

Technics SU-9070

Stereo DC Preamplifier



Professional Series

SU-9070 Stereo DC Preamplifier



A Unique DC Preamplifier with Built-in Pre-Preamp for MC Cartridges—Aims at the Highest Possible Fidelity

To transfer the pure audio signal from the external source to the power amplifier—that is the goal of any preamplifier. Any trace of side effects like noise, distortion, coloration or phase shift can make you very aware that you're listening to electronic equipment rather than pure music. The SU-9070's design reduces these undesirable elements so drastically that they might as well not exist at all. So you'll hear nothing added or taken away—just excitingly clear, transparent sound.

Filling the Requirements vs. Challenging the Limits

If you think about it, a preamplifier doesn't have to do much to earn its name. It must transmit a signal without altering it significantly. In the case of phono reproduction, it must equalize the signal to conform to RIAA standards. It should provide some operational flexibility to permit taping, mode switching and volume control. The SU-9070 does these things and can thus be called a preamp. But a preamp with a difference. Because Technics' goal in designing the SU-9070 was more than fulfilling requirements. It was rather to challenge the limits of high fidelity preamp performance. We are confident that most listeners will be satisfied with our product. But it is the really demanding connoisseur—the professional or audiophile who has been exposed to very fine equipment—who will fully appreciate the subtle yet ultimately significant accomplishments reflected in the SU-9070.

Facts and Figures

Take a look at the facts; compare the figures. A phono S/N ratio of 88dB (2.5mV sensitivity). A DC flat amp for waveform fidelity. Plus, a selector redesigned to provide full versatility when using tape decks. Now see what we've left out. Various filters and, believe it or not, a tone control. In fact, the only frequency response altering device incorporated in the SU-9070 is a subsonic filter. The reason is simple, perhaps self-evident. It is just that a preamp that performs so much better than others would not try halfway to perform a function that is not legitimately its own. For the truth is that conventional tone controls and filters, even the more elaborate varieties, are imperfect tools when highly linear response in the total system is the objective.

If tone is to be controlled, it should be done thoroughly and properly; and the way to accomplish this is to use a stereo universal frequency equalizer, the SH-9010 being an outstanding example thereof.

A look at the block diagram may give you a better idea of what we are talking about. Note the simple elegance of the MC pre-preamp, phono equalizer circuits, and DC flat amp. These circuits represent the solutions to the complex problems overcome by Technics in reaching the pinnacle of preamplifier design found in the SU-9070.

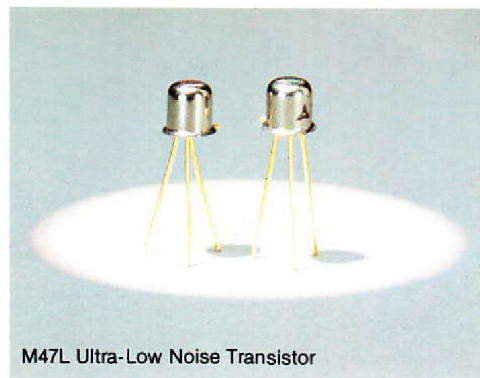
Extremely Quiet Phono Equalizer

For noise to be undetectable at high listening levels, it is essential that the phono equalizer have a high signal to noise ratio. In many preamps, equalizer noise becomes disturbingly noticeable when the volume is raised with the input selector in the phono position. Technics' SU-9070 does not have this problem because its unheard of S/N ratio of 88dB (2.5mV sensitivity) means that noise is reduced to an inaudible 1/25,000 fraction of the wanted signal.

