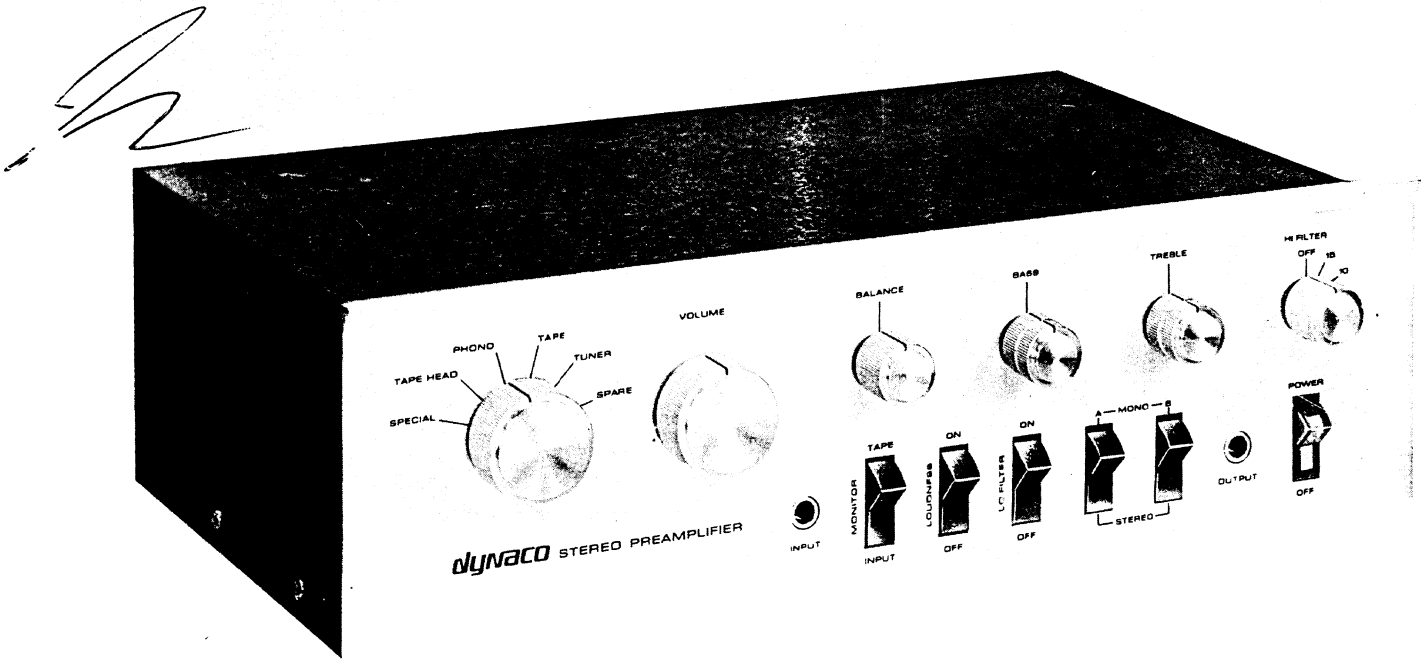
# dynaco PAT-4
## STEREO PREAMPLIFIER

SERIAL NUMBER
18031033

This number must be mentioned in all communications concerning this equipment.

# INSTRUCTIONS FOR ASSEMBLY OPERATION




Price $1.00

patents pending

929518

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### SPECIFICATIONS

**Frequency Response:** High Level inputs: ±0.5 db from 10 Hz to 100 KHz
Low Level inputs: ±1 db from 20 Hz to 20 KHz (equalized)

**Distortion at rated 2 volt output:** THD less than 0.05% 20 Hz to 20 KHz
IM less than 0.05% with any combination of test frequencies

**Hum and Noise:** Magnetic Phono: 70 db below a 10 mv input signal
High Level: 85 db below a 0.5 volt input signal

**Gain:** Magnetic Phono: 54 db at 1000 Hz
High Level: 20 db

**Tone Control Range:** ±16 db @ 50 Hz
±12 db @ 10 KHz

**Maximum Output:** 10 volts into high impedance
5 volts into 600 ohms

**Impedances:** Magnetic Phono: 47,000 ohms
Tape Head: 100,000 ohms
High Level: 100,000 ohms
Audio Output: 600 ohms
To Tape: from low level inputs, 600 ohms
from high level inputs, same as source
Amplifier Input: Nominal load 10,000 ohms or higher

