INTRODUCTION

Phase Linear congratulates you on purchasing the Model 3000 Preamplifier. The Model 3000 is a state-of-the-art preamplifier using modern solid-state technology. From its fully shielded, tightly regulated power supply to its unique gold-plated, tactile feel pushbuttons, the creativity and craftsmanship of the 3000 are evident. Touching a pushbutton or turning a knob will convince you of the precision and quality of the components used to make your Model 3000 not only elegant to look at, but a pleasure to operate.

Innovative features of your new preamplifier include its CMOS Logic Memory System used to control relays for all critical switching, two independent RIAA phono stages for elimination of all low level switching, built-in head amp for moving coil cartridge reproduction, stepped-attenuator volume control, and Noise Reduction input/output jacks for installation of outboard noise processors. Only the highest quality components have been used to assemble your Model 3000, including 1% metal film resistors, 2% polystyrene capacitors and solid tantalum capacitors—all to guarantee the high performance specifications for the life of the unit. Quality is not limited to just electrical components, but extends to the rugged 20 gauge cold-rolled steel chassis for minimization of magnetically induced interference, to the solid glass-epoxy, double-sided printed circuit boards, to the deep-grained, 3/16 inch thick front panel, and to the oversized 16 gauge line cord.

Considerable design effort has been put into the Model 3000 to separate fact from aural fantasy, with regard to audio reproduction. Use of third-generation integrated circuits creates virtual immunity from overloading caused by either steady-state or transient effects, whether amplitude, frequency or slew induced. Absolute minimizing of non-linearities and noise allows a clarity and accuracy of sound reproduction unsurpassed.

You are encouraged to thoroughly read the following manual in order to understand and be able to use the Model 3000. Before leaving the factory your Model 3000 was tested and certified to be in perfect operating condition. This manual will help you operate the Model 3000 as well as keep it in excellent condition and should be put away for future reference. With care befitting all fine instruments, your Phase Linear 3000 will provide years of musical enjoyment. Happy listening.
WARNING  TO PREVENT FIRE OR SHOCK HAZARD DO NOT EXPOSE THIS APPLIANCE TO RAIN OR MOISTURE

All warranty services must be performed at a warranty station located in the country where the unit was purchased or at the Phase Linear factory.

If you have any questions concerning the warranty please write to:

Service Manager
Phase Linear Corporation
20121 48th Avenue West
Lynnwood, Washington 98036
(206) 774-8848
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LINE VOLTAGE AND FUSE
This model is available in two basic versions: One version operates only on 120 Volt, and the other operates on either 120 Volt or 220/240 Volt. If your unit is the latter version it will be designated “Dual Primary” on the rear panel. These units will be set as shown on the shipping carton (i.e. 220/240 VAC or 120 VAC) and will be set for the proper voltage of the country of destination. You must only change the voltage if you move from a 220/240 VAC area to a 120 VAC area or conversely. If you need to make that change use the following procedure.

CHANGING LINE VOLTAGE SETTING AND FUSE
Only a qualified technician should change your unit from one voltage to another since that conversion must be done by rewiring the power supply. The following diagram will give the proper schematic to enable that conversion to be made correctly.

![Diagram showing 240 VAC and 120 VAC connections]

IF THE PRIMARY VOLTAGE IS CHANGED, THE LINE FUSE MUST BE CHANGED AS FOLLOWS:

120 VAC: Use \( \frac{1}{2} \) AMP
240 VAC: Use \( \frac{1}{4} \) AMP
REAR PANEL DESCRIPTION

PHONO: 2
Inputs for turntable to be used with moving-coil phono cartridge or other very low output cartridges; provides an additional +20dB gain. The RESISTANCE switch is used to select the desired leading impedance. (See Operating Instructions.)

PHONO 1:
For conventional moving-magnet phono cartridges with nominal outputs of 2mV. Selection of the recommended loading capacitance is done with the CAPACITANCE switch. (See Operating Instructions)

CHASSIS GROUND:
Used to ground turntables and other equipment.

TUNER:
Inputs for AM/FM tuner.

AUX:
Inputs for auxiliary equipment.