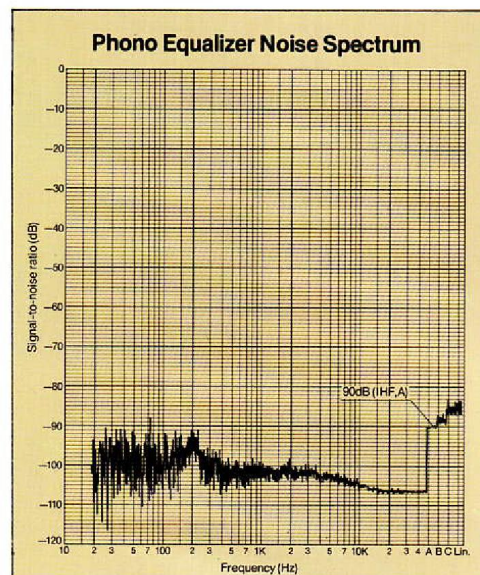
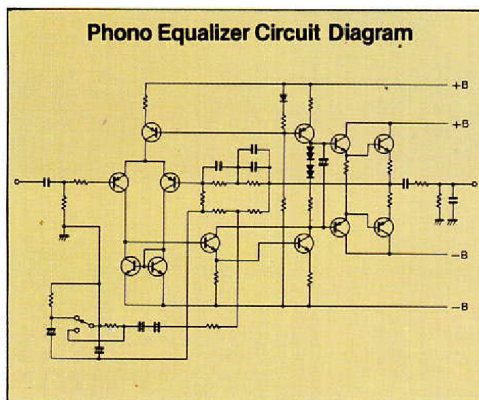
A theoretical analysis shows that most noise consists of first stage amplification of heat noise caused by nothing other than input circuit resistance and first-stage transistor internal resistance. Therefore, if these can be lowered, a high S/N ratio can be achieved. But available so called low-noise transistors retain the problem of noise-causing internal resistance when used in the equalizer circuit. Reaching this seeming impasse, Technics

had no choice but to independently develop a new transistor to meet the specification required. The M47L is the amazing result. A pair of these ultra-low noise transistors is utilized in the differential amplifier first stage. And to further ensure extremely high signal to noise ratio, our unique current mirror loading technique is employed.

For the realization of such a high S/N ratio, it was necessary to cut resistance in all elements of the equalizer circuit. One side-effect is the large current flow in the output section. To deal with this, a heat sink, rare in equalizers, has been added.



M47L Ultra-Low Noise Transistor

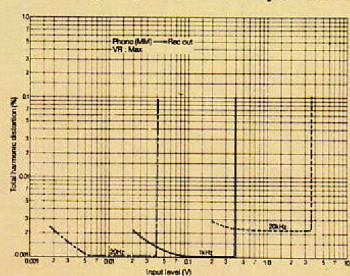


An Uncommon Pair: High Input Level Handling Ability Combined with Ultra Low Distortion

With a maximum undistorted permissible input of 380mV (at 1kHz), the phono equalizer amp can safely work with even the highest output signals that a modern phono cartridge can deliver when tracing discs of high cutting levels.

Distortion in this circuit is fought in two ways. First, the circuit has been designed for minimum distortion even without applying negative feedback; then, a generous amount of negative feedback is added to force down distortion to a level way below audibility—the accompanying graph shows *how* low. Please note that this very effective distortion reduction extends down into the low bass range where conventional NFB techniques often lose much of their efficacy. The SU-9070's equalizer is a four-stage direct coupled circuit consisting of current mirror load differential amp, constant current loaded voltage amp, and SEPP. $\pm 42V$ of high voltage is supplied for increased linearity in the first and voltage amp stages and to gain high maximum input capacity. The SEPP final stage delivers low distortion at low output impedance. Low output impedance is essential to avoid drops in output peak levels and rises in distortion when a tape deck with low-impedance input is connected to the rec out terminals. Metalized polyester film coupling capacitors are employed to reduce distortion even in areas beyond the audible frequency range.

Phono (MM) T.H.D. vs. Input Level



Accurate RIAA Characteristics ($\pm 0.2dB$)

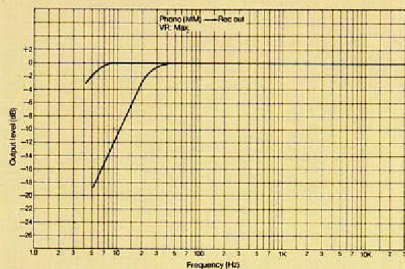
RIAA frequency characteristics are determined by precision elements for a tolerance of only $\pm 0.2dB$ from the ideal curve. Components used include metal film resistors of 1% tolerance and polypropylene capacitors with a 2% tolerance specification. An indication of the caliber of engineering put to use here is the fact that, thanks to a high frequency compensation circuit, the equalization response keeps following the theoretically ideal curve even beyond the upper limit of the audible sound spectrum.