**Inputs:** Low level or high level RIAA magnetic phono or ceramic phono; NAB 7½" tape head; Special (normally microphone); Tape amplifier; Tuner; Spare high level for TV, etc.; Front panel high level

**Outputs:** Tape output ahead of controls; 2 Audio outputs (one switched by front panel jack); Front panel output

**Controls:** Selector switch; Volume control; Balance control; 2 Bass controls; 2 Treble controls; High Filter switch @ 15 KHz, 10 KHz and 7 KHz; Loudness compensation switch; Tape Monitor switch; Low Filter switch; paired Stereo-Mono switches to provide A or B channels independently or combined (A + B) with 6 db blend for 3rd channel output, or stereo; illuminated power switch

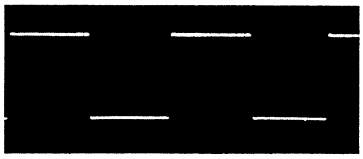
**Semiconductor Complement:** 8 transistors; 2 diodes

**Dimensions:** 13½" wide by 4¼" high by 9" deep

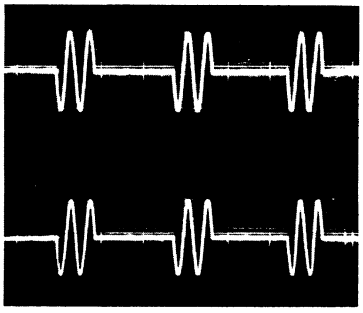
**Shipping Weight:** 10 lbs.

**Power Consumption:** 5 watts

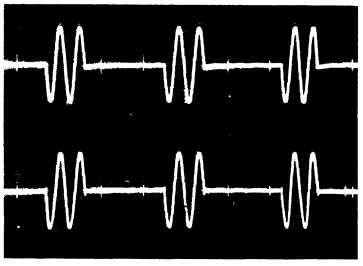
100 Hz Square Wave



10 KHz Square Wave

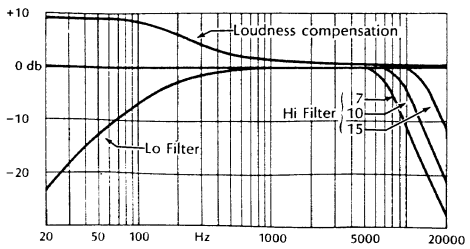


2 cycle 100 Hz Tone Burst

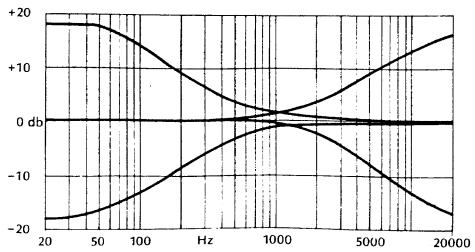


2 cycle 10 KHz Tone Burst

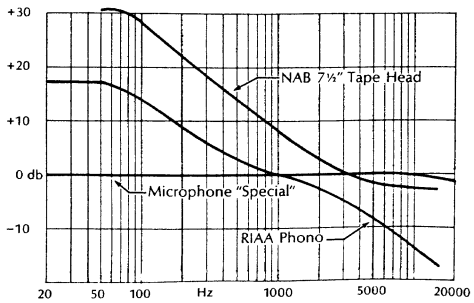
Tone bursts are indistinguishable at output of PAT-4 (top) from generator output (bottom).




FILTER ACTION




TONE CONTROL RANGE




EQUALIZATION

# DYNACO PAT-4 SOLID STATE STEREO PREAMPLIFIER

## INTRODUCTION

The Dynaco PAT-4 is an all silicon solid state control center and preamplifier which must be used in conjunction with a basic power amplifier, such as the Dynaco Stereo 70 or Stereo 120, and a pair of loudspeakers. In addition, the PAT-4 provides sufficient power for a pair of 600 ohm headphones. When headphones only are to be used, a power amplifier is not required.

All input signal sources, such as a phonograph, radio tuner, tape recorder, etc., are connected to the inputs of the PAT-4 and this preamplifier is the control center for all mono and stereo signals. Thoughtful planning has provided exceptional flexibility to accommodate future requirements for such sources as a second phonograph or a microphone, television sound, musical instruments requiring electronic amplification, etc. A standard phone jack input and output on the front panel enables convenient connection of a tape recorder or headphones, even when the preamplifier is installed in a cabinet.