TAPE 1 PLAY:
Inputs for tape playback or line output lines from Tapedeck 1.

TAPE 1 REC:
Record output for connection to tape record or line input jacks on Tapedeck 1.

TAPE 2 PLAY:
Input for tape playback or line output lines from Tapedeck 2.

TAPE 2 REC:
Record output for connection to tape record or line input jacks on Tapedeck 2.

OUTPUTS:
Two pair of main output jacks used to connect preamplifier via audio cables to the power amplifier inputs. Output A is switched off whenever headphones are plugged into the front panel socket; Output B is unaffected by the headphones.

AC SWITCHED OUTLETS:
Four outlets allowing remote equipment (not totalling more than 600 watts) to be switched by the preamp’s power switch.

AC UNSWITCHED OUTLETS:
Accessory outlets for turntables, fans, and other equipment totalling not more than 600 watts.

NR LOOP:
Noise Reduction Loop used to patch-in a noise reduction unit (Phase Linear 1000, Burwyn DNF1201A, Dolby Processor, DBX, etc.). The links are removed and then audio cables connect the NR Loop out-jacks to the inputs of the noise reduction unit; additional cables then tie the noise reduction unit’s outputs to the NR Loop in-jacks. IMPORTANT: THE JUMPER LINKS MUST BE INSTALLED IF AN OUTBOARD PROCESSOR IS NOT USED.
INSTALLATION INSTRUCTIONS

Please follow these instructions when installing the Model 3000 preamplifier:

PREAMPLIFIER CONNECTIONS
1. Initial Settings:
   a. AC Line Cord not plugged in.
   b. Power switch in out position.
   c. Volume control fully counterclockwise.
   d. All pushbuttons in out position.
   e. Balance control in center detent position.
   f. Low and High Tone Contour controls centered.

2. External Equipment:
   a. Plug the shielded phono leads from turntable into either Phono 1. (moving magnet cartridge) or Phono 2. (moving coil cartridge) inputs, first removing the factory installed shorting plugs. Always use these shorting plugs in the unused phono stage. Plug the AC line cord from the turntable into an unswitched AC outlet on the rear of the Model 3000. Connect the ground wire from the turntable to the Chassis Ground lug on the 3000. Refer to Operating Instructions section of this manual for proper setting of the cartridge loading Resistance and Capacitance switches.
   b. Plug the shielded leads from tuner into the Tuner inputs and connect all other equipment such as tape decks into the appropriate inputs.
   c. For proper hook-up of auxiliary equipment into the tape monitor loop refer to the manufacturer’s instruction manual.
   d. The bussing links connecting the NR (noise reduction) Loop outputs to inputs must be installed for proper operation if an outboard noise processor is not used. When using a noise reduction unit, first remove both factory installed bussing links and set aside for possible future use. Connect shielded leads from the NR Loop “Out” jacks to the noise reduction unit’s input points; next plug another pair of shielded leads from the noise reduction unit’s output points to the Model 3000 NR Loop “In” jacks. Plug the AC line cord from the outboard noise processor into a switched outlet on the rear of the 3000. Turn on the noise reduction unit and set all controls for normal operation.
   e. Connect the Model 3000’s main outputs (either A, switched or B, unswitched depending on headphone listening preference—see Operating Instructions for details) to the power amplifier’s inputs using shielded leads. The power amplifier should be plugged into a switched outlet on the 3000, provided it does not exceed the maximum total of 600 watts.
   f. Turn-on:
      a. Plug in the AC line cord. Leave the preamplifier turned off.
      b. Make sure the input level controls (if present) on the power amplifier are turned down and the unit is off (if controllable).
      c. Re-check all connections and turn on the Model 3000 preamplifier. Wait approximately 10 seconds for the output relay to energize before continuing. The time delay-on/instantaneous-off output relay controls “thumping”
      d. Turn on the program source (turntable, tuner, tape, etc.).
      e. Select the desired source by pressing the appropriate tactile switch. Upon initial power application to the Model 3000, one or more amber LED’s may light up. Press the tactile switch immediately beneath the LED to extinguish all amber lights. There should be only one green light on, indicating the desired source.
      f. Turn on the power amplifier and, if applicable, advance the level controls about 3/4 clockwise.
      g. When using a power amplifier without level controls, the 3000 Volume knob will provide sole control of the output level.
      h. Advance the Model 3000 volume control until the desired level is obtained.
LOW FREQUENCY TONE CONTOUR:
Use to boost (CW) or cut (CCW) low frequencies (bass).

