Dynaco has chosen a special *"A-Taper Audio" potentiometer* for adjusting volume level on the PAS-3 II. (Many manufacturers use a "B-taper audio" control which concentrates virtually all of the adjustment range in the first quarter turn, thus wasting nearly three-quarters of the control range.) ***The "A-Taper" potentiometer Dynaco uses in the PAS-3 II distributes useful volume control over virtually the entire mechanical range of the pot.*** With typical signal levels, the 7:00-12:00 position yields "very soft-moderate" listening levels; 12:00-5:00 "moderate-very loud" levels. Within that expanded range of adjustment, the user has many more fine-tuning options.

INPUTS—Magnetic Phono

As assembled, Phono is provided with a compensation capacitor of 220 picofarads. This value will accommodate most "moving magnet" cartridges. These have output levels intended for normal phono inputs (0.5 millivolts per centimeter or higher). Some high output moving coil design cartridges are not sensitive to capacitive loading, so they may be used with this input also. Though some phono cartridges are comparatively free of loading sensitivity, if the cartridge manufacturer specifies the proper load capacitance (which is the sum of the preamp's internal capacitance, and the cables you use, as well as the above described capacitor), the most accurate sound will be obtained by following that recommendation.

In the lower right hand corner of the rear panel is a *ground terminal*. This thumbscrew is provided for connection of a separate ground wire often provided on turntables, or as part of their audio cables. This "chassis ground" may sometimes reduce the hum level of a system when it is connected to an earth ground, such as a cold water pipe, or the ground wire of 3-wire house wiring. However, the need for such connection varies with individual situations. After the system is operative, using a phono source, experiment with and without an earth ground to determine which provides the lowest hum, and use that.

INPUTS—Tuner, CD, Video, Aux

These are high level signals from FM, AM or TV tuners, or compact digital audio disc, video disc, or VCR players.

INPUTS—Tape 1, Tape 2

These are at line level and impedance. They connect to Tape Play outputs on the tape deck. They are not grounded when unused, since they can be connected by either the Tape Monitor switch or used for tape dubbing.

RECORDING OUTPUTS

These connect to the Line Inputs of tape decks. The two pairs of outputs are connected in parallel when the **TAPE DUBBING** switch is set to "SOURCE." Thus two tape recorders receive identical signals from the input selector switch. Signals at these outputs are at line input level (phono signals are first amplified and equalized). These outputs are unaffected by external processing circuits, or by the PAS's Mono or Volume controls. Signals indicated by the Tape Dubbing switch are the other tape input, so tape copying is provided using either recorder as a source.

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LINE OUTPUTS

Two pairs of outputs are provided for your power amplifier connection.

EPL/EXTERNAL PROCESSING LOOP (EQ)

"OUT" is an output at line level for the purpose of driving an external signal processor such as an equalizer, time delay, or noise reduction unit. "IN" is an input from the signal processor at line level.

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OPERATION

When you turn on the PAS-3 Series II, the single "RED" LED on the front panel will light immediately, indicating that the preamp is functioning. After the preamps tubes become operational, the LED will glow "GREEN." At turn-off, it is norma! for the LED to fade slowly as the operating voltages decline and the power supply is drained.

DELAYED ON/OFF

Remember that your PAS preamp (and its companion ST70 power amp) will require 20-30 seconds for the tubes to become operational. Dynaco suggests you reduce the PAS volume control to a minimal level setting *before* PAS turn-on.

At *turn-off* your PAS will continue to produce output. *This is absolutely normal behavior*, and is a function of the high value electrolytic capacitors designed into your preamp's power supply section, as well as the cool down of the tube heaters. Once these energy-storing devices are drained, sound will cease.

"INPUT" SELECTION

Your choice of signal sources is usually indicated by the **INPUT** Switch. This switch passes line level signals direct to the Recording Outputs and the EPL. Either or both tape recorders may record this source if the **TAPE DUBBING** switch is set to "SOURCE."

TAPE DUBBING SWITCH

Tapes may be duplicated by selecting either **"1 TO 2"** or **"2 TO 1"** on the TAPE DUBBING switch (setting will depend on which machine you have designated to playback/send signal, and which you have designated to record/receive signal).

TAPE MONITOR SWITCH

To facilitate tape recording with tape decks which provide an independent monitoring facility, the PAS-3 II provides this second selection function. When it is OFF, the regular Selector switch determines what signals are heard. When the Monitor switch is turned to either Tape 1 or Tape 2, the line amplifier is disconnected from the signal being recorded, and is connected to the tape playback instead. This enables direct comparison of the signal source with the taped replica, without affecting the recording process. Tape decks which do not provide separate record and playback heads are not able to utilize this comparison.

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The following controls affect all signals which are heard through speakers. They have no effect on the signals to the recording outputs.

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.

EPL/(EQ) SWITCH

This is the External Processor Loop (EPL). Engaging this switch enables a signal processing device to be inserted in the preamplifier signal path. Such devices include equalizers, time delays or ambience simulators, expanders, compressors, and noise reduction systems. Since the switch permits bypassing the processor loop, an unpowered device in the EPL circuit will not deteriorate the PAS-3 II's performance, as might be the case with switched-off tape decks in the Record Outputs. The EPL switch can also function as an additional input selection.

BALANCE CONTROL

This adjusts the proportion of left and right channel signals to the Line outputs. In its center position the channels will be matched to +1-0.1 dB. Only the Left signal will be heard with the control fully counterclockwise, and only the Right signal at the other extreme. The ideal situation would find symmetry in room acoustics and in the electronics, but this realization is rare. Stereo reproduction is, at best, a splendid illusion, and the function of the Balance control is to optimize this illusion in the listening space. Sound wave reflections from walls, furniture and people can unbalance the stereo "stage." With judicious application of the balance control, much of the attendant distortion of stereo imaging can be overcome.

MINIMIZING NOISE IN THE SYSTEM

Your choice of separate components is the way to secure the best performance from a music system, but the wide-band characteristics and complexity of the best systems may also introduce ground loops, hum, and noise—especially RFI (radio frequency interference). With exceedingly high quality equipment we may become conscious of distractions that would be ignored on a lesser level. Careful interwiring practice will greatly reduce the likelihood of such problems.

To insure best results use connecting cables of high quality (gold is recommended), and treat them with care. Unplug cables by grasping the connector—not the cord—to maintain good connections. Make sure that the surfaces are free from grease, fingerprints, or any contaminate that may prevent a firm and complete connection.

Connecting each component to an "earth" ground does not usually reduce noise. This may even aggravate a ground loop problem, for good "earth" grounds are hard to find, and unsatisfactory grounds are likely carriers of RFI.

The preamp should be the central point of grounding in a system. Use an AC ground lift "cheater plug" on the end of all system components utilizing an AC power cord with 3-prong (grounded) plug. (The preamp's power cord may also need a "cheater plug" if it is to interface with another system such as VIDEO or other remote sources.)

LIMITED WARRANTY

For 3 YEARS from the date of purchase (1 YEAR PARTS on 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.

Your responsibilities are to use the preamplifier according to the instructions supplied, to provide transportation to the authorized Dynaco service representative who will perform warranty service, and to present proof of purchase in the form of your dated sales slip when requesting service.

Excluded from this warranty is damage that results from abuse, misuse, accidents, shipping, or 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 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, 125 Cabot Court, Hauppauge, NY 11788, giving us:

Your name and address

The preamplifier's serial number

When and where you purchased it
(copy of sales slip)

Make and model of your amplifier

Description of the problem

Whether you have the original carton and fillers or need new ones

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