Built-in Subsonic Filter Stops Rumble

Low frequency noise caused by warped records or low frequency resonance determined by the tonearm's effective mass and

the cartridge's compliance may give rise to undesirable IM distortion in downstream stages, and may cause the woofer to vibrate uselessly. Subsonic filters incorporated in power or preamps prevent this noise from reaching the speakers. Technics has gone a step further by placing the subsonic filter in the negative feedback loop of the equalizer amp section. (Cut-off 20Hz, $-12dB/oct.$) Thereby IM distortion is stopped at the very source.

Phono Equalizer Frequency Response & Subsonic Filter Characteristics



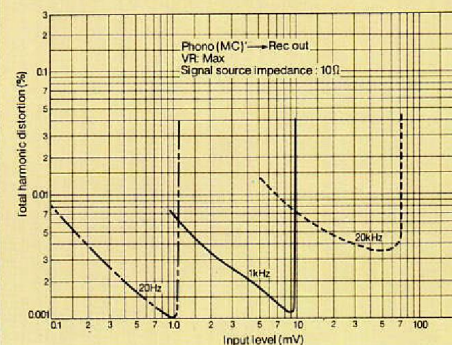
Ultra-Low Noise Pre-Preamp for MC Cartridges

Among audio connoisseurs the MM type cartridge has a large following. But there are some who prefer the unique characteristics and subtleness of the moving coil type. The problem is that the output signal of the MC type is so small that a special transformer or pre-preamp is required before the signal can be put into most preamps. MC cartridge fans will be glad to hear that the SU-9070 has an MC cartridge amp built-in so there is no need to purchase a separate piece of equipment. Available MC transformers have shown unfortunate frequency response characteristics and a tendency toward distortion. Technics has overcome all that with a circuit design breakthrough that ensures low distortion and an S/N ratio that approaches the ideal theoretical limits.

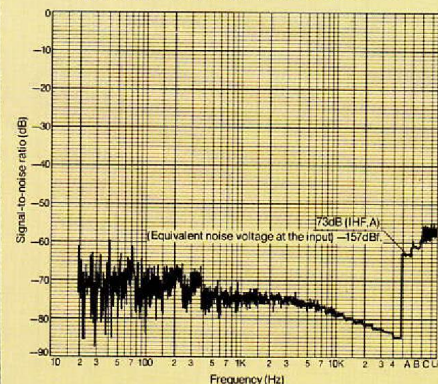
As mentioned above in the context of the phono equalizer, amp noise arises from circuit resistance noise. So, if there existed a perfect amplifier with zero circuit resistance, the S/N ratio would be decided only by the resistance caused when input is terminated. Assuming that this resistance amounts to 2.5 ohms, equivalent noise voltage at the input would therefore come to $-157dBV$. The SU-9070 pre-preamp's $-157dBV$ figure is astonishingly close to this ideal. Input sensitivity is rated at $60\mu V$; output is $2.5mV$. S/N ratio is 72dB, quite an achievement in a pre-preamp for MC cartridges. Another outstanding feature is that gain is stable irrespective of input load (cartridge output impedance). In sharp contrast to this, pre-preamps employing operation amp circuits, have reverse phase input and output while gain changes as a function of input load (a high impedance MC cartridge causes gain to fall). The difference between the S/N ratio of this type of pre-preamp and the type built-in to the SU-9070 can be clearly observed when a low impedance cartridge is used. On the other hand, since the input impedance of the

SU-9070's pre-preamp is sufficiently high, one may safely use a cartridge which requires a high matching load impedance.