HIGH FREQUENCY TONE CONTOUR:
Use to boost (CW) or cut (CCW) high frequencies (treble).

LOW FREQUENCY TURNOVER SWITCH:
Controls the low frequency point at which the low frequency tone contour circuits begin to take effect. In for 50Hz turnover, out for 150Hz turnover.

HIGH FREQUENCY TURNOVER SWITCH:
Controls the high frequency point at which the high frequency tone contour circuits begin to take effect. In for 2kHz turnover, out for 5kHz turnover.

POWER SWITCH:
Push-push type switch used to turn the Model 3000 on and off; also controls switching of the AC accessory outlets.

TONE CONTOUR SWITCH:
Push in to activate Tone Contour circuits; leave out to defeat. Out position bypasses all Tone Contour circuitry.

LOW FILTER TACTILE SWITCH:
Pushbutton control of the infrasonic filter for elimination of rumble frequencies. Amber LED indicator lights upon selection.
CMOS LOGIC SELECTOR SWITCH:
Convenient tactile pushbutton control of source to be played through the Model 3000, with green LED indicators.

TAPE MONITOR TACTILE SWITCHES:
Pushbutton control of two tape monitor circuits with amber LED indicators.

MONO SWITCH:
Push in to switch from stereo to mono operation of the Phase Linear 3000.

BALANCE CONTROL:
Use to shift stereo image to the right (CW), or to the left (CCW). Center position identified by positive detent.

VOLUME CONTROL:
Stepped attenuator volume control featuring 22 positive detented positions. Control is accurately calibrated in dB attenuation as shown.

TAPE COPY TACTILE SWITCHES:
Pushbutton control of tape copying circuits with amber LED indicators.

LOUDNESS SWITCH:
Push in to activate loudness contour circuitry; used to compensate for apparent low frequency loss at low volume listening levels.

HEADPHONE JACK:
Stereo jack for either low or high impedance headphones; also controls switching of Output A. Output A automatically mutes when headphones are installed while Output B is unaffected.

MUTE SWITCH:
Push in to engage −20dB attenuator network. Used to expand range of volume control and for quick reduction of overall sound level.
OPERATING INSTRUCTIONS

PHONO CARTRIDGE LOADING
The Model 3000 preamplifier is equipped with two, three position selector switches—one for each phono input—for the purpose of selecting the optimum loading resistance or capacitance for most phono cartridges. The switches are located on the rear of the 3000, directly adjacent to the phono input jacks, reducing signal path travel to a minimum and preventing accidental tampering, possible if they were front panel mounted.

PHONO 2 (MOVING-COIL):
Dedicated to moving-coil cartridge applications requiring a head amp (or pre-preamplifier) for reproduction. A transformer is not necessary for moving-coil cartridges played through the Model 3000. (If a transformer is already owned and operation with it is desired, then use Phono 1 inputs.) The only critical loading element for moving-coil cartridges is resistance and the 3000 offers a choice of three values: 50, 200 and 500 ohms. Consult the manufacturer’s data sheet for the proper resistance and simply slide the selector switch to the nearest value shown.

PHONO 1 (MOVING-MAGNET):
For purposes of simplicity any cartridge that is not moving-coil technology will be considered moving-magnet technology and should be connected to Phono 1 for reproduction. The critical loading elements now are resistance and capacitance. Resistance is fixed at 47k ohms (+/-5%, 20-20kHz—guaranteeing no cartridge interaction at any audio frequency) and complies with virtually every cartridge manufacturer’s requirements (the main exception being CD-4 cartridges).

Three values of capacitance are available via the selector switch. Selection of the correct capacitance is slightly more difficult than resistance since the amount of capacitance contributed by the turntable and the input cables should be included. If unknown, a reasonable value to use is 50pF for turntable and cables combined. The procedure is to take the recommended value, subtract 50pF (or the exact value if known) and then position the selector switch to the nearest value. For example, most Empire, AKG and Shure cartridges require a value around 470pF. So, take 470pF minus 50pF for turntable and cables and the desired position would be 420pF.