The components in the PAT-4 are of the highest quality to protect against failure, and all parts are operated conservatively with close tolerances to assure continued proper operation. The transistors have been specially selected for minimum noise and distortion in sustained use and the etched circuit modules have been pretested in the circuit to ensure that every unit, after assembly, will meet the specifications normally associated only with laboratory prototypes.

The specifications of the PAT-4 speak for themselves. The distortion and noise, up to levels well beyond those required to drive any conventional amplifier, are comparable to the finest tube designs and below the levels which can be accurately measured with commercial grade test equipment. Specifications cannot define all the facets of superior audio performance, however. In use with varying program material, the PAT-4 achieves its design goals of sonic ease and naturalness always sought but rarely achieved in solid state designs. There is remarkable clarity and an impression of direct contact with the original without the extra brightness or stridency which, unfortunately, is sometimes attributed to high fidelity sound.

Like any precision equipment, the superior capabilities of the PAT-4 will best be realized when it is properly connected and operated. Please read the Operating Instructions below before attempting to use this preamplifier.

## OPERATING INSTRUCTIONS

### Connection to Power Amplifiers

On the back panel of the PAT-4 there are two pairs of audio outputs which may be connected to a power amplifier, and one pair for connection to a tape recorder. The upper row of sockets is for the Left or "A" channel, and the lower row is for the Right or "B" channel of a stereo system. A monophonic connection may be made to either channel, but the left one is most commonly used. The PAT-4 may also be used on either channel as a monophonic preamplifier without difficulty and without termination of the second channel.

*Output 1* provides a low impedance (600 ohms) output at all times for normal connection to the amplifier through shielded single conductor cable of any length up to 50 feet. Two 6 foot audio cables are supplied with the unit for this purpose.

*Output 2* is identical to Output 1 with the exception that it is interlocked with the front panel *Output* jack, so that Output 2 is automatically disconnected when a phone plug is inserted into the front panel jack. Thus, if headphones were connected, the loudspeakers would be silenced.

If Output 1 is used, and headphones are also connected, it will be necessary to advance the volume control farther because of the power requirements of the headphones to obtain the same level of sound from the loudspeakers.

### Connection from Phonograph

There are three pairs of input sockets marked "Phono." The type and output level of the cartridge used determines which pair (only one at a time) should be used. One pair is for a ceramic cartridge, marked *Cer,* and the other two pairs provide RIAA equalization for magnetic cartridges. The *Low* input is used with all normal magnetic cartridges (maximum inputs up to 80 mv). If higher output cartridges become available, these can be used instead on the *High* input with a simple modification to each circuit board. Information and parts for this change will be supplied on request by Dynaco.

### Ground Connection

Sometimes the phonograph or tape machine will have an extra wire which is to be attached to the preamplifier chassis. A grounding screw *Gnd* is provided for this purpose. Under some unusual conditions of use, where it is advisable to ground the system to a water pipe or similar earth connection, this screw can serve as the connection point.

In general, it is advisable to use the *minimum* number of separate ground leads necessary to achieve lowest hum. Some experimentation may be necessary, but extra leads often cause an increase in the hum level of a good music system.

## Connection from Tape Playback

Two pairs of inputs are provided for playback from a tape. If the machine has no electronic *playback* circuitry, but the output is directly from the playback head, the *Tape Head* inputs provide NAB 7½″ equalization. Use the shortest possible shielded cables to this input because of the requirements of the playback head. This input is selected by turning the front panel selector switch to *Tape Head.* A separate ground wire should be connected from the tape deck's recommended grounding point to the *Gnd* screw on the PAT-4 to avoid hum.

When the *Tape Head* inputs are not used, the two shorting plugs supplied should be inserted in those input sockets. This will reduce noise which would otherwise be heard when switching through this position with the selector switch.

Most tape machines available today include playback preamplifiers. For these, audio cables should be connected from their "preamp output" or "line output" sockets to the *Tape Amp* inputs, and the selector switch turned to *Tape* position on the PAT-4.