Phono (MC) T.H.D. vs. Input Level



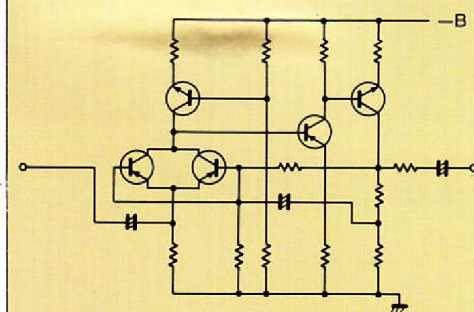
MC Pre-Preamp. Noise Spectrum



MC Pre-Preamp Circuit Features

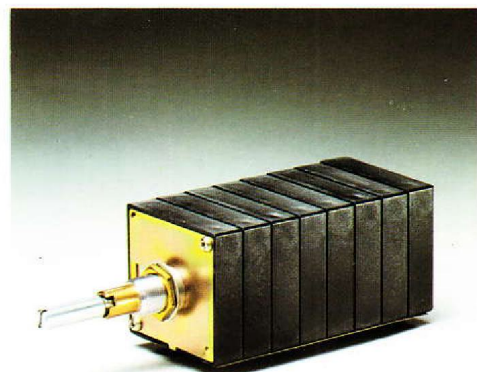
Two M57L transistors, which surpass even the M47L of the equalizer circuit in performance, are used in parallel, grounded to the base in the first stage. The base ground enables input impedance reduction and, since the negative feedback is 100%, distortion control is another big advantage. Plus, the parallel connection means no noise. Including the voltage amplifier and output stage, all together, five transistors are used in the amplifier.

MC Pre-Preamp. Circuit Diagram



Total of 6 Gangs in Volume/Balance Controls

In this design, two resistors control balance and there are two for each channel's volume control. The volume control function is divided between the flat amp's input and output sides in such a way that the combined attenuation results in the minimum possible noise at any volume setting. At minimum position, output is grounded so that there is no noise at all when the volume is turned completely down. The volume control is marked in decibels and is a continuously adjustable type of the same high precision as an attenuator. Every effort has been made to ensure perfect tracking of channels with minimized left and right gang error.



6-Ganged Volume/Balance Control

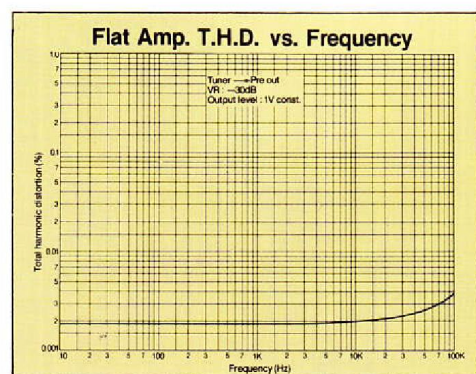
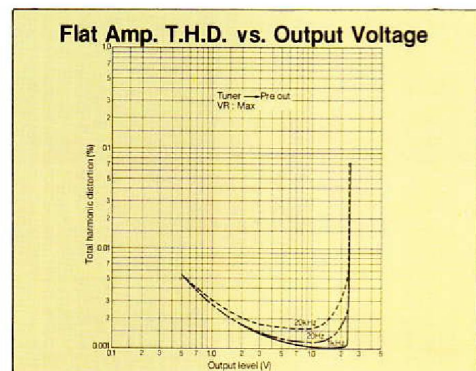
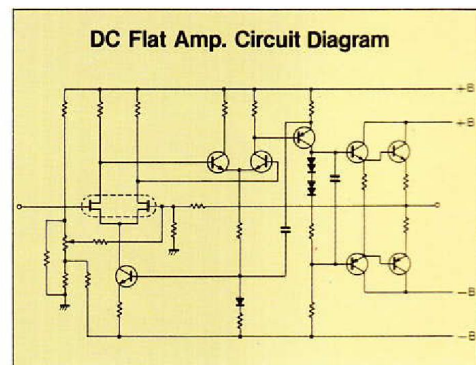
DC Flat Amp Assures Outstanding Waveform Fidelity

The flat amp is a DC amp without coupling capacitors at input or output. Capacitors have also been eliminated from the feedback loop. The DC amp holds gain to high levels and exhibits no phase shift in the low range, making for very good waveform fidelity.