Another example would be for ADC, Stanton and Pickering cartridges, all of which require 275pF loading capacitance. Subtracting the typical 50pF figure leaves 225pF as the correct setting for the Capacitance selector switch.

CMOS LOGIC SELECTOR SWITCH
In lieu of a conventional mechanical selector switch, the Model 3000 incorporates a solid-state CMOS logic controlled relay design. Control signals are generated by tactile pushbutton featuring gold-plated cross-bar switching mechanisms, achieving very low contact bounce and insuring constant electrical output. CMOS logic digital integrated circuits acknowledge the pushbutton signal and selectively energize the proper relays. All relays have silver contacts and, being designed to meet the critical telecommunications standards, a life-span in excess of 50 years. The use of relays allows a circuit design where all critical signal paths are reduced to the absolute minimum by locating the relays right at the input jacks and routing only non-critical DC control signals to the front panel. Further reduction of signal path length is achieved by the two RIAA stages where less than one inch separates the input jack and the equalizing amplifier, and no switching is done until after amplification.

A major feature of the CMOS Logic Selector Switch is its ability to remember which functions have been selected even with the power switched off. Memory precludes the annoyance of having to re-select each function every time power is applied. For the memory circuits to remain active the AC line cord must be plugged into an energized outlet; the power switch need not be on. In situations where control of the 3000 is to be done by switching power to its AC line cord, the logic circuits will automatically select Tuner as the source.

The usefulness and versatility of the logic memory system is best illustrated by example: Suppose Phono 1 and Low Filter are selected and the 3000 is turned off by its power switch. Re-applying power by pressing the power switch will cause the 3000 to select Phono 1 and Low Filter as before. Now suppose the same functions are selected and power is removed to the 3000 by interrupting the AC line cord via a timer or wall switch controlled outlet. Upon power being reapplied to the line cord, the Model 3000 will power up with Tuner selected. This makes it possible to go to sleep with a favorite record and wake to the radio if so desired. Or leave the house after listening to records, turning off the system via a wall switch, only to return, turn the system on with the wall switch, and have the radio come on.
The Model 3000 CMOS logic memory system is not foolproof and can be tripped if improper procedures are used. Familiarity with the following examples of abnormal operations should help avoid any surprises that may be encountered:

1. Upon first application of power the circuits will be confused and an undefined condition results. This will be displayed by one or more amber LEDs being lit, along with perhaps two green LEDs. If this occurs, simply press the pushbuttons beneath the amber LEDs and press any unlit source button (Tape 1, Phono 2, etc.). The erroneous condition demonstrated here is having both the power switch off and the AC line cord disconnected. One or the other is okay but not both. In other words, for proper operation of the memory circuits, power to the Model 3000 may be removed by using its power switch or interrupting power to its AC line cord—do not do both.

2. Simultaneous pressing of two or more source pushbuttons can result in selection of two or more sources (it is not easy, but it is possible). This is definitely a no-no, as there are no input summing resistors and damage may result to the Model 3000 and/or the sources.

3. Once power is turned off by using the 3000 power switch, further pressing of any pushbuttons will confuse the memory circuits. Normally this results in an undefined condition when power is reapplied. Sometimes the Model 3000 will come back on with no lights on at all. If this occurs, simply press a source button and the circuits will clear and reset.

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**FREQUENCY (HERTZ)**

Illustration 4
The rationale behind the Model 3000 having both green and amber LEDs is to assist the user in detecting any nuisance problems arising from switches left in erroneous positions. Green LEDs signify normal source selections while amber is restricted to functions considered other-than-normal. Who has not, at one time or another, thought their system was malfunctioning, only to find a tape monitor switch left on (or accidentally pressed by inquisitive, small hands)? Should this occur with the Model 3000, check first to make sure all amber LEDs are extinguished before consulting the dealer or factory.