## Connection to Tape Recorder

If your tape machine has recording facilities, then audio cables should be connected from the *To Tape* output sockets on the PAT-4 to the "radio", "high level" or "line" inputs on the recorder. The recorder inputs should require signal levels nominally between 100 millivolts and one volt for full recording level. The microphone inputs on the recorder are not suitable, because their sensitivity is too high.

*To Tape* output connections are made in the PAT-4 ahead of the volume, balance, filter and tone control circuits so that these controls may be operated to adjust the amplifier signal to the speakers during the recording process without affecting the signal going to the tape recorder. This is the normal connection for recording.

*To Tape* outputs are ahead of the stereo-mono switches, however, so each output is independent and should not be externally connected together for monophonic recording from a stereo sound source.

If you wish to use all the controls in the preamplifier to correct the recording signal, the amplifier *Output 1* may be used. Remember that the volume control of the PAT-4 will then control not only the speaker and/or headphone level, but also the signal level going onto the tape. The filter, stereo-mono switches and tone controls may be helpful when transferring older 78 rpm discs to tape, for example. A higher signal level can be obtained from *Output 1* by advancing the volume control than from *To Tape* because of added gain in the output stages of the preamplifier, enabling the transfer of weak input signals (such as Tape Head playback) with less noise. You may wish to disconnect the power amplifier and use headphones in this case, however.

The PAT-4 does not provide the equalization and bias requirements of a complete tape recording preamplifier. It therefore cannot be used as such.

## Connection from Radio Tuner and other High Level Sources

The *Tuner* and *Spare* inputs are identical and receive flat high level signals from AM/FM/Multiplex radio tuners, additional tape recorders, audio signals from a TV set, etc., via regular shielded cables.

## Connection from Microphone and other Special Sources

The pair of inputs marked *Special* are normally connected for a flat high gain input such as a high impedance (50,000 ohms) microphone using single conductor shielded cable. Alternatively, by internal change described in the Technical Section of this manual, the Special input can be used as an additional phono input or other high gain equalized input.

## Selector Switch

The selector switch connects your choice of program source, selecting both channels simultaneously, together with the proper equalization for phono or tape head. This switch also enables you to select a tape recorder's output, differing from the conventional switching arrangement in which the tape had been selected separately by the Monitor switch. In the PAT-4 there is a Monitor switch as well (described later), but selection of the recorder for routine playback is made in the same way as all other inputs to avoid confusion.

## Volume Control

The output of both channels is controlled simultaneously by this control, with close tracking of the two stereo channels so that the program material will remain in balance over most of its range. The taper rate of this control has been chosen to provide a slow increase in volume over the first half of rotation and a more rapid volume increase above 12 o'clock. This enables most satisfactory operation with both low and high efficiency speakers.

## Balance Control

The balance control is normally centered, giving equal signal strength to both channels. Rotation to the right shifts the apparent sound source to the right by reducing the left channel level, and conversely to the left. This control has a very gradual action in the first 90° of rotation either side of center, so that delicate adjustments in balance can easily be made, but its action increases rapidly to the extremes of rotation, where one channel or the other is silenced.

A balance control is required because some program sources are not accurately balanced, and it is possible that the speakers used may have different efficiencies, or some rooms may absorb more sound energy from one speaker than from the other. A certain amount of balancing adjustment is thus semi-permanent, while the rest varies with the source. If you find that your balance control gives best results in the normal listening location when it is consistently offset from center, you may wish to loosen the set screw and reposition the control knob so that it points straight up for most listening.

## Tone Controls

There are individual bass and treble controls for each channel, but to make normal operation easier, the two sets of controls utilize split knobs. This enables you to make routine adjustments on both channels simultaneously, yet vary them independently when special occasions call for it. The forward knob controls the left channel, and the one nearest the panel adjusts the right channel.

The normal or "flat" position is centered, with increasing effect to the right, and a decrease to the left. Tone controls alter the original signal to suit the user; but these alterations are deviations from truly accurate reproduction. The reference point should always be the center, which gives no frequency discrimination. The tone controls also help to correct for record compensation characteristics of older discs which do not follow the present RIAA standard playback curve.

The special tone control design in the PAT-4 is a patented Dynaco design which assures that the tone controls are "out of the circuit" when they are centered. This provides the convenience of continuously variable correction without the complication of extra disabling switches.