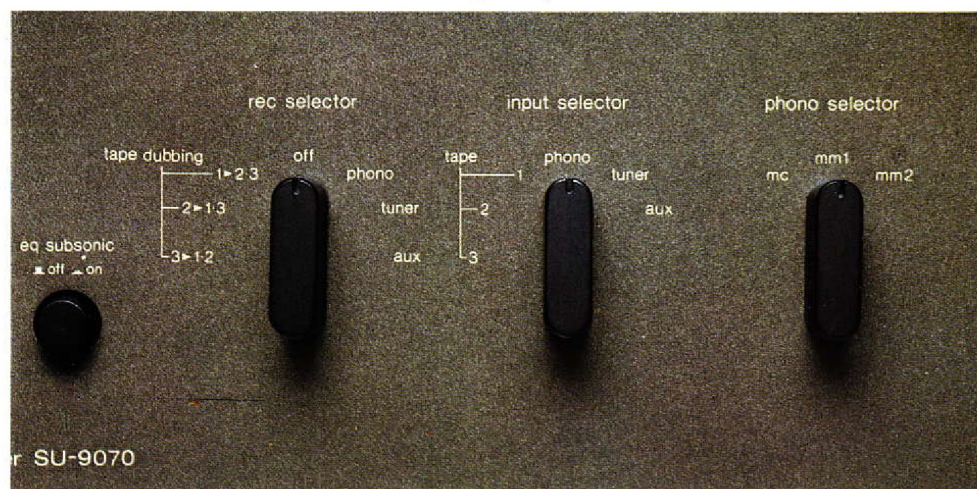
DC Flat Amp Circuit Construction

The first stage consists of a matched, dual-FET, differential amp with current mirror load. The five-stage design is further made up of a pure resistance load voltage amp and an

SEPP output stage. The result is amazingly low distortion of below 0.003% at 1V output (VR: -30dB, 20Hz~20kHz). Through improving the thermal balance of the first stage, the DC amp's operational stability has been significantly enhanced.



Versatile Redesigned Input Selector



or SU-9070

Double Muting Protection Includes Rec-Out

Since relay operated muting is provided for both pre-out and rec-out, there is no danger of shock noise reaching your power amplifier or tape deck when the amp is turned on.

Versatile Redesigned Input Selector Incorporates Tape Monitor

Until now, preamps had separate input selector and tape monitor switches. Why the tape monitor was left out is a moot point, but with the increasing attractiveness of tape decks, it's about time something was done to make preamp controls more logical. Therefore, the tape deck is included as a signal source controlled by the input selector of the SU-9070. Three tape deck inputs are provided for in the selector switch along with phono, tuner, and auxiliary.

Another surprising feature is the entirely separate recording selector. This seven-way switch provides for any recording hook-up regardless of the position of the input selector. What this means is that you can record from any of three tape decks to either or both of the others or you can record from phono, tuner or auxiliary. With this capability it is no trouble to make a recording from your tuner while simultaneously listening to an album. Versatile capability is given by the three way phono selector that lets you decide between MC cartridge input and two inputs for MM or other high level cartridges.

External Unit Switch for Universal Frequency Equalizer

Both input and output sides of the UFE are to be connected to the preamp. With that done, one button on the front panel of the SU-9070 lets you decide where to insert frequency equalization in the signal path. Specifically, when the button is extended, the SH-9010 UFE processes the pre-out signal; when the button is depressed, it switches over to rec-out signal for controlled frequency response recording. This makes pre-emphasis recording and de-emphasis playback (with resultant noise reduction) more convenient and opens up new possibilities for creative recording.

Other Features:

- Stabilized voltage power supply is used to reduce crosstalk and single-channel transient distortion to an absolute minimum.
- Cut-core power transformer boasts low leakage flux, large capacity in a small package.



- 19" panel corresponds to EIA specifications for easy rack mounting.