**LOUDNESS SWITCH**

Apparent loss of low frequencies at low volume listening levels may be overcome by activation of the loud switch. Doing so engages a volume sensitive loudness compensation circuit. Further flexibility of this function is afforded by using the mute switch in conjunction with the loud switch. It should be noted that the amount of compensation is based upon listening tests and psycho-acoustics rather than strict adherence to the famous Fletcher-Munson curves. The result is a more pleasing, natural sounding bass response at low listening levels.

Due to the larger than 2dB steps occurring at the low listening settings of the volume control, the Model 3000 loudness circuit is designed to be operated in conjunction with the mute switch. Illustration 4 shows the volume sensitive nature of the control for several settings; also shown is the effect of adding the mute function which shifts the corresponding curve down by 20dB. This allows the loudness circuit to operate in the finer, 2dB/step, portion of the volume control.

**HEADPHONES**

The Model 3000 incorporates a true high-fidelity headphone amplifier that powers the panel mounted jack. Use of headphones involves nothing more than plugging the headphones into the jack. All control functions remain active for use with the headphones. No circuitry is bypassed. headphone listeners seem to fall into two broad categories: Those who wish the main speakers muted while using headphones, and those who do not. For this reason, the 3000 provides two sets of main outputs. Output-A is controlled by a headphone relay and disconnects whenever headphones are plugged in; Output-B is unaffected by headphone operation.

Since headphone impedance can vary from as low as 4 ohms to greater than 2000 ohms depending upon manufacturer, the Model 3000 incorporates a power averaging circuit that allows approximately the same power to be delivered into headphones from 4-800 ohms. The variation is roughly ±3dB (2 to 1 variation). Illustration 5 shows this effect as well as giving the maximum available voltage that can appear at the headphone jack as a function of impedance.

**CAUTION:**

The power output of the Model 3000 headphone amplifier may exceed the maximum allowed by some headphone manufacturers. Consult the owner's manual supplied with your headphones for the maximum limitations on either power or voltage and check Illustration 5 before any attempt is made to operate the 3000 at full volume.
TONE CONTOUR AND LOW/HIGH TURNOVER SWITCHES

The Phase Linear 3000 has adjustable tone contour turnover points (see Illustration 6). The turnover point is the place on the frequency spectrum above and below which the tone controls will have an effect. The turnover point for the Low controls may be set at 150Hz by leaving the low frequency turnover button out. In the depressed position the turnover point is switched to 50Hz and the bass boost will be audibly reduced. The turnover point for the High control is set at 5kHz with the high frequency turnover button in the "out" position. In the depressed position the turnover is changed to 2kHz which will increase the effects of the treble tone controls.

The tone controls can boost or cut up to 10dB starting at the turnover point selected and rotating clockwise for boost and counterclockwise for cut.

It should be noted that the Model 3000 tone controls are designed to compensate for typical speaker deficiencies and not to augment poor source material. They are therefore subtle in effect, so as not to alter the critical mid-frequency area; preferring instead to act only on the highest and lowest octaves.

Below are listed some hypothetical loudspeaker irregularities and how to utilize the tone controls and turnover points to correct them:

1. Excessive or "boomy" bass: set Low turnover for 150Hz and gradually turn the Low control knob counterclockwise until bass response is "tighter."

2. Excessive midrange or presence: set High turnover for 2kHz and gradually turn the High control knob counterclockwise until the midrange level is more closely matched to the bass response.

3. Lack of high frequency response: set High turnover for 5kHz and gradually turn the High control knob clockwise until the response is improved.
TAPPING OPERATIONS
Considerable thought and effort has been put into the Phase Linear Model 3000 taping facilities to make them easy and flexible to use. The design of the rear panel allows for unambiguous connection of two tape decks. By separating the monitoring switches from the playback switches, much confusion inherent in operating other preamps is avoided. Playback is accomplished just like any other source by pressing either Tape 1 or Tape 2 tactile pushbuttons. Recording is a straightforward process of pressing the appropriate source pushbutton and turning on the tape machine. Monitoring is done with the corresponding “1” or “2” pushbutton. Copying one tape onto another is easily done via the two Copy pushbuttons. Simply press the appropriate button and turn on both machines. Recording is now in progress. Note that machine-to-machine copying does not involve any of the other source circuits; thereby allowing total use of the 3000 during the copying process.