### High Frequency Filter

The *Hi Filter* rotary switch gives sharp reduction of the frequencies above the points which are marked (in KHz) on the front panel. The first step away from "flat" is barely detectable, being at the extreme of the audio range. Further steps have an increasing but still subtle effect. The 15 KHz position may be useful in filtering out supersonic disturbances when recording from some stereo radio programs. Successive steps will assist in reducing high frequency distortion in poorer program sources.

### Monitor Switch

The spring-return *Monitor* switch enables direct comparison of the source signal as indicated by the selector switch, with the same signal played back from the playback amplifier of a tape recorder. This feature is applicable when recording through the PAT-4 to a tape recorder which has separate preamps and 3 or more heads designed for simultaneous playback while recording. For example, while recording from a radio tuner, the selector switch is on "Tuner," and "To Tape" is connected to the recorder input. The playback output of the recorder is connected to "Tape Amp." You will hear the tuner directly until you depress the *Monitor* switch against the spring. Then, you will hear the program just recorded as it is played back from the tape.

### Loudness Switch

The *Loudness* switch is normally left "Off," but it may be used at lower settings of the volume control to provide an increase in bass to compensate for the ear's lack of sensitivity to low frequencies at low sound levels. The high fidelity purist usually avoids any such compensation; but many listeners will find this switch, used in moderation, adds listening enjoyment at low levels. This sonic correction does not add boom or muddiness to the reproduction.

### Low Filter Switch

When "On" the *Low Filter* reduces the level of signals below 100 Hz, and thus minimizes rumble and similar low frequency disturbances.

### Stereo-Mono Mode Switches

The pair of switches marked *Stereo-Mono* is normally left in the stereo position, with the bottom of each switch depressed. They provide three additional choices: 1) The *left input channel "A"* is switched through both outputs by depressing the *top* of the *"A"* switch *alone;* 2) conversely, the *right input channel "B"* is available at both outputs when *"B" top* is depressed, and the *bottom* of *"A"* is depressed; 3) a partially *blended* mono signal is obtained at both outputs by depressing the tops of both switches.

When the tops of both switches are depressed this is a blended position to be used for combined channel mono signals. This gives 6 db of separation and is desirable for reducing the apparent separation between stereo speakers, or for establishing the proper spatial effect for more natural sound in stereo headphones. This is the normal position for playing mono records with a stereo cartridge. It can also be used when operating a center speaker in the Dynaco derived center channel system. This 3rd channel system is described in the Technical Section of this manual. The Technical Section also describes the minor wiring change to obtain a fully blended (A+B) mono signal if desired.

Since the stereo-mono switching system enables you to play a mono program through both output channels, it is possible to have extra mono inputs by using the Spare or Special positions for different signal sources in the left and right inputs. For example, a TV input could be selected for the Spare "A" input, and a mono tape machine for the Spare "B" input. Then selection between these would be made with the stereo-mono switches.

### Front Panel "Input"

The front panel *Input* jack will override the selector switch and cut out the signal from all other inputs when a phone plug is inserted. This is a normal high level input, identical to the Tuner and Spare inputs. You may wish to connect a tape recorder here, but remember that the Monitor function is not operable on this input. Another possibility is to insert the output plug from a musical instrument requiring amplification, such as an electronic guitar. If the plug from a mono source is only partially inserted (to the first detent, or notch) then only the right channel is activated by the front panel input, and you can mix a guitar, for example, on the right channel, with a record (selector switch on phono) heard on the left channel. You can adjust relative levels with the balance control. If desired, you can mix the two signals (if they are already properly balanced) by depressing the tops of both mode switches. Thus you can accompany a musical instrument with a record, tape, radio, or a microphone.

If a mono phone plug is fully inserted, it will provide signal to the left "A" channel only; then depressing the top "A" button will switch it through both output channels.

### Front Panel "Output"

The front panel *Output* jack provides a normal 600 ohm output in parallel with amplifier Output 1 on the back panel. Connecting to the front panel output mutes Output 2 on the rear, enabling the use of headphones, for example, to automatically cut out the speakers.

If an amplifier is connected to Output 1, which is not muted by the front panel jack, the introduction of headphones will cut the amplifier signal approximately in half.

Headphones should be of medium impedance (nominally 600 ohms) or higher. If only low impedance (4 to 16 ohms) headphones are available, such as are normally connected to *amplifier* outputs, then a matching transformer should be used.