By having both source and monitor pushbuttons, it is possible with the Model 3000 preamplifier to record tapes through an outboard noise processor located in the NR Loop and playback around it if desired. This feature allows use of single-pass noise reduction units that work best for recording or playback but not both.

For the correct connection and operation of auxiliary equipment normally used in the tape path, such as equalizers, refer to the respective manufacturer's instruction manual.
TROUBLESHOOTING CHART

Should you have any difficulties in the installation or operation of the 3000 Pre-Amp, the chart below will greatly assist you in both locating the source of the problem and then taking the appropriate action to correct it. Simply answer each basic question and follow the instructions beginning here:

Is the problem evident in one or both channels?

Turn off the system and reverse the 3000 outputs so that the left channel of the 3000 drives the right channel of the power amp, and vice versa. Operate the system. Is the problem still heard through the same speaker as before?

The problem lies in other equipment. Refer to the Complete System Troubleshooting Chart or contact the Factory Service Dept., or your local dealer for further assistance.

NO

Turn off the system and switch the inputs to the 3000 from left to right, right to left. Operate the system. Is the problem still heard through the same speaker as before?

Splendid

Check each of the following:

- Line cord plugged into working AC outlet.
- Depress one function tactile button. Does the LED light up now?

Check the following:

- Balance control centered.
- Both NR Loop links installed properly.
- All cables, plugs good, plugged in firmly.

Is the problem still present?

YES

There is apparently a malfunction internal to the 3000. Take it to the nearest authorized service center or send it to the Factory Service Dept. for repairs.

NO

Check all switches and cables on power amp and speakers. Refer to the Complete System Troubleshooting Chart for further assistance in locating the source of the problem.

Does at least one LED indicator light up?

YES

Check each of the following:

- Rotate Volume Control fully CCW.
- All Switches in Out position.
- Both NR Loop links installed properly.
- Headphones unplugged.
- Depress desired source button.
- Depress button beneath any lit amber LED.
- Turrantile(s) placed on phone 1 or 2 (or Tuner plugged into Tuner).
- Operate the turntable (or tuner) and turn Volume Control up slowly.

Does the system now operate properly?

YES

Now employ the various special circuits and functions of the 3000. Do you encounter a problem with any of these?

NO

Excellent

YES

The 3000's versatile tape functions have been carefully tested at the factory prior to shipment. Double check all connections and then carefully re-read the section in this manual which describes the many functions of the tape circuits in detail.

Is the problem associated with any tape functions?

YES

Is the problem associated with any tone functions?

NO

Is the problem associated with the NR Loop?

YES

DOUBLE CHECK TURNOVER SETTINGS.

- Simultaneous use of loud and large amounts of boost in the 150 Hz position can lead to muddy or distorted sound.
- Substantial bass boost may cause feedback through the turntable. Isolate the turntable from any vibrations transmitted from the speakers.

DOUBLE CHECK ALL EXTERNAL CONNECTIONS.

Carefully re-read the section of this manual describing use of NR Loop.

NO

If none of the above suggestions yield satisfactory results, refer to the Complete System Troubleshooting Guide or consult the Factory Service Dept., or your local dealer for further assistance.

NO
Illustration 6 gives the complete schematic for the Phase Linear Model 3000 preamplifier. The following technical description refers to this diagram and for purposes of clarity and brevity only makes reference to the left channel nomenclature.

PHONO STAGES AND LOW FILTER
Phono 1 inputs (moving magnet cartridges) are shunted by SW19 which adds additional parallel capacitance as required. Input resistance (and cartridge loading resistance) is fixed by R120 at 47k ohms. Phono equalization and gain is done by Z102 and its feedback network. The output of Z102 is routed through the normally-closed contacts of relays K8-P2 and K9-LF to the normally-open contacts of relay K7-P1.

Phono 2 inputs (moving-coil cartridges) are shunted by SW18 which adds additional parallel resistance as required. The input signal is amplified 20 dB by the Class-A, series-series feedback pair comprised by Z101 and Q101. Z101 is shown as two parallel NPN transistors but is actually 64 integrated transistors cross-coupled to produce one statistically matched pair, with extremely low shot noise. The output of Q101 is capacitively coupled to Z10 where the necessary RIAA equalization and gain is accomplished. The output of Z10 is routed through the normally-open contacts of K8-P2 and normally-closed contacts of K9-LF to the normally-open contacts of K7-P1.

Any time that the Low Filter relay K9-LF is energized then the output of either phono stage is routed through the high-pass active filter made up of Z9 and three each, resistors and capacitors. The configuration shown is the multiple-feedback, infinite-gain variety giving a maximally flat Butterworth, three-pole response of 18dB/octave, with a fixed corner frequency of 15 Hz.

HIGH LEVEL SIGNAL SELECTION AND PROCESSING
High level signal selection is done by activating any one of the source relays K1-TUN, K2-AUX, K3-T1, K4-T2 or K7-P1. Doing so, routes the desired signal through the NR Loop, tape monitor relays K10-T1M and K11-T2M, build-out resistor R150 to the top of the balance pot R151. From the slider of R151, the signal passes through the normally-closed contacts of the MUTE SW14 and to the top of the Volume pot R155. If the MUTE switch is depressed then a 20dB pad made up of R152 and R153 is inserted into the signal path. A tap on R155 is loaded through LOUD SW13 by R154 to ground. Series capacitor C138 is switch-selectable by SW13 to give the desired low frequency boost characteristic. Coming from the slider of R155, the signal is amplified 20dB by the "times ten" gain block made up of Z9 and its feedback network. The line level output is now routed through the normally-closed contact of the tone switch SW15 and the output relay K13-0 directly to output B, and through relay K12-H to Output A.

TONE CONTROLS
The active tone control consists of Z8 and its associated feedback elements. The topology used is a modified form of the classical Baxandall circuitry. Low frequency boost and cut is done via R131 and frequency determining capacitors C125 and C127. Frequency shifting is done via SW17 and C124. Likewise, high frequency boost and cut is done with R134 and capacitors C128 and C126.

HEADPHONE AMPLIFIER
The headphone amplifier consists of Z106 and current booster transistors Q102 and Q103. Gain is set at 13dB by feedback resistors R137 and R140. Power output is limited to safe levels for headphones by the parallel combination of R146 and R161. Power averaging is done by output parallel resistor R147 which limits the maximum load resistance seen by the amplifier. The output of each amplifier is delivered to the stereo headphone jack where relay K12-H is controlled by the auxiliary contact.

CMOS LOGIC SWITCHING CIRCUITS
All relays used for signal routing are controlled by CMOS D-flip flops — either dual units (Z1-Z3), or quad units (Z4-Z5). Tactile pushbuttons (SW1-SW11) are used to control the clock input lines on the dual-D's and the D-inputs on the quad-D's. Transistors Q3 and Q13 are used for sequencing during power-up, along with R-C networks R1-C1, and R12-C8.

POWER SUPPLY
Integrated circuits Z6 and Z7 comprise a dual tracking regulator system giving ±20VDC for use by all IC's except the CMOS circuitry which operates from ±10VDC, regulated by zener diode D18. Output relay K13-0 is controlled by transistor Q16. Delayed turn-on is accomplished by the R-C charge time of R45 and C24, while the quick turn-off time is fixed by discharge time constant R44-C24. Zener diode D39 guarantees K13-0 drops out when the power switch opens and inserts R35 in series with the power transformer, so that a small voltage is left to keep the CMOS logic circuits active. Once K13-0 drops-out then both A & B outputs are disconnected as well as the headphone jack.
OPTIONAL ACCESSORIES

1. Integral mounted, contoured wood sides with deep-brushed aluminum top cover. Available in either solid-walnut or solid-oak.

2. Rack mounting front panel with standard EIA hole locations and dimensions.

MAINTENANCE AND SERVICING

CLEANING
To maintain the luster of the front panel, occasionally clean it with a soft paper towel and diluted ammonia. This will remove dulling films which have a tendency to build up on the brushed finish.

REPAIR FACILITIES
Only qualified technicians should be allowed to repair the Phase Linear Model 3000. Phase Linear Corporation and its authorized warranty stations have the personnel and equipment to repair the Model 3000. Should any problems occur with the unit, BE SURE to consult the dealer nearest you, or call or write the Factory Service Department BEFORE sending it anywhere for repairs. This will help you to identify and locate any specific malfunctions and possibly avoid needless shipment.

If the Model 3000 is in need of service, either send it to the factory or take it to the nearest warranty station described on the enclosed list. In either case, BE SURE TO ENCLOSER A COMPLETE DESCRIPTION OF ANY PROBLEM WITH THE RETURNED UNIT, along with your NAME, RETURN ADDRESS, and a copy of the WARRANTY CARD or SALES SLIP, if applicable.

If assistance of any kind is required, please feel free to contact the Factory Service Department, 20121 48th Avenue West, Lynnwood, WA, 98036, phone (206) 774-8848.

SHIPPING
Never ship the Model 3000 in any shipping carton other than the original or a replacement supplied by Phase Linear. Ship only via a reputable carrier. DO NOT USE PARCEL POST! Insure the unit for the full value and double check to ensure the unit is properly packaged.
SPECIFICATIONS

PERFORMANCE
Rated Output Voltage: 2.0 Volts RMS
THD @ Rated Output: less than 0.04%
(20Hz-20kHz)
Typical THD @ 1kHz and Rated
Output: less than 0.005%.
S/N (IHFA Curve):
  Phono 1 (MM): greater than 90 dB
  re 10mV input
  Phono 2 (MC): greater than 78 dB
  re 1mV input
  High Level: greater than 91 dB
  below rated output
Input Impedance:
  Phono 1 (MM): 47K ohms shunted
  by selectable 150pF, 225pF
  or 420pF
  Phono 2 (MC): Selectable 50, 200
  or 500 ohms, shunted by less than
  20pF
  High Level: greater than 50k ohms
Input Sensitivity for Rated Output:
  Phono 1 (MM): 2.0mV
  Phono 2 (MC): 0.2mV
  High Level: 200 mV
Frequency Response:
  Phono 1/Phono 2 RIAA Deviation:
  ±0.3dB
  High Level: 20Hz-20kHz, ±0.1dB
Residual Noise Level (IHFA-Curve)
  @ Preamplifier Output:
  Phono 1 (MM): less than 35
  microvolts
  Phono 2 (MC): less than 135
  microvolts
  High Level: less than 55 microvolts
Maximum Output at Clipping:
  greater than 10 volts into 10k ohms
  @ 1kHz
Phono Overload Level
  (1kHz, THD 0.1%):
  Phono 1 (MM): 120mV
  Phono 2 (MC): 12mV
Volume Control Tracking: ±0.5dB
Tone Controls:
  Low: Turnover Frequency 50Hz:
  ±7dB @ 20Hz
  Turnover Frequency 150Hz:
  ±9.5dB @ 20Hz
  High: Turnover Frequency 2kHz:
  ±10dB @ 20kHz
  Turnover Frequency 5kHz:
  ±8.5dB @ 20kHz
Low Filter Characteristics:
  3 pole Butterworth with −18dB/
  octave (−60dB/decade) slope
  Corner Frequency: 15Hz
Attenuation:
  20Hz  0.5dB
  15Hz  3.0dB
  4Hz  35dB
Headphone Amplifier:
  Power Output: 200mW into 8 ohms
  with less than 0.07% THD from
  20Hz-20kHz, both channels driven
  S/N: greater than 90dB re 200mW
  output
GENERAL
Power Requirements: 60 Hz 120 V
  (U.S.A. & Canadian Models) or
  100-120/220-240v AC, 50/60 Hz
Power Consumption: 8 Watts
AC Outlets: 2 unswitched, 600 watts
  maximum
  4 switched, 600 watts maximum
Dimensions: 19"w × 3½"h × 8"d;
  (48.3 cm × 9 cm × 20.3 cm)
Weight: 10 lbs.; (4.5 kgs)
Semiconductor Complement:
  16 Integrated Circuits, 22
  transistors, 37 diodes, and 11 LEDS